AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

NASA'S RESPONSE TO THE COLUMBIA REPORT

HEARING

BEFORE THE

COMMITTEE ON SCIENCE
HOUSE OF REPRESENTATIVES

ONE HUNDRED EIGHTH CONGRESS

FIRST SESSION

SEPTEMBER 10, 2003

Serial No. 108–28

Printed for the use of the Committee on Science

Available via the World Wide Web: http://www.house.gov/science

U.S. GOVERNMENT PRINTING OFFICE

89–217PS WASHINGTON : 2004

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
Fax: (202) 512–2250 Mail: Stop SSOP, Washington, DC 20402–0001

COMMITTEE ON SCIENCE

HON. SHERWOOD L. BOEHLERT, New York, *Chairman*

LAMAR S. SMITH, Texas
CURT WELDON, Pennsylvania
DANA ROHRABACHER, California
JOE BARTON, Texas
KEN CALVERT, California
NICK SMITH, Michigan
ROSCOE G. BARTLETT, Maryland
VERNON J. EHLERS, Michigan
GIL GUTKNECHT, Minnesota
GEORGE R. NETHERCUTT, JR., Washington
FRANK D. LUCAS, Oklahoma
JUDY BIGGERT, Illinois
WAYNE T. GILCHREST, Maryland
W. TODD AKIN, Missouri
TIMOTHY V. JOHNSON, Illinois
MELISSA A. HART, Pennsylvania
JOHN SULLIVAN, Oklahoma
J. RANDY FORBES, Virginia
PHIL GINGREY, Georgia
ROB BISHOP, Utah
MICHAEL C. BURGESS, Texas
JO BONNER, Alabama
TOM FEENEY, Florida
RANDY NEUGEBAUER, Texas

RALPH M. HALL, Texas
BART GORDON, Tennessee
JERRY F. COSTELLO, Illinois
EDDIE BERNICE JOHNSON, Texas
LYNN C. WOOLSEY, California
NICK LAMPSON, Texas
JOHN B. LARSON, Connecticut
MARK UDALL, Colorado
DAVID WU, Oregon
MICHAEL M. HONDA, California
CHRIS BELL, Texas
BRAD MILLER, North Carolina
LINCOLN DAVIS, Tennessee
SHEILA JACKSON LEE, Texas
ZOE LOFGREN, California
BRAD SHERMAN, California
BRIAN BAIRD, Washington
DENNIS MOORE, Kansas
ANTHONY D. WEINER, New York
JIM MATHESON, Utah
DENNIS A. CARDOZA, California
VACANCY

CONTENTS

September 10, 2003

	Page
Witness List	2
Hearing Charter	3

Opening Statements

Statement by Representative Sherwood L. Boehlert, Chairman, Committee on Science, U.S. House of Representatives	5
Written Statement	6
Statement by Representative Ralph M. Hall, Minority Ranking Member, Committee on Science, U.S. House of Representatives	7
Written Statement	8
Statement by Representative Dana Rohrabacher, Chairman, Subcommittee on Space and Aeronautics, Committee on Science, U.S. House of Representatives	9
Written Statement	10
Statement by Representative Bart Gordon, Minority Ranking Member, Subcommittee on Space and Aeronautics, Committee on Science, U.S. House of Representatives	10
Prepared Statement by Representative Nick Smith, Chairman, Subcommittee on Research, Committee on Science, U.S. House of Representatives	11
Prepared Statement by Representative Vernon J. Ehlers, Chairman, Subcommittee on Environment, Technology, and Standards, Committee on Science, U.S. House of Representatives	12
Prepared Statement by Representative Rob Bishop, Member, Committee on Science, U.S. House of Representatives	12
Prepared Statement by Representative Tom Feeney, Member, Committee on Science, U.S. House of Representatives	13
Prepared Statement by Representative Jerry F. Costello, Member, Committee on Science, U.S. House of Representatives	13
Prepared Statement by Representative Eddie Bernice Johnson, Member, Committee on Science, U.S. House of Representatives	14
Prepared Statement by Representative Michael M. Honda, Member, Committee on Science, U.S. House of Representatives	14
Prepared Statement by Representative Sheila Jackson Lee, Member, Committee on Science, U.S. House of Representatives	15
Prepared Statement by Representative Jim Matheson, Member, Committee on Science, U.S. House of Representatives	16

Witnesses:

The Honorable Sean O'Keefe, Administrator, National Aeronautics and Space Administration (NASA)	
Oral Statement	17
Written Statement	17
Admiral Harold Gehman (retired), Chairman, *Columbia* Accident Investigation Board	
Oral Statement	22
Discussion	
Schedule Pressure	22

Page

One-Year Look-Back 23
Operating Plan Changes 24
Crew Escape 25
Foam 26
Vision and the Interagency Review 28
The Independent Technical Authority 31
Management Communication Regarding Schedule 33
Countermeasures to Schedule Pressure 34
Shuttle Safety and Risk 35
Vision Formulation and the Interagency Process 38
External Tank Foam and the Use of Freon 40
RTF Workforce 42
Schedule Effects on Workforce 43
NASA/Navy Benchmark 44
Accountability 46
Vision 50
Shuttle Upgrades 53
OMB Passbacks 55
Independent Technical Engineering Authority 56
Stafford/Covey 59
Attitude/Culture 61
OSP and ISS 64
ASAP 68
Effects of the Proposed $200 Million Cut to Human Space Flight 69
Political Appointees and Bonuses 69
Budget Cuts 72
Supplemental Request 72
Manned vs. Unmanned Space Flight 74
RTF Costs and Schedule 76
Hubble 77
Schedule Pressure 77
Hubble 79
Stafford/Covey 80
Alternative Access to Station 81
Interagency Working Group Participants 82
OSP 85
Accountability 87
ISS Safety 87

Appendix 1: Answers to Post-Hearing Questions

The Honorable Sean O'Keefe, Administrator, National Aeronautics and Space Administration (NASA) 92
Admiral Harold Gehman (retired), Chairman, *Columbia* Accident Investigation Board 110

Appendix 2: Additional Material for the Record

NASA's Implementation Plan for Return-to-Flight and Beyond, September 8, 2003 114
Letter to Chairman Sherwood Boehlert from Sean O'Keefe, Administrator, NASA, dated July 23, 2003 264
Return-to-Flight Task Group Charter 265
Stafford-Covey Task Group Biographies 268
Stafford-Covey Task Group Members 272
Implementation Plan, NASA Engineering & Safety Center, Langley Research Center, August 15, 2003 284
Management Plan, NASA Engineering & Safety Center, Revision A 291
Letter to The Honorable Ted Stevens, Chairman, Committee on Appropriations, from Douglas Holtz-Eakin, Director, Congressional Budget Office, dated July 29, 2003 304
NASA's Space Flight Operations Contract and Other Technologically Complex Government Activities Conducted by Contractors, July 29, 2003, Congressional Budget Office 306

Page

Not Culture But Perhaps a Cult, Op. Ed. on NASA and the Shuttle by Homer Hickam, *Wall Street Journal*, August 30, 2003 333

Convert the Shuttle, article by Robert Zubrin, *SpaceNews,* September 8, 2003 . 335

NASA'S RESPONSE TO THE COLUMBIA REPORT

WEDNESDAY, SEPTEMBER 10, 2003

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE,
Washington, DC.

The Committee met, pursuant to call, at 10:00 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Sherwood L. Boehlert [Chairman of the Committee] presiding.

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, DC 20515

Hearing on

NASA's Response to the Columbia Report

Wednesday, September 10th, 2003
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building

WITNESS LIST

The Honorable Sean O'Keefe
Administrator
National Aeronautics and Space Administration

Admiral Harold Gehman (ret.)
Chairman
Columbia Accident Investigation Board

Section 210 of the Congressional Accountability Act of 1995 applies the rights and protections covered under the Americans with Disabilities Act of 1990 to the United States Congress. Accordingly, the Committee on Science strives to accommodate/meet the needs of those requiring special assistance. If you need special accommodation, please contact the Committee on Science in advance of the scheduled event (3 days requested) at (202) 225-6371 or FAX (202) 225-0891.
Should you need Committee materials in alternative formats, please contact the Committee as noted above.

HEARING CHARTER

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

NASA's Response to the Columbia Report

WEDNESDAY, SEPTEMBER 10, 2003
10:00 A.M.—12:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

1. Purpose

On Wednesday, September 10th at 10:00 a.m., the Science Committee will hold a Full Committee hearing on the National Aeronautics and Space Administration's (NASA) response to the *Columbia* Accident Investigation Board Report. The Committee will receive testimony from NASA Administrator Sean O'Keefe and retired Navy Admiral Harold Gehman, Chairman of the *Columbia* Accident Investigation Board (CAIB).

The hearing will examine NASA's just released plan, "NASA's Implementation Plan for Return-to-Flight and Beyond," which is NASA's response to the CAIB report. Issues for the hearing include whether the plan fully complies with the CAIB recommendations; the cost and schedule associated with implementing the plan; whether the task group (led by the two former astronauts Thomas Stafford and Richard Covey) that NASA has appointed to oversee return-to-flight provides the best mechanism to assess NASA's implementation; and the criteria used to determine when the Shuttle is ready to return to flight. The hearing will also review the impact a significant delay in return-to-flight might have on the International Space Station, the Hubble Space Telescope, and the proposed Orbital Space Plane.

2. Background

On Monday, September 8, 2003, NASA released its response to the CAIB report, "NASA's Implementation Plan for Return-to-Flight and Beyond." (See Attachment.) In the plan, NASA states that it accepts the findings of the CAIB, will comply with the recommendations, and embraces the entire report. The plan outlines NASA's response to each recommendation made by the CAIB, along with the current status and a schedule of milestones. In addition to the CAIB recommendations, NASA has developed 10 additional corrective actions to address other areas of concern. Two of these actions (SSP–1 and SSP–2) coincide with "observations" in the CAIB report. (The CAIB labeled as "observations" several recommendations for changes at NASA that did not relate directly to the *Columbia* accident.)

NASA describes the implementation plan as a "living document" that will be periodically updated as plans are refined and progress is made in making technical, management, cultural, and safety changes. NASA Administrator O'Keefe has stated that the Shuttle will not return to flight until it is "fit to fly." However for planning purposes, NASA continues to work toward a March 11, 2004 date for return-to-flight.

NASA has a poor record of fully implementing recommendations from previous reports, particularly non-technical recommendations. Therefore, a key issue is whether NASA will fully satisfy the CAIB recommendations. The return-to-flight plan says little at this point about how NASA will implement the central organizational recommendations of the CAIB, such as creating an independent technical authority. NASA officials say they are still figuring out how to respond to those recommendations, and implementation plans for reorganization will be added to the return-to-flight plan later. (The CAIB required only that NASA have a detailed plan for reorganizing in place before flights resume; CAIB said the plan could be implemented after return-to-flight.)

Since the CAIB only laid out criteria for reorganization, rather than providing a detailed plan of its own, the Committee will have to review NASA's plans carefully against the CAIB criteria. For example, in July, NASA created a new safety center at the Langley Research Center in Virginia. NASA at first described the center as being in step with the CAIB recommendations, but reversed itself once the CAIB publicly disagreed with that description. NASA is now in the process of reviewing how the new safety center at Langley will operate.

Several months ago, NASA Administrator O'Keefe appointed a Return-to-Flight Task Group, headed by former astronauts Richard Covey and Tom Stafford and including 26 other members, to independently assess NASA's implementation of the CAIB recommendations, but only insofar as they relate to the readiness of the next Shuttle launch, STS–114. The Stafford-Covey Task Group was created under the auspices of the NASA Advisory Council and is subject to the Federal Advisory Committee Act. The Task Group will formally and publicly report its results. The Task Group is not to second-guess the CAIB recommendations, but is only to report on NASA's progress on meeting the intent of the CAIB.

This differs from the approach taken after the *Challenger* accident in 1986 when the National Academy of Sciences was tasked to form a special independent technical oversight team to evaluate NASA's return-to-flight actions. Unlike the Stafford-Covey Task Group, which apparently can only advise NASA, the Academy team had the authority to reject technical changes proposed by NASA. In fact, the Academy rejected the first two concepts proposed by NASA for fixing the "O-ring" joint of the Solid Rocket Booster. Earlier this year, the Academy offered to provide NASA a similar service, but NASA apparently rejected the offer. Administrator O'Keefe is reluctant to give "sign off" for return-to-flight to anyone outside the NASA structure for fear that doing so would cloud his message that NASA managers are responsible and accountable for flight safety.

NASA plans to review the more than 3,000 waivers that exist to the Shuttle's technical specifications—a move that goes even beyond the CAIB's recommendations, but a step that was taken after the *Challenger* explosion. Such waivers allowed the Shuttle to continue flying, for example, without NASA fixing the foam problem even though the design requirements stipulate that no foam debris be allowed to strike the Shuttle's delicate thermal insulation. The CAIB reported that more than a third of the Shuttle's waivers had not been reviewed in over 10 years.

NASA's plans to have the Shuttle program review the waivers by next January. (The CAIB did not mention reviewing the waivers explicitly, but assumed that the new, independent technical organization it recommended would review all specifications and waivers after return-to-flight.) NASA's plans raise questions about how such a review can be accomplished so quickly and about what process and structure NASA will use to carry out the review to ensure that it is independent and thorough. Since the specifications and waivers were created by the Shuttle program; the CAIB was skeptical of the program's ability to take a hard look at them itself.

3. Witnesses

The Honorable Sean O'Keefe, Administrator, National Aeronautics and Space Administration. Mr. O'Keefe was sworn in as the 10th Administrator of NASA on December 21, 2001. Prior to NASA, O'Keefe served as the Deputy Director of the Office of Management and Budget. Prior to joining the Bush Administration, he was a Professor at the Syracuse University Maxwell School of Citizenship and Public Affairs and previously at Pennsylvania State University. O'Keefe has served as Secretary of the Navy and Comptroller and Chief Financial Officer of the Department of Defense during the first Bush Administration. Before joining the Defense Department, he served as Staff Director of the Senate Defense Appropriations Subcommittee. His public service began in 1978 upon selection as a Presidential Management Intern.

Admiral Harold Gehman (retired), Chairman, *Columbia* Accident Investigation Board. Formerly Co-Chairman of the Department of Defense review of the attack on the U.S.S. *Cole.* Before retiring, Gehman served as the NATO Supreme Allied Commander, Atlantic, Commander in Chief of the U.S. Joint Forces Command, and Vice Chief of Naval Operations for the U.S. Navy. Gehman earned a B.S. in Industrial Engineering from Penn State University and is a retired four star Admiral.

Attachment

NASA's Implementation Plan on Return-to-Flight and Beyond, dated September 8, 2003, appears in Appendix 2: Additional Material for the Record.

Chairman BOEHLERT. The hearing will come to order.

I want to welcome everyone here this morning for the second of our hearings on the report of the *Columbia* Accident Investigation Board, and the first of our hearings on "NASA's Implementation Plan on Return-to-Flight and Beyond."

I think Administrator O'Keefe and NASA are to be congratulated for their wholesale embrace of the CAIB report and for moving so swiftly to put together a detailed, specific plan in response. But while the wholesale embrace is comforting, what happens at the "retail" level is what will matter in the end. We need to ensure that, after this report, reforms are put into effect that will truly change NASA behavior up and down the chain of command.

The current iteration of the NASA Implementation Plan is a useful start, but as I am sure Administrator O'Keefe will be the first to acknowledge, it is only a start. It is a work in progress. At this point, for example, the report is still pretty much silent on how NASA will implement the CAIB's recommendation to establish an independent technical authority, one of the essential reforms sought by the CAIB.

And yet, at the same time, the Plan says that NASA will go beyond the CAIB recommendations and review all waivers before return-to-flight. Such a review is undoubtedly a useful additional step, but it raises questions about who will conduct such a review and whether enough time is being allowed for it to occur thoroughly.

Indeed, timing remains a critical question for NASA and this committee. Administrator O'Keefe has made clear in his recent statement, and I am sure he will again today, that there is no fixed date for return-to-flight and that the target date of March 11 is a "no earlier than" date.

That said, I am still concerned that the target is exceedingly ambitious and could skew NASA's efforts to return-to-flight. We also need to hear more about how NASA will schedule launches after return-to-flight to avoid the excessive schedule pressure related to the construction of the International Space Station, pressure that was discussed in great detail in the CAIB report, and pressure that Admiral Gehman has cited as an area in which NASA leadership created a cultural problem.

So we have many questions about the Implementation Plan, but they are just that, questions. This report has been available for less than a week, and it is, as I said earlier, a work in progress. It is far too early for us to comment definitively on it. All we can really say now is that we will monitor the Implementation Plan and how it is carried out as closely as humanly possible, even as we deal with larger questions about the future of the human space flight program as a whole.

I should add that NASA personnel, including the Administrator, have been extremely accessible to both the Members and the staff of this committee in recent weeks, which should enable our oversight of return-to-flight to go more smoothly. I am sure Administrator O'Keefe will continue to be helpful to us this morning.

Let me also thank Admiral Gehman for appearing before us again today.

I want to make clear that Admiral Gehman is not here to comment on the Implementation Plan itself; he has only had a week or two to look at it, and he isn't authorized to speak on this subject on behalf of his Board, which has officially dissolved now.

The reason we have asked Admiral Gehman back is to ensure that no one mischaracterizes the findings or recommendations of the Board at today's hearing even inadvertently. The last thing we need is for a misinterpretation to originate here and for it then to be perpetuated as NASA plans for its future. So Admiral Gehman will have a circumscribed, but vital role today, keeping us on the straight and narrow, and I want to thank him for doing that.

Mr. Hall.

[Statement of Chairman Boehlert follows:]

PREPARED STATEMENT OF CHAIRMAN SHERWOOD BOEHLERT

I want to welcome everyone here this morning for the second of our hearings on the report of the *Columbia* Accident Investigation Board (CAIB)—and the first of our hearings on "NASA's Implementation Plan on Return-to-Flight and Beyond."

I think Administrator O'Keefe and NASA are to be congratulated for their wholesale embrace of the CAIB report and for moving so swiftly to put together a detailed, specific plan in response. But while the wholesale embrace is comforting, what happens at the "retail" level is what will matter in the end. We need to ensure that, after this report, reforms are put into effect that will truly change NASA behavior up and down the chain of command.

The current iteration of the NASA Implementation Plan is a useful start, but—as I'm sure Administrator O'Keefe will be the first to acknowledge—it is only a start. At this point, for example, the report is still pretty much silent on how NASA will implement the CAIB's recommendation to establish an independent technical authority—one of the essential reforms sought by the CAIB.

And yet, at the same time, the Plan says that NASA will go beyond the CAIB recommendations and review all waivers before return-to-flight. Such a review is undoubtedly a useful additional step, but it raises questions about who will conduct such a review and whether enough time is being allowed for it to occur thoroughly.

Indeed, timing remains a critical question for NASA and this committee. Administrator O'Keefe has made clear in his recent statements, and I'm sure he will again today, that there is no fixed date for return-to-flight and that the target date of March 11 is a (quote) "no earlier than" date.

That said, I'm still concerned that the target is exceedingly ambitious and could skew NASA's efforts to return-to-flight. We also need to hear more about how NASA will schedule launches after return-to-flight to avoid the excessive schedule pressure related to the construction of the International Space Station—pressure that was discussed in great detail in the CAIB report, and pressure that Admiral Gehman has cited as an area in which NASA leadership created a cultural problem.

So we have many questions about the Implementation Plan—but they are just that—questions. This report has been available for less than a week, and it is a work in progress. It is far too early for us to comment definitively on it. All we can really say now is that we will monitor the Implementation Plan and how it is carried out as closely as is humanly possible, even as we deal with larger questions about the future of the human space flight program as a whole.

I should add that NASA personnel, including the Administrator, have been extremely accessible to both the Members and staff of this committee in recent weeks, which should enable our oversight of return-to-flight to go more smoothly. I'm sure Administrator O'Keefe will continue to be helpful to us this morning.

Let me also thank Admiral Gehman for appearing before us again today.

I want to make clear that Admiral Gehman is not here to comment on the Implementation Plan itself—he's only had a day or so to look at it, and he isn't authorized to speak on this subject on behalf of his Board, which has officially dissolved now.

The reason we've asked Admiral Gehman back is to ensure that no one mischaracterizes the findings or recommendations of the CAIB at today's hearing even inadvertently. The last thing we need is for a misinterpretation to originate here and for it then to be perpetuated as NASA plans for its future. So Admiral Gehman will have a circumscribed, but vital role today, keeping us on the straight and narrow, and I want to thank him for doing that.

Mr. Hall.

Mr. HALL. Mr. Chairman, good morning. I thank you for the capability that you have brought and the responsibility and the flexibility you have practiced and the availability that you have given to us. By golly, you have been available here and there, so I have attended almost every meeting we have had with the families and you have both performed admirably. And I respect and I thank you.

These hearings are some of the most important that this committee will hold during this Congress, and I think they are arguably probably the most important we have held in the last 10 years on the subject matter that we are talking about here today. We are examining the causes of the terrible accident that took the lives of seven brave astronauts and resulted in the loss of the Space Shuttle *Columbia*. We are looking for solutions to the problems that were uncovered by the *Columbia* Accident Investigation Board to ensure that we do all that we can do to avoid any type of Shuttle problems in the future.

Admiral Gehman and his colleagues gave very helpful testimony last week. We thank you for that. We appreciate their insights and constructive criticisms. Now it is your turn, Mr. O'Keefe. This Committee is interested in hearing your response to the CAIB report, what you agree with, what you may disagree with, and what you intend to do with the report's recommendations.

We are talking about the future of the Nation's human space flight program. All of us are going to have to work together to address the issues raised by the *Columbia* tragedy. I intend to work with you, Mr. Administrator, with the White House, and with my colleagues in Congress to get past this setback and to continue the exploration of space.

We are dealing with gentlemen and capable men and leaders of this country, two of the finest leaders we have in this country. And I look forward to working with you and working toward making the Shuttle work and getting back into space and continuing the progress that we have made. Mr. Administrator, I intend to work with you and with the White House and with my colleagues in Congress. And I intend, Admiral, to keep in touch with you. And I know your interest is not going to wind up with the day that your jurisdiction ceases or is slowed down.

As part of that effort, I intend to devote myself to an examination of how we can best protect the lives of the Shuttle astronauts. All of us have that hope and that desire. We may not have another Shuttle accident for many, many years. I hope we never have another one, but God forbid, we may have one a lot sooner than that. However, if an accident does ever happen again, I just want to know that we did all we could to develop a crew escape system for the Shuttle, if it is feasible, if it is workable. And we have to know that, but we have to start on that route. And we have to get on that route. And we have to get underway with doing that. I don't know how much money ought to be put up. I am not sure where the money ought to come from, but I know that that ought to be everyone's goal is to have a way out. If we guess wrong on the type of Shuttle to put up there, the type of protection we put in there, they need to have an alternative or a way out if we have all guessed wrong or if we guess wrong in the future. And we are capable of it, because we have guessed wrong in the past.

Last week, I asked one of the distinguished Board members, Dr. Sheila Widnall, MIT professor and former Secretary of the Air Force, if she thought it made sense to at least start down the trail of looking seriously at Shuttle crew escape systems. And she, as of record, agreed with us saying "it is a completely reasonable path to take."

Well, I will not take any more of your time to discuss these issues in my opening statement. I think we all want to hear from the witnesses. And I think we all want to know that those youngsters that we send up there—we want to know that they have the safest vehicle, the safest circumstances, and if we don't give them those safer circumstances or if they don't turn out to be the safest, that they have an alternative and an opportunity to live. That is my whole—that is what I will be working toward, but I plan to work with you, Mr. Chairman, with the President, and with you, Mr. Administrator, and with every Member of Congress.

I yield back my time.

[Statement of Mr. Hall follows:]

PREPARED STATEMENT OF REPRESENTATIVE RALPH M. HALL

Good morning. I want to join the Chairman in welcoming NASA Administrator O'Keefe to our hearing, as well as welcoming Admiral Gehman back for some further discussion.

These hearings are some of the most important that this committee will hold during this Congress, and they are arguably some of the most important we have held over the last 10 years. We are examining the causes of the terrible accident that took the lives of seven brave astronauts and resulted in the loss of the Space Shuttle *Columbia*. And we are looking for solutions to the problems uncovered by the *Columbia* Accident Investigation Board (CAIB)—to ensure that we do all we can to avoid another Shuttle accident in the future.

Admiral Gehman and his colleagues gave very helpful testimony last week, and we appreciate their insights and constructive criticisms. Now, it is your turn, Mr. O'Keefe. This committee is interested in hearing your response to the CAIB report—what you agree with, what you may disagree with, and what you intend to do with the report's recommendations.

We are talking about the future of the Nation's human space flight program. All of us are going to have to work together to address the issues raised by the *Columbia* tragedy. I intend to work with you, Mr. Administrator, with the White House, and with my colleagues in Congress to get past this setback and to continue the exploration of space.

As part of that effort, I intend to devote myself to an examination of how we can best protect the lives of the Shuttle astronauts for as long as we continue to fly the Shuttle fleet. We may not have another Shuttle accident for another 17 years. God forbid, we might have one much sooner than that. However, if an accident ever does happen again, I want to know that we did all we could to develop a crew escape system for the Shuttle if it is feasible. We need to at least start down that road.

Last week, I asked one of the distinguished CAIB members, Dr. Sheila Widnal—MIT professor and former Secretary of the Air Force—if she thought it made sense to at least start down the path of looking *seriously* at Shuttle crew escape systems. She agreed with me, saying *"it is a completely reasonable path to take."*

Well, I will not take any more time to discuss these issues in my opening statement. I know we all want to hear from the witnesses, and I will continue this discussion during the question period.

I look forward to your testimony, and I yield back the balance of my time.

Chairman BOEHLERT. Thank you very much, Mr. Hall. You demonstrate the bipartisan spirit that has always dominated the proceedings of this committee.

Let me make a correction for the record. In my opening statement, I said that Admiral Gehman had the NASA return-to-flight plan for a week or so. It is a day or so. I want to make that clear.

Now the Chair recognizes Chairman of the Subcommittee on Space and Aeronautics, the distinguished gentleman from California, Mr. Rohrabacher.

Mr. ROHRABACHER. Thank you very much, Mr. Chairman. And I appreciate the fact that you have taken personal leadership and put so much time and energy into this to make sure that we not only have a full understanding of the *Columbia* tragedy but also that we have accounting and that we have the changes necessary to make sure that America's space program gets back on track and remains a leader in space exploration utilization.

Tomorrow marks the second anniversary of the attack on the World Trade Center and the Pentagon. That happened roughly a half year into President Bush's Administration. A half-year after that, Mr. O'Keefe, you were appointed to head NASA. One half year after that, a major—another major catastrophe happened, the destruction of the Space Shuttle *Columbia*.

The American people understand that it takes time for a new leader to affect change within an organization, especially the size and scope of the United States Government and the size and scope of NASA. At some point, however, there must be accountability.

Well, when you add it all up, Mr. O'Keefe was the Administrator of NASA for roughly a year before the *Columbia* went down. He was a good choice to head the agency, and I still believe that. It was a good choice, because NASA needed accounting. And Mr. O'Keefe was affectionately dubbed, as he took control, the ultimate bean counter and the one who would make sure we understood all of the financial happenings over at NASA, and what was going on there.

However, more than financial responsibility was vitally necessary at NASA. The Gehman Report suggests an evolution in attitude toward safety. Evolution that took place for over a decade, long before Mr. O'Keefe got there. This downward evolution towards safety was a major cause of the *Columbia* tragedy. I am disturbed that there still seems to be certain attitudes at NASA, even after the Gehman Report has pointed out this attitude and that the general attitude was a major cause of this crisis or this catastrophe. Perhaps—and it just seems to me to be reflected in what I see as a rush to return-to-flight, in terms of NASA, and a rush, I might say, to return to policies that would keep us dependent on the Shuttle. NASA's recent decisions which basically nixed alternative resupply efforts to the Space Station seem to reflect this mindset, a mindset that would keep us dependent on the Shuttle even after the Gehman Report, even after all has been said and done. We end up having policies that are pushing away alternatives to the Shuttle and keeping us dependent on that in terms of the completion of Space Station and the supple of Space Station.

Today, we examine the causes of the *Columbia* tragedy. We are looking for accountability and solutions. We need to know about changes in personnel, in policy, and in mindset at NASA. Let me state for the record that I still have, and I believe this committee, has faith in Mr. O'Keefe. He was Chairman—or Administrator for a year. Now how much he could have changed things in that year, I know that he personally went to all of the Space Shuttle launches, and we will be talking about that during the questions

and answers, and we know that he took his job very seriously and continues to take his job very seriously. But what he does now is as important in his place in history in terms that he will be viewed in history as what he did before. And so we are looking for not only an examination of what you did before and what your predecessor did before, but also the policies that you are advocating and the leadership you are providing now to NASA. And again, let me state that I have full faith in Mr. O'Keefe and consider him to be—we are lucky to have a man of his caliber leading NASA.

Finally, I think, Mr. Chairman, that we, in Congress, need to accept some accountability ourselves to not just always be pointing fingers. The fact is that all of us on this committee have been serving on—with this responsibility of overseeing NASA and for a lot longer than Mr. O'Keefe has been on his job. And I think that that deserves some self-introspection as well and some thoughtful examination by this committee as to whether we are doing our job.

So with that said, I look forward to the testimony today. And again, I appreciate the leadership you are providing, Mr. Chairman.

[The statement of Mr. Rohrabacher follows:]

PREPARED STATEMENT OF REPRESENTATIVE DANA ROHRABACHER

Mr. Chairman, I am interested in hearing the NASA Administrator provide this Committee his agency's response to the *Columbia* Accident Investigation Board's recommendations, particularly as they relate to resuming our human space flight program. As painful as the lost of life can be, the risks of human space travel should not detour us from pursuing this worthy endeavor.

I see little evidence that NASA fully appreciates the Board's findings on near-term, cargo delivery to the Space Station. For example, NASA's return-to-flight plan includes a new goal of having the International Space Station serve as a safe haven for the crew in the event of an emergency. But it is contingent upon the Russians' timetable for showing up with Progress and Soyuz vehicles to keep the crew alive.

Unfortunately, alternatives for Space Station cargo resupply missions have gained little attention from NASA over the last few years. Why are we still risking lives on the Shuttle to deliver cargo supplies to the Space Station when there are other unmanned vehicles available to deliver cargo with our international partners? This problem is compounded by the fact NASA has repeatedly failed to develop a successful replacement for the Shuttle. This is now a national crisis resulting from NASA's failure to develop a new vehicle. They promised hi-tech solutions during the last decade with the X–33 and could not deliver it. This is why I believe NASA must seriously consider low-tech, safe, low-cost and practical solutions for human space flight.

Further, NASA's ability to implement the Board's recommendations will take money more than organizational wiring diagrams. In this instance, I share Chairman Boehlert's view that the Congress should not be in the business of rubber-stamping NASA's funding requests. NASA must be forthcoming in its near-term budget plans in order for this committee to make well-informed policy decisions. Determining the future of NASA is a team effort involving both the Congress and the Administration. We need straightforward, honest answers from NASA to avoid further deferring our dream of man's exploration of space.

I look forward to today's discussion with Sean O'Keefe and the opportunity to learn more of his agency's plans for the future.

Chairman BOEHLERT. Thank you very much, Mr. Rohrabacher.

The Chair recognizes the Ranking Member on the Subcommittee on Space and Aeronautics, Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman. And welcome, Admiral Gehman and Mr. O'Keefe.

Let me start by reading some statements that struck me from a report here—the report. "NASA must support the Space Shuttle Program with resources and staffing necessary to prevent the ero-

sion of flight safety critical processes. The Committee feels strongly that the workforce augmentation must be realized primarily with NASA personnel rather than with contractor personnel. Space Shuttle maintenance and operations must recognize that the Shuttle is not an operational vehicle in the usual meaning of the term. The size and complexity of the Shuttle system and of NASA contractor relationship placed extreme importance on understanding, communication, and information sharing." Admiral Gehman, you may recognize that from the McDonald report that came forth in 2000. And I think it is probably why you have said candidly, on a variety of occasions, that—and you can say it for yourself, but you didn't plow all that much new ground in those areas, that McDonald laid out a good premise there.

Then on April the 18th, 2002, Mr. Blumberg, who was the head of the Aerospace Safety Advisory Panel, testified before this panel—or this committee: "In all my years of involvement, I have never seen—I have never been as worried for Space Shuttle safety as I am right now. All of my instincts suggest that the current approach is planting the seeds for future danger." And I think those statements laid a premise for this statement that was—that Admiral Gehman, your Board put in your report. "Based on NASA's history of ignoring external recommendations or making improvements that atrophy with time, the Board has no confidence that the Space Shuttle can be safely operated for more than a few years based solely on renewed post-accident vigilance." The report also noted that "the long-term recommendation will be internally resisted by the space agency." That is pretty rough.

But let me say, I am not that pessimistic. As I told Mr. O'Keefe the other day, he has received a lifetime's worth of criticism and advice from the front page of most every newspaper in the country. And so I think that he is an able person who has gotten the message. And I am looking forward today to hearing more about how we get these benchmarks so that when the crowds recede and the cameras go away that we can make sure that the attention is still on safety and moving this process forward.

And again, Mr. O'Keefe, I think we are all in this together. I am optimistic that you are going to—that you have gotten the message and that you are going to lay out a good plan for us. And thank you for being here today.

Chairman BOEHLERT. Thank you very much. And all of the Members will have the authority to put their statements in the record at this juncture.

[The prepared statement of Mr. Smith follows:]

PREPARED STATEMENT OF CHAIRMAN NICK SMITH

I'd like to thank Chairman Boehlert and Ranking Member Hall for holding this hearing today to discuss NASA's reaction to the *Columbia* Accident Investigation Board (CAIB) report.

In the wake of the loss of the Space Shuttle *Columbia* there are a number of questions that need to be answered. The CAIB has done an admirable job of investigating the accident, pinpointing the direct cause, and identifying related factors, such as the "NASA culture," that contributed to the tragedy. There are reasonable arguments why manned space flight should be put on hold. On this committee and as a nation, we need to have an honest, open discussion about whether or not the Shuttle program is viable and should be continued as is and whether there should be a greater shift to unmanned flight in terms of science and space exploration. I

am concerned that NASA's "Return-to-Flight" plan, which sets March 11, 2004, as a goal for the next Shuttle launch, is an attempt to rush back to manned space flight, ignoring this important policy debate.

By setting the goal of a March launch date, it almost feels like back to business as usual for NASA. The CAIB report cited unreasonable expectations for the Shuttle program, both by Congress and NASA, as one of the factors that detracted from attention to safety concerns. Last week, Admiral Gehman told the Committee that NASA has a history of promising more than they can deliver in order to get a program approved. He also said that lower level officials felt pressured to meet deadlines at the expense of safety.

Administrator O'Keefe, you have said that the Shuttle will not return to flight until it is "fit to fly," but with the target date for the next launch six months away I am concerned that we will end up not dealing with all past mistakes. A successful mission would merely give us a false sense of confidence in the Shuttle and create inertia against a thorough re-evaluation of the space program that includes a shift to unmanned flight.

The American people deserve a spice program that focuses on producing quality and efficient scientific research. The conversation that needs to be taking place right now is whether or not continuing the Shuttle program advances this goal. Instead, Mr. O'Keefe, you seem to be debating that the same priority for manned flight is a forgone conclusion and how quickly we can resume sending astronauts into space. I look forward to working with my colleagues and Administrator O'Keefe to work on ways to create a safer, mode effective research-oriented space program.

[The prepared statement of Mr. Ehlers follows:]

PREPARED STATEMENT OF REPRESENTATIVE VERNON J. EHLERS

Our nation is at a crossroads in space science and space exploration. Our task is not as simple as determining whether NASA can implement the *Columbia* Accident Investigation Board's recommendations and return-to-flight. It is much more difficult and fundamental than that. We need to determine whether our nation should continue human space exploration.

If we decide to continue, we must decide on the extent of that exploration and ensure that the program has goals that clearly contribute to NASA's overall mission as a science agency. We must remember that dollar for dollar unmanned missions provide significantly more scientific knowledge than human space flight. A commitment to human space exploration will be expensive and risky—we must be prepared to pay the price and accept the risk.

Deciding the fate of human space flight at NASA requires an extensive and open national debate on a range of subjects from NASA's cultural and organizational flaws to the design of a new launch vehicle. I am pleased that the NASA Administrator, Mr. O'Keefe, and the *Columbia* Accident Investigation Board Chairman, Admiral Gehman, are here today to engage in this debate.

I know that Mr. O'Keefe recognizes the need for change at NASA; I look forward to hearing NASA's response to the Board's report. Make no mistake though, Congress must now provide the necessary leadership and oversight to help NASA make the right changes and emerge as a stronger science agency.

[The prepared statement of Mr. Bishop follows:]

PREPARED STATEMENT OF REPRESENTATIVE ROB BISHOP

Since the *Columbia* disaster, only the second Shuttle failure in over 22 years of operation, we have re-evaluated the importance and viability of human space flight and exploration. It has been a valuable discussion, and we must continue to define the role our nation will play in space exploration, but an overwhelming majority of Americans support our continued human presence in space—it's part of our heritage and vital to our future. I reject much of the recent criticism by "Monday morning quarterbacks" directed at NASA, when NASA and the Space Shuttle program have so greatly benefited us and this nation.

I am proud to live 40 miles from Promontory Summit, Utah, where in 1869 the first transcontinental railroad was completed. This advancement in transportation was achieved at an enormous cost of human lives and material resources, but was crucial for the unification and technological advancement it provided this country. The railroad, in its prime, was the most vital transportation link in America. Although this form of transportation has since been complemented by automobiles and airplanes, it still serves an important function today in transporting heavy cargo and people across the country. About ten miles from the historic Promontory Point,

the motors that propel the Space Shuttle through our atmosphere are manufactured. The Shuttle has proved to be just as important and significant to travel and technological innovation in our time as the transcontinental railroad was over 100 years ago.

I fully support the development of a new human space flight launch vehicle that will be more reliable and more cost-effective than the Space Shuttle; however, the Shuttle—in the immediate future—is our only link to human presence in space. The Shuttle should be returned to service as soon as safely practical. NASA should be commended for its commitment to safety and willingness to comply with the safety recommendations of the *Columbia* Accident Investigation Board and to improve its cultural infrastructure, not criticized with the 20/20 vision of hindsight. Our development of a new human space flight launch vehicle should supplement—and not immediately replace—the Space Shuttle that has served us so well for 22 years.

[The prepared statement of Mr. Feeney follows:]

PREPARED STATEMENT OF REPRESENTATIVE TOM FEENEY

Last week, Admiral Gehman, Dr. Hallock, Major General Hess, and Dr. Widnall testified about the *Columbia* Accident Investigation Board's (CAIB) report. Like that report, they provided candid, direct, and insightful testimony about *Columbia*'s loss. Furthermore, they agreed to reconstitute, if asked, the CAIB in one year to review NASA's progress in implementing the report's recommendations and observations. This nation is deeply grateful for the unselfish and tireless dedication of the CAIB's members and staff—a remarkable example of public service.

We now focus on moving forward. Two days ago, NASA released its plan to implement the CAIB's recommendations. This plan remains a work in progress but provides a good faith effort to returning the Shuttle to flight. Time will tell whether NASA meets the challenges laid down by the CAIB. But I know the NASA family—who lost so much on February 1—possesses the potential to do so. I urge every one of them to unconditionally dedicate themselves to this effort.

Today, NASA Administrator O'Keefe joins us. I commend him for fully embracing the CAIB Report—not only the words but also more importantly its spirit. I was with Administrator O'Keefe on that terrible February day and have watched his leadership during the subsequent months. At times, he seems like Atlas—carrying America's human space program on his shoulders. He too exemplifies genuine public service.

I look forward to today's testimony and the subsequent give and take. Chairman Boehlert and this committee's Members provide a much needed forum for thoughtful discussion about achieving a rigorous and sustainable American human space program—a final example of public service.

[The prepared statement of Mr. Costello follows:]

PREPARED STATEMENT OF REPRESENTATIVE JERRY F. COSTELLO

Good morning. I want to thank Administrator O'Keefe and Admiral Gehman for appearing before our committee to discuss NASA's response to the *Columbia* Investigation Board (CAIB) Report. In any discussion of the *Columbia* accident, we must remember to honor the seven astronauts, their vision and their legacy. Both our nation and our world benefit enormously from each mission.

NASA just released its plan, "NASA's Implementation Plan for Return-to-Flight and Beyond," which is NASA's response to the CAIB report. This report provides a start at how NASA plans to reorganize its programs to become flight ready.

The CAIB report is quite critical of schedule pressure placed on the Shuttle program to meet a February 19, 2004 date for the launch of Node 2 to complete the "core complete" milestone. "Core complete" was not a recognized space station assembly milestone prior to this Administration's decision in early 2001 to cut the station program by eliminating the planned U.S. crew return vehicle and habitation module, cutting the planned crew size from 7 to 3, and cutting the planned research budget by 40 percent.

In the House Science Committee hearing last week, Admiral Gehman stated that Shuttle program workers felt pressure because of requirements to work weekends and to make up a potential 45-day delay in the milestone by performing some safety activities in parallel rather than in a prescribed sequence. Even more telling was that Admiral Gehman believes there was a disconnect between managers and workers, whereby managers viewed the deadline as flexible and workers got a message that it was not.

Because of this, I find it surprising that we see echoes of the management focused on deadlines for return-to-flight. With respect to the schedule for returning the Shuttle to flight, NASA management set an aggressive milestone of December 2003 before the CAIB report was even completed. As the magnitude of the Board's recommendations became known, NASA management then changed the date to early March 2004. After further criticism of a rush to return the Shuttle to flight, NASA stated that the schedule would be "event driven" and not "schedule driven." Nevertheless, the just-released NASA return-to-flight plan sets March 11, 2004 as the current planning date.

CAIB found that management goals were having a negative impact on the line workforce that keeps the Shuttles flying, and more significantly for *Columbia,* affecting the attitudes of Shuttle program managers who came to view flight problems through the lens of threats to the schedule rather than threats to the safety of the astronauts. I find it problematic that there may be similar pressure on NASA employees to return-to-flight by the March 2004 deadline and I am interested in delving further into this issue of schedule pressure.

I am also interested in the independent organizations recommended by the CAIB report. I have been a fervent proponent of external review for the Department of Energy (DOE) civilian labs. I see many similarities and differences to the current system at DOE in the proposed CAIB recommendations and believe Congress must take a closer look at how the report and NASA will interpret and define independent, who will staff these organizations (government employees, contract employees, or both), and what exactly their duties will be.

I again thank the witnesses for being with us today and providing testimony to our committee.

[The prepared statement of Ms. Johnson follows:]

PREPARED STATEMENT OF REPRESENTATIVE EDDIE BERNICE JOHNSON

Thank you, Mr. Chairman. I would like to thank you for calling this important hearing today, and I would also like to thank Administrator O'Keefe for agreeing to appear here today and Admiral Gehman for returning to answer our questions on this most important hearing on the *Columbia* Accident Investigation Board Report.

Today we are brought here again to discuss the details of the *Columbia* Accident Investigation Board (CAIB) report. To protect the safety and integrity of the future of this country's space program, we must learn from the mistakes of the past. The report from this investigation will allow us to see what went wrong and how to prevent it from happening again. It is essential that we put forth a concerted effort to protect the safety of our astronauts.

Unfortunately, we see from the CAIB report that there was pressure from the leadership that led to unsafe practices. One of the biggest concerns I've had with this current NASA administration has been the privatization and competitive sourcing of governmental functions. Throughout the 1990's, the Shuttle workforce has shrunk. From the 1992–2002, NASA Shuttle workforce was reduced by more than 50 percent and the Shuttle contractor workforce by more than 40 percent. The Gehman report documents these facts as well as the fact that the diminished capability of the NASA Shuttle workforce was a factor in the *Columbia* accident. I find this quite alarming.

We can no longer pass blame or hide behind ignorance when we discuss the safety of our astronaut core. Its time we stand up and face the music of the mistakes made, if not only to honor of our brave heroes who have passed because of our arrogance or failure to see the errors of our ways. That is the least we owe in their memory.

[The prepared statement of Mr. Honda follows:]

PREPARED STATEMENT OF REPRESENTATIVE MICHAEL M. HONDA

I thank the Chairman and Ranking Member for holding this important hearing, and Administrator O'Keefe and Admiral Gehman for taking the time to join us today.

I want to quote from an anonymous e-mail sent by a NASA employee to NASAWATCH regarding the *Columbia* accident and accountability:

"(W)hat is most disheartening in the aftermath of this accident, is that not one of those (NASA or contractor) managers has resigned.

Mr. Gregory, who oversaw the downsizing of the safety program, and still believes safety is alive and well at NASA, continues to provide Mr. O'Keefe with technical advice. Mr. O'Connor, who did not feel he should interfere with the Shuttle Program on a potentially catastrophic safety matter, continues to occupy NASA's highest safety position. Mr. Readdy, who signs off on the CoFR, accepted the "lousy" rationale for continuing to fly after previous Shuttle flights were damaged by foam from the ET. And what about the iron fisted Major General Kostelnick, who steadfastly controls any communication coming from Shuttle or Station Program Managers?"

"Why are American managers so beset with ego that they cannot accept responsibility for their actions? How many times must we hear, "I serve at the pleasure of the (fill in the blank). And only they can fire me." These people are not leaders. . ."

Another writer noted that no repercussions have been seen at USA or Boeing. One could add that Steve Isakowitz, NASA's CFO, was the program examiner who presided over cuts the Shuttle upgrades budget. I know that 14 or 15 people have been moved around—so I don't want to hear about them—but cynics within NASA those moves as program or project managers getting moved to save the skin of top management.

In light of the comments CAIB members have made about the importance of leadership in setting a new culture at NASA, I look forward to hearing from the Administrator why he has not made any changes at the top in the wake of *Columbia.* I would like to know why he feels that his mix of leaders are the right one's to change NASA's culture, especially when Deputy Administrator Gregory, is actually quoted as saying there is no such thing as a NASA culture.

[The prepared statement of Ms. Jackson Lee follows:]

PREPARED STATEMENT OF REPRESENTATIVE SHEILA JACKSON LEE

Mr. Chairman,

Thank you for moving so swiftly to organize this series of hearings to ensure that this committee does all that it can do to help America get back to its vital mission in space. And again I would like to commend Ranking Member Hall, and the Chairman and Ranking Member of the Space Subcommittee for their excellent leadership in that endeavor. Last week's hearing with Admiral Gehman and CAIB members was enlightening and productive. Although it is always a pleasure to see you, Admiral, I hope you'll understand as we turn our attention toward NASA today—to hear how they will proceed in the weeks, months, and years to come.

Administrator O'Keefe, thank you for taking the time to be with us today. The *Columbia* Accident Investigation Board report has obviously set some great challenges before you. I know you have a lot of work ahead, but I am sure that working together, we can get this job done more effectively.

Mr. Chairman, Admiral Gehman's findings must have been tough to hear at NASA. They were tough for all of us to hear—the overlooked clues, the missed opportunities. But I guess this is a time for tough love. I think we all share a commitment to science, and exploration, and to a bold mission at NASA. But, quite frankly, I for one am frustrated. I have sat in this room time after time over the past years, talking about safety, talking about the chronic under-funding of NASA programs, talking about the need for a vision for the future of mission that will capture the hearts of young engineers and scientists, talking about how much this program is worth to the American people.

But my words, as those of many of my colleagues on this side of the aisle, never seemed to take hold. I respect the Administrator's recent comments, accepting responsibility for this tragedy, and vowing to fulfill the CAIB report recommendations. But I have a nagging fear that it is just lip-service. NASA does not just need some quick fixes, and maybe a new office with a catchy name. It needs a *dramatic* alteration in the mindset of every NASA worker, and every NASA contractor, and every NASA manager. They all need to be fully committed to the safety of NASA spacecraft and crew. That is the cultural change that Admiral Gehman called for, and we need it immediately.

I am concerned that kind of dramatic change in mindset is not yet happening. Admiral Gehman's team has been very specific about instances of gross negligence in the NASA decision making chain, but as yet the managers who made those decisions are still in critical positions. I want to hear if the Administrator believes it is possible to have a new culture-of-safety at NASA, without holding NASA managers accountable for their lack of attention to safety in the past.

Furthermore, the CAIB report has pin-pointed dwindling budgets and a lack of a clear vision for the mission of NASA—saying that both had a role in bringing

down the Shuttle *Columbia.* And now, as NASA engineers need to be rising to their highest heights, getting our Shuttles back to work safely, and intensive study needs to be undertaken so that tough decisions can be made about where human space flight is going, and what we will need to do to get there—I am still not hearing a request for money, or any ideas from NASA or the Administration of what to do next. I hope that NASA is not trying to do it on the cheap, yet again. I appreciate that this process will take time, but I hope that soon we see a clear statement of the importance of the NASA, of its mission, and of what resources it will take to make it happen.

Finally, this change of culture at NASA needs to be comprehensive, not just focussed on a handful of immediate recommendations, or on the Shuttle alone. Right now we have two brave astronauts up above us, orbiting the Earth in the multi-billion dollar International Space Station, the culmination of decades of dreaming and hard work. Last week, in response to a question I asked, Admiral Gehman suggested that the Space Station could also have technical problems or weaknesses that may have been discounted, as was the falling foam. Today I hope to hear that the Administrator is looking into safety of the Space Station with the same kind of diligence and objectivity that the CAIB used in the case of the Space Shuttle.

As a Representative of Houston, I know just how talented and committed the people at NASA are. They have great ideas, but they must be heard. We need to open up channels of communication at NASA to get answers to the questions of the past, and to develop a bold vision for the future. To foster that dialogue, I have a bill with me today, that I will be introducing soon, to enhance the whistleblower protections for NASA employees. The CAIB reported that several engineers had recognized that the *Columbia* may have been fatally wounded, but "when asked by investigators why they were not more vocal about their concerns, Debris Assessment Team members opined that by raising contrary points of view about Shuttle mission safety, they would be singled out for possible ridicule by their peers." This can never happen again. The NASA Promotion of Excellence and Safety Act of 2003, will ensure that legitimate safety concerns of NASA workers are heard and respected.

NASA's mission is vital to our economy, and to our growth as a people. It is time for some bold steps forward. I look forward to the discussion.

[The prepared statement of Mr. Matheson follows:]

PREPARED STATEMENT OF REPRESENTATIVE JIM MATHESON

Thank you Mr. Chairman and Ranking Member Hall for your consideration.

The *Columbia* Accident Investigation Board report, under the excellent direction of Admiral Gehman, produced 29 essential recommendations for NASA and the Space Shuttle program that will hopefully result in a safer human space flight program at NASA.

Following the loss of the Space Shuttle *Columbia* earlier this year, Congress has naturally turned its attention to ensuring that NASA fixes the internal problems that led to the accident.

I am impressed by Mr. O'Keefe's energy and hope that he will be able to lead NASA away from the institutional mindset that led to the *Columbia* accident. However, I remain concerned about the lack of a long-term focus on implementing the Gehman recommendations. NASA created the Stafford-Covey panel in order to direct the agency's return-to-flight actions, but this panel is slated to exist for only eight months. It is essential to the long-term viability of human space flight that NASA is vigilant about following through on all of the Gehman report's findings over the next five years.

The present circumstances have focused our attention on the Shuttle program, but I hope that the passage of time does not result in a return to a NASA culture that compromised safety in the Shuttle program. In order for this nation to benefit fully from the CAIB findings, NASA must meet all of the Gehman Board's recommendations and I look forward to working with my colleagues in support of that end.

Thank you.

Chairman BOEHLERT. We will go right to our witnesses. Our panel today consists of the Honorable Sean O'Keefe, Administrator of NASA, and Admiral Harold Gehman, Chairman of the *Columbia* Accident Investigation Board.

Gentlemen—Mr. O'Keefe, you are first. And we will not be arbitrary with any time limit, and then we will hear from Admiral Gehman.

STATEMENT OF HONORABLE SEAN O'KEEFE, ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Mr. O'KEEFE. Mr. Chairman, Congressman Hall, Members of the Committee, thank you very much for the opportunity to appear before you today to discuss NASA's response to the *Columbia* Accident Investigation Board's report.

Mr. Chairman, if you would, I have a statement that I would like to submit for the record and then summarize.

Chairman BOEHLERT. Without objection, so ordered.

[Statement of Mr. O'Keefe follows:]

PREPARED STATEMENT OF SEAN O'KEEFE

Mr. Chairman and Members of the Committee, I appreciate the opportunity to appear before you here today with Admiral Gehman, who along with the other members of the *Columbia* Accident Investigation Board (CAIB) has selflessly performed a valuable and patriotic public service these past seven months.

Shortly after the tragic loss of the Space Shuttle and its heroic crew, I made a solemn pledge to the families of *Columbia*'s crew that we would find out what caused the loss of the Space Shuttle *Columbia* and its crew, correct what problems we find, and safely continue with the important work in space that motivates our astronauts and inspires millions throughout the world. Thanks to the CAIB's thorough report, we now definitively know what caused the accident. It was a combination of hardware, process and human failures. We also have a more complete understanding of the problems that must be fixed at NASA to ensure that Space Shuttle operations are conducted as safely as humanly possible in pursuit of our Nation's space exploration and research agenda.

The CAIB report provides NASA with a very detailed roadmap for returning to flight safely, one that we intend to faithfully follow. I can assure you that we will not only implement the CAIB's recommendations to the best of our ability, but we are also seeking ways to go beyond their recommendations.

Today's focus is on the hard lessons we've learned from the *Columbia* accident and about the hard work that lies ahead before we are ready to launch the Space Shuttle Atlantis for the STS–114 mission. I want to emphasize, as we undertake this work, we will be ever mindful of and appreciative of the people who have helped NASA and our entire country recover from that terrible first day of February.

First and foremost, we owe enormous gratitude to the brave families of the *Columbia* crew. Through their steadfast courage and dignity they have provided inspiration to the Nation. A fitting memorial for the crew will be constructed at Arlington National Cemetery. We thank the Members of this committee for your strong support of the *Columbia* Orbiter Memorial Act, which President Bush signed into law on April 16, 2003.

One month ago, the family members demonstrated an incredible spirit of exploration and discovery in their own right as they joined astronaut Scott Parazynski in climbing to the top of the recently named Columbia Point, a prominent vista on Colorado's Kit Carson Mountain that now honors the memory of the *Columbia* STS–107 crew.

We are also indebted to the over 14,000 people from the Environmental Protection Agency, Federal Emergency Management Agency, the Federal Bureau of Investigation, Defense Department, U.S. Forest Service, the Texas and Louisiana National Guards and many State and local law enforcement and emergency service units who contributed to the recovery of *Columbia*'s debris. As a result of this unprecedented interagency and intergovernmental cooperative effort, an area in eastern Texas and western Louisiana, about the size of Rhode Island, was carefully searched, resulting in the recovery of thirty-eight percent of the dry weight of the orbiter, including several key parts from the left wing, the part of the Orbiter damaged by a foam strike during liftoff, and the critical Orbiter Experimental Recorder—the data recorder that verified and validated much of what was learned about the accident. We are deeply saddened to note that one of the helicopters searching for debris from the Shuttle *Columbia* crashed in the Angelina National Forest in east Texas on March 27, claiming the lives of the pilot and a Forest Service Ranger. Our thoughts and prayers go out to the families of the helicopter crew members.

In support of this unprecedented operation, we received tremendous hospitality and support from the Texas communities of Lufkin, Hemphill, Nagadoches, Pal-

estine and Corsicana, as well as the Louisiana communities of Shreveport and Leesville, particularly in support of activities at Barksdale AFB and Fort Polk. NASA vows not to forget the many kindnesses bestowed upon our people and the other recovery workers by all these communities. We will use the resources and people of our Education Enterprise to help nurture the spirit of discovery and exploration in the young people who grow up in the region, just as we are working to help inspire and motivate school children throughout the country as they embark on their studies this fall.

Finally, we are grateful for the diligent work of the *Columbia* Accident Investigation Board members and staff. As many of you know, the Board has worked nonstop since it was given this important responsibility. Admiral Gehman has performed many tremendous acts of public service throughout his distinguished career, and I'm certain that the history books will regard his work on this report as among his most significant contributions to his country.

We accept the findings of the Board and will comply with its recommendations. The *Columbia* Accident Investigation Board's report recommendations will be our benchmark for Return-to-Flight. Using the Board's recommendations as NASA's organizing principles for emerging from the *Columbia* accident as a safer, stronger and smarter organization, we have developed a preliminary Return-to-Flight Implementation Plan which details the Agency's evolving blueprint for returning to flight safely and reliably. Released on September 8, this preliminary Implementation Plan provides an outline of how NASA will comply with the recommendations of the *Columbia* Accident Investigation Board, and also includes other corrective actions. The Implementation Plan is a living document and will be updated on a regular and frequent basis, with input from across the entire Agency.

Following the logic of the Board's report, the preliminary Implementation Plan focuses on making improvements in the following key areas:

- **Technical excellence—**Making specific technical engineering changes that will enhance our overall technical capabilities. Among these changes is the establishment of our new NASA Engineering and Safety Center at the Langley Research Center in Hampton, Virginia that will draw upon talent throughout our Agency to take a no holds barred approach to mission safety. If people in the center spot a problem or potential problem during their engineering and safety assessments of all our programs, they will be empowered to get the entire Agency, if necessary, focused on finding and implementing solutions.
- **Management—**Putting in place more effective management procedures, safeguards, and decision-making processes.
- **Organizational Culture—**NASA recognizes that prior to the *Columbia*, mission cultural traits and organizational practices within the Agency detrimental to safety were allowed to develop. We will now work diligently to develop an organizational culture that reflects the best characteristics of a learning organization, one based on clear and open communications throughout our Mission Teams, with a management culture that empowers both dialogue and achievement.

At the same time the CAIB was developing its report, NASA pursued an intensive, Agency-wide effort to identify additional actions that will further improve the Space Shuttle Program. We took a fresh look at all aspects of the Program, from technical requirements to management processes, and developed a set of internally-generated actions that complement and go well beyond the CAIB recommendations. For example, some of the types of activities we are focusing on include rudder speed brake actuator inspections and re-evaluation of catastrophic hazard analysis, to name a few.

The Implementation Plan integrates the CAIB recommendations as well as other actions. It is the first installment in a living document that will be periodically updated to reflect the progress toward safe return-to-flight and faithful implementation of the CAIB recommendations.

With respect to preliminary budget implications of the return-to-flight efforts, on September 4, 2003, NASA submitted to the Committee an update to the FY 2003 Operating Plan. This update reflects anticipated costs of about $40 million associated with implementation of an initial set of actions tied to the CAIB recommendations and other corrective actions. NASA is determining the full spectrum of recommended return-to-flight hardware and process changes, as well as their associated costs. The Administration is also assessing the long-term implications of the return-to-flight requirements. We will keep the Committee informed as decisions are made.

We are now determined to move forward with a careful, milestone-driven return to space flight activities, and to do so with the utmost concern for safety, incorporating all the lessons learned from the tragic events of February 1st. That's exactly what we will do.

Our Return-to-Flight effort involves a team of space flight professionals, led at NASA headquarters by Dr. Michael Greenfield, Associate Deputy Administrator for Technical Programs and veteran astronaut Bill Readdy, Associate Administrator for Space Flight.

Another veteran astronaut, Jim Halsell, who has flown on five Shuttle missions, will oversee the day-to-day work required for our return-to-flight. As the commander of an upcoming Shuttle mission, STS–120, Jim has a personal interest in ensuring that Return-to-Flight is done right. I can assure you we will also rely on the advice and judgment of all members of the astronaut corps, the men and women who have the most vested interest in safe operations of the Shuttle program.

We will also have the benefit of the wisdom and guidance of a seasoned Return-to-Flight Task Group, led by two veteran astronauts, Apollo commander Thomas Stafford and Space Shuttle commander Richard Covey. Members of the Stafford-Covey Task Group were chosen from among leading industry, academia and government experts. The Members of the Task Group have knowledge and expertise in fields relevant to safety and space flight, as well as experience in leadership and management of complex programs. The diverse membership of the Task Group will carefully evaluate and publicly report on the progress of our response to implement the CAIB's recommendations.

There is another body that NASA will greatly rely on in the Return-to-Flight process: this committee, and all in Congress who have a vital interest in how NASA performs our work on behalf of the American public. We very much respect and value this committee's oversight responsibility, and I personally look forward to working with the Committee in the weeks and months ahead to ensure that we do our job right.

Building upon work already underway to address issues previously identified by the CAIB, the release of our preliminary Implementation Plan marks an important step in our efforts to address and fix the problems that led to the *Columbia* accident. We are about to begin a new chapter in NASA history, one that will be marked by a renewed commitment to excellence in all aspects of our work, a strengthening of a safety ethos throughout our organization and an enhancement of our technical capabilities.

As we proceed along this path, all of us will be challenged. I am absolutely certain that the dedicated men and women of NASA are up to this challenge and we will not let the families of the *Columbia* astronauts and the American people down.

I would also like to provide an update on the status of the International Space Station (ISS) and the impact from grounding the Space Shuttle. The Space Shuttle's return-to-flight is critical to complete assembly and ensure research capability for the ISS. Only the Shuttle can deliver the large elements, spare parts and the logistics required to successfully meet our research goals and international agreements. While the Space Shuttle fleet is grounded as a result of the *Columbia* accident, Russian Soyuz and Progress vehicles continue to provide assured crew and cargo access to and from the ISS.

In the absence of Space Shuttle support, NASA and the International Partners are addressing contingency requirements for the ISS for the near- and long-term. In order to keep the Expedition 7 and future crews safe, we are ensuring that there are sufficient consumables, that the ISS can support the crew, and that there is a method for safe crew return available.

The ISS Expedition 7 crew (Yuri Malenchenko and Ed Lu) continue their stay on-board the ISS, which began in late April 2003. The ISS was re-supplied with a Progress vehicle (ISS Flight 12P) launched on August 28 and docked to the Station on August 30, 2003. The crew is continuing experiments for which sufficient hardware and supplies are already on-board the ISS. Twenty-six science investigations are in process or planned for Increments 7 and 8. Operations continue to go well, with sufficient consumables on-board the ISS. The launch of the next Progress to resupply the ISS has been accelerated from January 2004 to November 2003. I am proud that the ISS partnership has come together as a true partnership during this challenging time. I also wish to assure you that there is no schedule pressure to return the Space Shuttle to flight until we are confident it is safe to fly.

The Expedition 8 crew (Commander C. Michael Foale and Flight Engineer Alexander Kaleri) is scheduled to accept hand-over of the ISS from the Expedition 7 crew following their launch on Soyuz in October, 2003.

In closing, I want to reiterate that the country owes Admiral Gehman and the entire Board a tremendous debt of gratitude for the service it has performed. We

embrace the CAIB report and we are committed to implementing the recommendations and safely returning to flight.

Finally, I believe it is important to note that all 13 CAIB members arrived at and agreed to the final conclusion of their report: "The United States should continue with a Human Space Flight Program consistent with the resolve voiced by President George W. Bush on February 1, 2003: 'Mankind is led into darkness beyond our world by the inspiration of discovery and the longing to understand. Our journey into space will go on.'"

Thank you again for the opportunity to appear before the Committee.

Mr. O'KEEFE. Over our 45 years as an agency, since NASA was founded in 1958, we have found, in the course of this history, that our time has been defined by great success and by great failures. In each of these defining moments, our strength and resolve as professionals has been tested. This is one of those seminal moments in our history, and it is defined by failure.

On February 1, we pledged to the families of the *Columbia* 7 that we would find the problem, fix it, and return to the exploration objectives that their loved ones dedicated their lives to. The *Columbia* Accident Investigation Board report completes the first of these commitments, and we are indebted to Admiral Gehman and his colleagues to their exception of public service and extraordinary diligence to a very difficult task. We asked for an unvarnished, objective, independent view, and we got it.

As we begin to fulfill the second commitment to the families, to fix the problem, our critical first step is to accept the findings, to comply with the recommendations, and to embrace this report. There is no equivocation on that pledge. This report is a blueprint. It is a road map to achieving that second objective.

In the course of the proceedings in this investigation, the Board has given us an extraordinary head start by their candor, their openness, and the release of findings and recommendations during the course of their investigation itself. They didn't wait until the final words were drawn on the paper of the report itself. They had been conducting this is a very open setting, and they had been communicating regularly and often.

In the telegraph all along the way, in the course of their public hearings and commentary exactly where their findings were, and they found them and moved forward in that particular direction, and we have been listening. It was started, thanks to their good work and the manner in which they conducted it by developing an implementation plan. This is not something we developed in the last 10 days. It has been a work in progress as we have listened carefully to their open testimony, their open commentary, their written advice and recommendations to us so that we could begin to prepare that effort.

And as the Chairman mentioned, on the 8th of September, we released a preliminary Implementation Plan in response to these recommendations, which we will upgrade regularly, often, amend it as necessary, all of the way to the point of return-to-flight and well beyond.

The report is divided into two primary categories: the 29 recommendations of the *Columbia* Accident Investigation Board, and a second approach, which is to raise the bar to a standard higher than what has been stated in those recommendations. And that raise the bar input will include observations of the Board, other

findings, commentary in the course of the Board's report with you, different ideas or initiatives that they have proposed separately, factors we have discovered during the course of supporting the investigation, and any other good ideas from the general public or anybody else who wants to offer it. We are trying to inventory all of those different approaches in order to work through each of those recommendations and additional ideas to make this a better, safer, stronger organization. We include in that category anything and everything that is going to improve this process as well as the capabilities and the hard work.

As we work through these recommendations, we have chosen to implement them very thoughtfully in order to be compliant with the recommendations. There are several options that may be considered for each of those respective recommendations. We must continually improve and upgrade that plan to incorporate every aspect we find along the way in the implementation effort, any other observations, wherever they may come, that need to be addressed as we work our way through this commitment to fix the problem. And in doing so, there will be regular updates, regular amendments, regular republication of that Implementation Plan to assure that everyone knows exactly where it stands.

The *Columbia* Accident Investigation Board report covers hardware failures and human failures and how our culture needs to change to mitigate against succumbing to failures of both kinds. We must go forward to resolve to follow this blueprint and do it in a way that is our very best effort to make this a stronger organization.

It is important to recognize, and we do, that it will require all of us in the agency, not just those within the space flight community or any one center or any one program. It must involve all of us at NASA. And to those who don't get that message, we will continually, diligently transmit that message. And there is no question. Some may not have received it, but that is not an excuse to not keep trying to make sure it is received by all.

We must recognize this is an institutional set of findings well beyond the scope of this accident. It has application to everything we do. And that is a profound set of recommendations. It does have applicability to everything we are engaged in. Again, we wanted an unvarnished assessment from the Gehman Board, and that is exactly what we got.

NASA is a very different organization today than it was on February the 1st. Our lives are forever changed by this tragic event, but not nearly to the extent of the lives of the *Columbia* families. Again, we sincerely apologize for our failures.

In taking inspiration from their approach, we must be as resolute and courageous in our efforts as they have been in working through this tragedy, it will be with them for the rest of their lives, by committing ourselves to accepting these findings, complying with these recommendations and embracing this report. We know that how we respond in the days, weeks, and months ahead will matter as much as what we decide to do. And whether it will be a lasting change that will withstand the years of time. And it must be an institutional change. Of that, there is no doubt. We must also resolve to be definitive in our acceptance of our failures and fol-

lowing through on our commitments to the *Columbia* families to fix the problem and return to the exploration objectives that our loved ones dedicated their lives to. And in that effort, we know we have got a lot of work ahead of us. And we accept that, and we are pursuing that with great diligence.

In this period of this tragedy, in this chapter, we take great guidance and inspiration from the words uttered so many years ago by Oliver Wendell Holmes. "Greatness is not where we stand but in what direction we are moving. We must sail sometimes with the wind and sometimes against it, but sail we must and not drift, nor lie at anchor."

Mr. Chairman, thank you for the opportunity to testify this morning, and I would be happy to respond to any questions you have, sir.

[The Return-to-Flight Task Group Charter appears in Appendix 2: Additional Material for the Record.]

Chairman BOEHLERT. Thank you very much, Mr. Administrator.

Admiral Gehman.

STATEMENT OF ADMIRAL HAROLD GEHMAN, CHAIRMAN, COLUMBIA ACCIDENT INVESTIGATION BOARD.

Admiral GEHMAN. Why thank you, Mr. Chairman, Mr. Hall, and Members of the Committee.

I will just make two short points. The—I appreciate the opportunity to appear here at this second hearing. The Board's intent was to—was that the report we submitted would be the catalyst to cause changes. The Board was very direct and clear that we don't intend that our report be dropped in somebody's in basket and that our duties are finished. In furtherance of that goal, I am pleased to appear here and to assist in making sure that the changes that are necessary, the changes we feel are necessary, are pursued vigorously.

The second point I would make is just to remind the Members of the Committee that our report is also clear that the full implementation of our recommendations are not completely in the hands of Mr. O'Keefe. Many of the recommendations are going to take the cooperation of NASA plus the Congress and the White House in order to implement. And I would like to—I just want to remind the Committee of that.

I hope that during the questions and answers that I get an opportunity to reply to Mr. Hall and Mr. Gordon who asked two very provocative questions, and I will prepared to deal with those during the questions and answers.

Thank you, Mr. Chairman.

Chairman BOEHLERT. Thank you very much, Admiral.

DISCUSSION

SCHEDULE PRESSURE

Mr. O'Keefe, one of the most serious concerns discussed by the CAIB was undue schedule pressure born of, among other things, an unrealistic schedule of Shuttle flights to complete node two of the International Space Station. In your preliminary schedule for returning to flight, you show four flights in 10 months, three flights

in six months, and three—within two months between two of the flights. Is this realistic? How are you determining what the pace of Shuttle flights can be once STS–114 is launched?

Mr. O'KEEFE. Well, thank you, Mr. Chairman. We will be guided by two primary objectives. The first one is we will return-to-flight when we have determined that based on all of these recommendations and all of the efforts that are necessary to comply with them have been met and that we are fit to fly and not one day before. So whatever date is published as a "not earlier than" schedule. And we intend to be driven by those milestones and achievement of compliance with those individual options we may choose to implement the recommendations.

The second guidepost we will use for whatever flight sequence occurs thereafter will be based on the optimum systems integration planning or how the components and modules may be transported and installed aboard the International Space Station. And that will be at a flight sequence, again, that is based on whatever that engineering sequence model is and will occur no earlier than we are fit to fly. So there will be a requirement each and every flight that we have met all of these objectives prior to doing so. And so what you see is a notional schedule that is intended to try to drive out what the long poles in the tent are and the issues are in order to achieve those objectives.

Chairman BOEHLERT. So it is absolutely clear, in your mind, as I think it should be, and it is clear in our minds, as we want it to be, that you will be driven by milestones and not a calendar?

Mr. O'KEEFE. Indeed, sir.

ONE-YEAR LOOK-BACK

Chairman BOEHLERT. Admiral Gehman has agreed to—and we had a rather lengthy discussion on this last week. And let me, once again, praise the Admiral and the entire *Columbia* Accident Investigation Board, for the outstanding public service they have rendered, not just to NASA and the Federal Government, but to the Nation. But during our discussion, he has agreed to reconvene the *Columbia* Accident Investigation Board after a year. We think, on the Committee, and I feel very strongly about this, that a one-year look-back would be very useful. It is good to hear you say you embrace the recommendations and you are going to implement the recommendations, but we require some assistance in helping us to evaluate the whole process. Are you willing to bring the Board back to evaluate NASA's performance?

Mr. O'KEEFE. Well, having appointed the Board in the hopes that we would receive an unvarnished, objective opinion, and having received just that, this is an imposition on the time of Admiral Gehman and his colleagues as to their willingness and availability later, but by all means, if that is the desire of the Congress, the Committee, and yourself, and willingness on the part of the former Chairman of the *Columbia* Accident Investigation Board, we are always anxious for their input. It has been most helpful, and I think they have given us a very objective view.

Chairman BOEHLERT. Once again, let me say, hindsight is always 20/20, but I think there is great admiration for the Board, for the diligence with which they pursued their task, the thoroughness

with which they executed the mission, and the independence they displayed at all times. Admiral, would you care to comment on the Administrator's response to that question?

Admiral GEHMAN. Mr. Chairman, the Board discussed this matter, and I am authorized to speak on their behalf and to say that, if asked, we will serve. And we feel that we would know exactly where to go and where to look. And it wouldn't take us very long to figure out whether or not these changes that Mr. O'Keefe proposes are really taken or not.

Chairman BOEHLERT. Thank you so much. And that is precisely why I individually—or collectively, we are so interested in having that reconvening of the Board for that one-year look-back at evaluation.

Mr. O'KEEFE. So ordered.

OPERATING PLAN CHANGES

Chairman BOEHLERT. Thank you very much. That is the spirit of cooperation we hope for, and quite frankly, expect.

NASA submitted an update to its fiscal year 2004 operating plan last week. In the plan, NASA requests to transfer $40 million from the science account to the human space flight account. Why are you requesting this transfer? Is it more than a coincidence that this is the same amount of 2003 funding NASA intends to spend on return-to-flight activities? And how will this reduction impact on the science program?

Mr. O'KEEFE. Yes, sir. Let me give you a breakdown for the record, but it is a very small portion of the fiscal year 2003 costs that we anticipate will be continuing to incur through September 30, in other words, three weeks from now, that represent the expenses we have engaged in, primarily related to supporting the investigation as well as the costs additional to the amount that we have already absorbed to provide for all of the institutional support necessary to the Board's activities. A very small fraction of it, but again, we will provide all of the information for the record, begins to identify the costs to look at options to begin implementing the recommendations. It is a full cost estimate of what it takes for all of the folks institutionally within NASA to support this activity. And so we will provide a greater detail of that, as is contained in that.

As far as the consequence to the science programs, it derives from a number of different programs that is based on just program execution realities that occurred there. But again, I will give you greater detail for that for the record as—and provide exactly where the consequences are, but I don't see it as being a case in which we are deferring science or eliminating any scientific program as much as execution savings or efforts necessary during the course of implementation to make that kind of resource available.

Chairman BOEHLERT. We would hope that this is not a trend, getting into the habit of dipping into the science fund to finance other operations, vital though they may be.

Mr. O'KEEFE. Yes, sir.

Chairman BOEHLERT. We want to do it right the first time with the other operations as well as we want to do it right all of the time with the science portion of the budget. And I will look forward

to the more detailed information you are willing to submit for the record.

Mr. Hall.

Mr. O'KEEFE. If I could, I am sorry, real quick, Mr. Chairman. I apologize. The—part of it, too, is due to the proposal that the President submitted in July for an additional $50 million to support the activities related to the investigation from NASA as well as the Board itself and the beginnings of the activities we are looking at for the options. That not having made it as part of the supplemental consideration prior to the Congress adjourning in August, we have had to accommodate those '03 costs within funds available, again, very, very mindful of your precise point, which is that we not defer science objectives to do so. But we endeavored to cover it elsewhere. That was not feasible, given the nature of the Congressional schedule, so as a consequence, we are working through what resources are available to do this.

Chairman BOEHLERT. Thank you very much, Mr. O'Keefe.

Mr. O'KEEFE. Thank you, Mr. Chairman.

Chairman BOEHLERT. Mr. Hall.

CREW ESCAPE

Mr. HALL. Mr. Chairman, thank you. In continuance of my—I think from the very word go, my effort not to seek causation nearly as much or not looking for blame on what has already happened behind, but how to lessen our loss and how to lessen that thing that we talk about and we call risk, and if we can't lessen it down to zero, then to find an alternative to losing a crew. And that alternative has to be a crew escape vehicle of some type.

Mr. O'Keefe, I would like to follow-up on the topic that I raised in my opening statement. As you know, I feel strongly, and I am not alone in that. This entire Committee feels strongly, and I am sure the President, you, and everybody under you feels strongly that we need to do more than we are doing now to protect the astronauts who fly the Space Shuttle or its upgrade or its replacement, whatever vehicle we have, to have safety as the number one factor in there and as a necessary part of the amount that we have raised or appropriated toward that cause that safety occupies its proper percent of that appropriation. It seems to me that it doesn't have to be as risky as it is. At the present time, if we lose a Shuttle, it is almost certain that we are going to lose the crew, and it just shouldn't be that way.

As I have said in my opening statement, we need to be taking a serious look at what could be done to add crew escape systems to the Shuttle that would protect all of the crew, not three of them or four of them or just the Captain, but everybody that is aboard. And we ought to be challenging industry to come up with innovative approaches that could make such a Space Shuttle crew escape system possible and affordable and doable and look to them to find a way to lessen the weight and to lessen the costs and to work it into any future spacecraft we have and to be working toward making it available to the spacecraft we are using. As I understand it, NASA has a modest study underway to review previous crew escape studies. That is good, but it is really just not sufficient. We need the kind of in-depth engineering analysis and a consideration

of design options advocated by Dr. Widnall at last week's hearing. And that is what we are aiming for up here when I offered my amendment to the NASA Appropriations Bill just two months ago and it was accepted unanimously. As you know, that amendment was adopted by the entire House without objection, so far as I know, supported by this good Chairman, supported by everybody on the Floor and voted unanimously as an amendment. It is not the final answer, but it ought to start us down the road to getting the information we need to work and to make an informed decision.

Now Mr. Administrator, I guess my question is to you. Will you support our efforts on crew escape for the Space Shuttle, and are you prepared to work with us on establishing a serious initiative to seek the best, most innovative crew escape concepts industry can provide and then allow these design concepts to get a thorough, independent assessment——

Mr. O'KEEFE. Yes, sir.

Mr. HALL.—by the best that you have——

Mr. O'KEEFE. Yes, sir.

Mr. HALL.—the finest minds you have?

Mr. O'KEEFE. Yes, sir.

Mr. HALL. And I think it is the responsible thing to do. And I believe your answer is going to be yes.

Mr. O'KEEFE. Yes, sir.

Mr. HALL. I am through. Thank you.

Chairman BOEHLERT. Thank you very much.

Mr. Rohrabacher.

Mr. ROHRABACHER. Thank you very much.

FOAM

I would like to focus a little bit on the actual, you know, technical cause of this tragedy, which is, as we know, the foam coming off of the Shuttle and hitting the wing. When were you first—when did you first hear about the foam as a potential threat to the Shuttle as a safety problem, Mr. O'Keefe?

Mr. O'KEEFE. After the accident.

Mr. ROHRABACHER. After the——

Mr. O'KEEFE. After the accident.

Mr. ROHRABACHER. Okay. No one ever mentioned to you, no staff member mentioned to you before, in your one year prior to—as Administrator leading up to that? And how many Space Shuttle launches did you go to?

Mr. O'KEEFE. Six.

Mr. ROHRABACHER. Six. So you took personal—you paid personal attention to each one of these, and you were there at each one of these launches. And no one—none of your staff—no one on your staff ever mentioned the foam?

Mr. O'KEEFE. I have searched my recollection, and I can not recall a single occasion.

Mr. ROHRABACHER. Right. And Dan Goldin was, of course, the Administrator prior to you. For about 10 years, I guess, he was the Administrator. Eight years? Well, for about a decade, he was——

Admiral GEHMAN. Nine and a half.

Mr. ROHRABACHER. Nine and a half? All right. Thank you.

Is there any evidence? Did he ever leave anything that suggested that the foam was a potential problem that needed to be dealt with?

Mr. O'KEEFE. Not that I am aware of.

Mr. ROHRABACHER. Admiral Gehman, did——

Admiral GEHMAN. Mr. Rohrabacher, the Board did a search of over 50 reviews and investigations into NASA, including the Rogers Commission, in which foam came up during the Rogers Commission. And all 50 reviews missed categorizing the foam as a danger to the Shuttle.

Mr. ROHRABACHER. Now so right up unto the—but there was an awareness that the foam was coming off. And Mr. O'Keefe, were you ever—was it mentioned that foam was coming off as a phenomena but not as a threat? Did anyone ever mention it?

Mr. O'KEEFE. Not that I recall.

Mr. ROHRABACHER. Shortly after the—I mean, I think within a matter of hours after the *Columbia* went down, I remember reading a press account that the foam had been ruled out by NASA. Someone in your organization said that. Do you know who in your organization made that statement?

Mr. O'KEEFE. Yes, sir. The policy of the agency, from the first day, the first moments after the accident all the way up until the completion of this report and the drying of the ink on it was that we were never going to rule out any scenario, never going to fall in with any particular option——

Mr. ROHRABACHER. Right.

Mr. O'KEEFE.—and yet there were always going to be some folks who didn't quite get the message.

Mr. ROHRABACHER. Yet there was a quote in the paper——

Mr. O'KEEFE. Yes, sir, that is quite true.

Mr. ROHRABACHER.—saying that the foam had been ruled out.

Mr. O'KEEFE. Yes, sir. That was quite true, and that was corrected. The individuals involved in that case were advised that no, the policy is we will leave every single option open until the Board closes off those options methodically in their efforts——

Mr. ROHRABACHER. So NASA people took it upon themselves to announce to the press that the foam had been ruled out?

Mr. O'KEEFE. There were some folks that expressed an opinion, and that was corrected. By our actions—sir.

Mr. ROHRABACHER. Yeah.

Mr. O'KEEFE. We have supported the Board in the effort in order to assure that every single option, scenario, every approach was run in the ground at their choosing. That is by our actions. The statements on the part of some individuals were corrected and we acted on the larger policy I just enunciated.

Mr. ROHRABACHER. But does that—did that not reflect the mindset that Admiral Gehman was—it was reported it was a major contributor to the fact that we have the foam ruled out shortly after the tragedy yet we now know the foam was the technical cause of this tragedy.

Mr. O'KEEFE. Well, the larger question I think you are raising on this specific instance is that we assume we know what we know while then proving what it is we know. One of the most powerful comments in this entire report that I have seen repeated several

times, for a fact, is that the burden of proof must be shifted from prove that it is unsafe to prove that it is safe. And that is a—something that is going to require not only a management focus, a leadership objective, a set of processes that support that particular approach, and a complete twist of that particular approach, and I have taken that to heart.

Mr. ROHRABACHER. Yeah, I think that is called being proactive rather than reactive.

Mr. O'KEEFE. Yes, sir.

Mr. ROHRABACHER. And now I hate to do this, but I think that the public deserves this. You, yourself, mentioned after people kept asking about the foam, that people were taking—were not—in what I took as being not taking this seriously, you referred to people who were looking at the foam as "foamologists." Of course, now I regret saying that, and—but who advised you that it was so unlikely that the foam was an issue that it should be taken that lightly?

Mr. O'KEEFE. My comments to that effect were during the course of the early weeks of this investigation, which several folks, journalists, sought to write about this particular strike as being the likely condition. And the plea in that case was let us keep all of the options on the table until the Board has closed off every element of the fault analysis, and they arrive at a conclusion of what they believe was the source of this accident. And so on that regard, it was meant to try to put it in perspective.

Mr. ROHRABACHER. Yeah.

Mr. O'KEEFE. And I do not regret statements made. Looking back, you can't correct them. So yes, that is exactly the terminology used. And it was intended to please—ask folks, let us not get a lot of exercise leaping to conclusions. Let us wait for the Investigation Board——

Mr. ROHRABACHER. Okay.

Mr. O'KEEFE.—to reach those findings in a deliberate way. And they did.

Mr. ROHRABACHER. Okay. I think that we needed that explanation, Mr. Chairman, because at first glance, it would appear that that phrase was used to belittle those who were thinking that foam was a—wasn't a potential, but instead, what you are suggesting is that you were trying to caution people to make a broader scope of their investigation rather than a focus, technical focus.

Mr. O'KEEFE. We purposely appointed 13 investigators. We wanted to see what those 13 investigators thought rather than the opinions of everybody else.

Mr. ROHRABACHER. I accept that.

Mr. Chairman, I would—if we have a second round, I would like to go into questions about the future strategies for the Shuttle——

Chairman BOEHLERT. We will have a second round.

Mr. ROHRABACHER.—which are very important.

Chairman BOEHLERT. And the Chair now recognizes Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman.

VISION AND THE INTERAGENCY REVIEW

There has been, obviously, a lot written about this incident. One article that I thought was particularly good was written by David

Sanger at the *New York Times*. And I will quote. Here is how he starts: "The bitter bottom line of the *Columbia* disaster comes down to this: NASA never absorbed the lessons of the *Challenger* explosion of 1986, and four successive American presidents never decided what America's space program should head—where America's space program should head after the Cold War and what it would cost in dollars and the risk of human life to get there." And so, Mr. O'Keefe, I was particularly pleased to read the other day about the interagency review within the White House of the future of NASA. My friend and Chairman, Dana Rohrabacher, for at least the five years that he has been our Chairman, and I think before that, has frequently criticized every Administration that he could get his hands on for not having this vision with NASA. And Admiral Gehman the other day—I wanted to write it down, because it was much more eloquent than I am going to say, but he—by paraphrasing him, he said that basically vision is just a dream unless you have some money behind it. So—and this has got to start with the White House, so I am glad that this process is starting. And I think it would be helpful for all of us to know a little more about that.

So if you would, please, you could share with us first who specifically in the Administration is heading the review? Is it the Vice President, the Director of the Office of Science and Technology Policy, or someone else so we know at what level this is taking place? What agencies are participating and at what level? That is, is it at the Cabinet level, the Undersecretary level, or at some other level? And I know you have mentioned to me that there was no formal charter, but could you tell us what the group's stated goals are and, you know, what you see as the product? Do you expect that there will be recommendations for the President or simply options? What do you see as the schedule? And so far, I don't think Congress has been involved. Do you expect to get Congress involved, and how would you do that?

Mr. O'KEEFE. Well, I think, correctly cited, there is, indeed, an internal effort underway, I think, to examine the U.S. space exploration policy objectives. And this has been, certainly, prompted by this cathartic event, without a doubt. And the process is a—one that, again, is very familiar within the internal functioning of the Administration of inclusion of all of the interested interagency as well as within Administration participants: the President's Science Advisor, the Defense Department, the Commerce Department, NASA, others who have a specific stake in the activity, as well as those who would have a requirement to offer opinions, views, advice as we serve up a range of options that ultimately would be presented to the President for consideration. So that process is just a very standard, normal procedure of what goes——

Mr. GORDON. Well, we know like with the—when they did the——

Mr. O'KEEFE. If I could conclude. I am sorry. I apologize. You asked a whole series of questions, and I wanted to——

Mr. GORDON. Yeah. Okay. Good.

Mr. O'KEEFE.—respond to those. And—at your pleasure, though. If you would prefer——

Mr. GORDON. No, no, no. I wanted to get to the specifics, so go right ahead.

Mr. O'KEEFE. Okay. So that process is serving up those options. And again, what the timing of that will be is based on, again, the maturity of that debate as we work our way through it. Ultimately, again, this will be offered to the President for his consideration and the options that may be available. And again, it is a timing circumstance now that would dovetail neatly into not only the policy deliberation process but also that which would pertain to the resource allocation, the budget process, and all of the other elements that would pertain. So it is an organized effort in that regard, again, not dissimilar to those that have been engaged in every other effort, internal to not only this Administration but others, and designed to serve up those alternatives for his consideration.

Timing I would not speculate. And I think the answer to that one flatly is whenever the President decides. It is very clear, though, in the minds of all of the folks who are engaged in this debate, which has been intensifying in light of the—again the focus of the Board's report as well as that particular concentration that it will be moving at a time in which it needs to be relevant for Congress's consideration. As we have discussed, as you mentioned in our private discussions, indeed, we are looking to determine how Congressional input may be developed here and brought into that equation. And again, you have offered some interesting ideas of what we may want to consider as questions for that, and I certainly await that opportunity to see the kinds of things that I can bring in during the course of these deliberations and make that possible.

Again, if—in conclusion to this, though, my overarching concern is that the expectations be calibrated. As you define the vision requirements that has eluded us for the better part of three decades, indeed since the end of the *Apollo* program, have been difficult enough and I think it was best summarized by commentary offered by the Augustine Commission, which met and concluded its activities in the early '90s in which they determined that yes, indeed, we are unanimous in the view that a vision is required, but there are no two individuals who could agree on what that vision should be. We are attempting to do something that hasn't been done in quite some time. And we are endeavoring to do that as deliberately as we possibly can.

Thank you for your patience.

Mr. GORDON. Okay. If I could—but if I could be more specific, the questions that I asked were who heads it up. You know, we know that the Vice President headed up the Energy Task Force. I want to get an idea of at what level this is. So I asked, you know, who heads it up and at what level are the various agencies? What level are they participating?

Mr. O'KEEFE. We are certainly not in the process of describing in great detail exactly who the participants are in these efforts.

Mr. GORDON. Can you say who heads it up?

Mr. O'KEEFE. No, sir. It is an internal deliberative process, one that includes all of the appropriate officials for the purpose of advising the President on what the options are for his consideration.

Mr. GORDON. But we are going to—we are developing a vision for NASA and Congress doesn't even know who is on it, who heads it, or you know, when, sort of, the game plan on reporting back.

Mr. O'KEEFE. Well, again, this is——

Mr. GORDON. So I guess this is your review.

Mr. O'KEEFE. No, sir, it is not.

Mr. GORDON. Okay. Well——

Chairman BOEHLERT. The gentleman's time has expired. We will have a second round.

Mr. GORDON. Okay.

Chairman BOEHLERT. We will allow you back——

Mr. GORDON. I tried to—I would point out, I tried to——

Chairman BOEHLERT. I understand.

Mr. GORDON.—stop earlier, so I could get to the specifics, but we never got there——

Chairman BOEHLERT. I understand——

Mr. GORDON.—so——

Chairman BOEHLERT.—and the Chair was very understanding of your approach, and that is why we allowed an additional two minutes, but we will have a second round.

Mr. O'KEEFE. My apologies to the Congressman. I was attempting to answer that. I apologize for being too long.

Mr. GORDON. Well, we——

Chairman BOEHLERT. Mr. Calvert.

Mr. CALVERT. Thank you, Mr. Chairman.

THE INDEPENDENT TECHNICAL AUTHORITY

As I mentioned last week, when Mr.—Admiral Gehman was out testifying, I was very much in agreement with the Board's suggestion that responsibility and authority for decisions involving technical requirements and safety should rest with an Independent Technical Authority. I couldn't agree more with the conclusion and the relating recommendation. NASA needs to utilize independent assessment capabilities that will serve them throughout the life cycle of the Space Shuttle system and human space flight generally.

Admiral Gehman and Dr. Widnall had a nice exchange last week about NAVSEA Corona's long experience with independent assessment. Several months ago, as I understand, NASA created the NASA Engineering Safety Center, NESC, at NASA's Langley Research Center. The NESC purportedly will serve as the independent safety oversight function. And I guess my question is to you, Mr. O'Keefe, is what is the mission of the NESC and what role does the NESC play in NASA's return-to-flight activities, one? How does the NESC play into the independent safety organization that the Gehman Board recommended? And finally, what other DOD and other governmental agencies that already employ independent assessment did you talk to in setting up this new authority?

Mr. O'KEEFE. Yes, sir. The NASA Engineering Safety Center was anticipating to be operational, up and running on or about the 1st of November. So what we announced a couple of months ago was our intent to recruit from around the agency engineering and technical staff who have the expertise to participate in one of the most, again, powerful parts of the recommendation on the Independent

Technical Authority that is described in that recommendation is a requirement for trend analysis the capacity to come in and look with a fresh set of eyes, excuse me, at what we consider to be routine operations and tease out of that what really are the anomalies that ought to be investigated further. And so in that context, the primary function of this group, but not exclusively, will be to have that capacity among the technical engineering talent to make determinations and to examine the records, operational information and so forth, of every program we do, not just Shuttle but anything else we are engaged in, in order to see where those anomalies exist because we just flat missed them during the course of operational conduct.

It also has a role that we are developing as part of its charter to conduct, you know, the on-site inspections to see that we are really living up to what we are talking about as opposed to just simply, you know, reading our own press clippings on this and believing it is true. We have got to have the capacity to actually conduct the capabilities to see that. In addition, it also will run what we—is the NASA Safety Reporting System, which is the anonymous system for reporting safety anomalies, or anything else, anybody has got a problem with so it is just not lost in the shuffle along the way. So this becomes just part of that recommendation on the Independent Technical Authority is covered by this particular initiative. By no means was it intended to be the monolithic organization that answered all of the elements in that recommendation. It covers large pieces of it. It—that covers the second piece of your question, which is how does it play into the operational activity. They will have a role in operational activities in, again, any program that NASA conducts as a means to assure that we are not just using the engineering talent that is attached to the program and therefore a potentially bias view. Another powerful observation made by the Board is that there becomes advocacy on the part of engineers and technical authority and the objectivity is lost. And so as a consequence, this makes sure that we have done that.

And in terms of the other Defense Department models used, one of the reasons for setting it up at Langley is literally across the runway is the Navy Safety Center. And again, given my naval service background and history, that—in understanding exactly how that institution operated, there are some real interesting object lessons on how to do that right and a regular advice that we don't need to have a conference center required. They simply walk across the runway and can obtain that right on the spot. So there are a number of different ways. We are trying to bring best practices of how the Defense Department has done this business into how we set up this particular entity before we open its doors on November 1.

Mr. CALVERT. And finally, Admiral Gehman, does the NESC satisfy the Board's recommendation for the creation of an independent safety organization for the Space Shuttle, or did you have something else in mind?

Admiral GEHMAN. Not intended to. No. As Mr. O'Keefe said, it is not intended to satisfy the requirements, and it does not completely, but it is a good start.

Mr. CALVERT. What would you like to see?

Admiral GEHMAN. We were very careful to not prescribe what NASA should do to implement this, but clearly the functions that we want to be performed are prescribed in our report. And to be very brief, they are a robust engineering organization that owns all of the requirements and specifications to the Shuttle Program and all waivers to them as well as the funding and engineering expertise to understand why those requirements and specifications were written in the first place so they could understand why or why they should not grant a waiver. And so there are many ways to organize to do that, and we left that up to NASA.

Chairman BOEHLERT. The gentleman's time has expired.

And let me just explain. I am trying to be very arbitrary in sticking to the five-minute rule, at least for the initial round, because I want all Members to be given an opportunity to participate.

Mr. Costello.

Mr. COSTELLO. Mr. Chairman, thank you. And Mr. O'Keefe, welcome.

MANAGEMENT COMMUNICATION REGARDING SCHEDULE

Let me talk just a little bit about the Core Complete goal schedule for the International Space Station. I note that in the report that the Board found that the management goals were having a negative impact on the workforce and the workforce keeping the Shuttle flying. It affected the attitudes of managers who came to view the problems as threats to the schedule rather than threats to safety of the astronauts. Admiral Gehman testified that the workforce was aware that the schedule was probably unrealistic, but they—that was not communicated to management that there was a disconnect and a lack of communications. I have reviewed your Senate testimony concerning that issue and others. And you indicated in your Senate testimony that because prior flights had slipped that workers should have been getting the message that there was flexibility in the Core Complete goal.

And I guess my first question is—first let me say that I was pleased to hear you answer the Chairman's question on the issue of return-to-flight that the number one issue will be safety and we will not fly until we are certain. But my question is, in your Senate testimony you said that the workers should have been getting the message when there was slippage. Was management getting the message? Were you getting the message and was your team getting the message that if, in fact, the goal of February 19, 2004, that if this goal was slipping, number one, did you recognize it? Number two, if you did recognize it, why didn't we modify the goal?

Mr. O'KEEFE. Um-hum. Well, indeed, the opinion on this point is irrelevant, because the Board has reached that finding. It therefore, in my judgment and all of us in the agency, it is fact now.

Mr. COSTELLO. I would take issue with that. I would say that it is relevant to the viewpoint of a management issue. If, in fact, there are problems at the worker level, if they believe that goals are unrealistic, I want to know if they are communicating that to management and, if so, what action was taken, not so much for the past, but for the future?

Mr. O'KEEFE. I appreciate that. Thank you, sir. I appreciate the clarification. Indeed, we failed to make sure that that message was clearly understood by every single person associated with the Shuttle Program. We failed to do that. We failed to communicate that effectively. It was a very clear understanding among the management team, the Shuttle Program management, the International Space Station Program management, all of the folks engaged in this that these were schedules to move towards the optimum systems integration schedule. And that is a point we have testified to and talked about lots in this particular Committee proceedings in the past. And so in that context, again, we failed to get that message out clearly that this was a movement in the direction of the best systems integration and engineering approach to achieve the deployment of those modules and components to International Space Station and that the critical feature in order to make any possible final configuration of Space Station even arguable was to achieve that node two configuration. Anything else builds off of that.

And so we are trying to keep folks attended to that without our international partnership who wanted to talk about longer term goals, lots of different inputs from external oversight that had different opinions in that. And we wanted to stay concentrated on the first essential step in order to make any of those debates meaningful. In the process, we failed to communicate that point effectively. We need to do that in the future more effectively, and that is the start we are trying to make now to say these are milestone driven. When we are fit to fly, that is when we are going to fly.

Mr. COSTELLO. And that is what we are concerned about is the future. A couple of quick questions, brief answers so I don't run out of time here.

Mr. O'KEEFE. Yes, sir.

Mr. COSTELLO. One is how often were you briefed on the progress for the Core Complete and who briefed you, if I may ask?

Mr. O'KEEFE. We are engaged in regular program review on the International Space Station. And the integrated effort from Shuttle and Station, systems integration efforts, are roughly a monthly basis. It involved the program management teams from both programs as well as the senior folks in headquarters who are engaged in space flight activity.

COUNTERMEASURES TO SCHEDULE PRESSURE

Mr. COSTELLO. And do you—have you developed plans yet? I realize that the Board just completed its work, but have you developed plans as to how we will guard against an overly aggressive schedule on return-to-flight?

Mr. O'KEEFE. Well, again, it is—this is a tough one, because the—your observation is right on. The observation of the Board, as I read the words, was our focus on the schedule may have begun to influence the management team in the way they made decisions about, and it proceeds. And what we have got to do is just constantly remind ourselves that, indeed, these are milestone objectives. And in the process of doing so, we have to have some notional schedule. We all live by that. From the moment the alarm clock goes off in the morning, we are driven by schedules. Every

Member of this committee is, I am sure, driven by lots of schedules that are involved in terms of what people expect of us. So it is—it has got to become more, as the Board observed, an effective management tool for kind of teasing out what those problems could be to achievement rather than being violent objectives to trying to find, you know, an accomplishment of some goal. And that is the shift in mentality that I think we have had in the management team, but we have got to effectively communicate to every single person turning the wrench on this that that is exactly what the objective is.

Mr. COSTELLO. Thank you.

Mr. O'KEEFE. Thank you, Congressman.

Chairman BOEHLERT. The Chair recognizes Mr. Barton.

Mr. BARTON. Thank you, Mr. Chairman. I appreciate that.

Chairman, I would ask unanimous consent that two articles be put into the record at the appropriate place. One is an article that appeared on September the 8th, 2003 in *Space News* entitled: "To Convert the Shuttle." The author is Dr. Robert Zugren. The other is an expanded version of an editorial that appeared in the *Wall Street Journal* last week or the week before, and it is written by Homer Higgman.

Chairman BOEHLERT. Without objection, so ordered.

[The information referred to appears in Appendix 2: Additional Material for the Record.]

SHUTTLE SAFETY AND RISK

Mr. BARTON. Mr. O'Keefe, I want to read to you something from one of these articles and get your view of it. This is the opening. The first sentence. "It is now apparent that the Space Shuttle orbiters can not be used much longer as the system for transporting crews to Earth orbit. The *Columbia* disaster has made it clear that the antiquated orbiters are becoming increasingly unsafe. Moreover, even if the Shuttle could be flown safely, it is clear that using a launch vehicle with a takeoff thrust matching that of a Saturn 5 to transport half a dozen people to International Space Station makes about as much sense as using an aircraft carrier to tow water skiers." What is your reaction to that?

Mr. O'KEEFE. I think it is a wrong-headed view.

Mr. BARTON. You think it is a wrong-headed view? How many flights have there been of the orbiter that had astronauts aboard?

Mr. O'KEEFE. Oh, gee. Let me get a precise number for the record.

Mr. BARTON. Well, I think it is 113.

Mr. O'KEEFE. Yes, sir, it is—no, 113 flights. I thought you said the number of astronauts aboard.

Mr. BARTON. Number of flights with——

Mr. O'KEEFE. I am sorry. Yes, 113.

Mr. BARTON. Okay. And——

Mr. O'KEEFE. And there were some number of astronauts, and I will have to get you precise——

Mr. BARTON. I don't need to know the number. My question is how many times has the orbiter gone up when there were people on it? I think that number is 113.

Mr. O'KEEFE. Yes, sir. That is correct.

Mr. BARTON. It may be a little bit more or a little bit less.

Mr. O'KEEFE. That is it.

Mr. BARTON. How many catastrophic accidents have there been in that 113 flights?

Mr. O'KEEFE. Two.

Mr. BARTON. Two. What does that percentage turn out to be if you take two over 113?

Mr. O'KEEFE. It is one in 58 or 56, whatever it is.

Mr. BARTON. It is about 1.7 percent. Do you know what the probability of a combat death is in a fighter aircraft over Iraq?

Mr. O'KEEFE. No, sir, I don't.

Mr. BARTON. It is not that. It is a lot less than that. It is about one hundredth of that, maybe even one thousandth of that. Now we are putting our astronauts at risk in these orbiters that the technology, in some cases, is 30 years old so that they can fly up to the International Space Station. How long, if we build the Space Station—do exactly what we are planning to do, how long will that Space Station be useful?

Mr. O'KEEFE. The next 15 to 20 years or, you know, whatever period of time it is going to take——

Mr. BARTON. Right.

Mr. O'KEEFE.—for that asset to——

Mr. BARTON. Now what happens after that?

Mr. O'KEEFE. I think our longer-term objectives are to look at conquering the technology limitations that we currently live with.

Mr. BARTON. But right now, what is the next goal of the manned space program after the International Space Station, which is going to be obsolete and non-functional in the next 15 to 20 years?

Mr. O'KEEFE. To conquer the technology limitations that we have right now that really limit us from going——

Mr. BARTON. But we have no goal. We are not going to the moon. We are not going to Mars. We are not going to a Space Station that is in synchronous orbit between the Earth and the moon. We have no goal. Isn't that true?

Mr. O'KEEFE. I beg to differ, sir. The strategic plan we have developed, and again, I would be delighted to go through this with you and make sure that we have it laid out, it is a stepping stone approach in order to achieve getting beyond low Earth orbit to be able to permit any exploration within the Solar System. But the two things we have got——

Mr. BARTON. My time is about to expire. Here is my point. Here is my point, sir, and I am not upset with you, and I am not upset with Admiral Gehman. But we are putting American men and women at great risk for their lives to fly an orbiter that is 30 years old, that can not be made safe, and there is article after article after article that says that. So my proposal, at the appropriate time, at least with the acceptance of being able to offer it, is to use these orbiters in an unmanned capacity, build a new space plane or a space orbiter that is just for people and go to the President and get the President to set a goal for the American people to have a real mission for our astronauts.

And I don't know what that will be, but I am going to do everything I can within the rules of this committee and the House to prevent more Americans going up in the existing orbiters. I just

think it is inherently unsafe. We have already lost 14 men and women, and if we keep flying them, we are going to lose 21 other men and women in the next 10 to 15 years.

And with that, Mr. Chairman, I would yield back.

Chairman BOEHLERT. Would you like to comment on that, Mr. O'Keefe?

Mr. O'KEEFE. Well, thank you, Mr. Chairman.

Thank you for your views, sir. We certainly are anxious to meet with you to walk through what our vision and objectives are. At this point, we are basing everything we are doing at this stage, beginning with the strategic plan to determine how we can proceed, and again, what I attempted to respond to is we really have to conquer the technology limitations that currently exist on in-space propulsion, power generation capacity, and human endurance beyond low Earth orbit in order to make any Solar System exploration objectives feasible. And that is what we are trying to work through right now. I just ask that you keep an open mind on that process, and I appreciate the points you have raised. Positively, this is among the issues that we need to adjoin as part of the President's options that he will be considering for the purpose of what that broader exploration space policy objective will be.

Mr. BARTON. Thank you.

Mr. O'KEEFE. Thank you for that input, sir.

Chairman BOEHLERT. The gentleman's time has expired, but Admiral Gehman, your report, the Commission's report, said the Shuttle was not inherently unsafe, but it is inherently risky. Now would you comment on that?

Admiral GEHMAN. Yes, sir. The Board felt that it would be a pretty cheap shot to deliver to the Congress a long list of woes without at least editorializing on a way out of this dilemma. And in order to do that, we had to characterize the risks, which we attempted to do. But we also suggested a way out of this dilemma. And I might add that if we do get invited to come back and reconvene a year from now, in our little formula for addressing this very excellent question, if there has been no action on our little formula, we will probably comment on that. And our little formula is very simple. It does go along the lines that were proposed here. That is, the Nation needs to decide what it needs to do in space, not what the vehicle should look like. First of all, we have to decide what our—what we want to do in space. And NASA's vision doesn't count. It has got to be an agreed national vision.

So if we are, one year from now, no further along with that, we will probably put that in our report, too. But we did opine that it—that the Shuttle can be operated for the next couple of years with an acceptable amount of risk. It is still risky, but it could be made safer, but as soon as possible, we need to separate the crew from the cargo, and I think that was the point that was made here.

Thank you, Mr. Chairman.

Chairman BOEHLERT. Thank you very much. And we will get back to the second round. And that is why, Mr. Administrator, I would suggest that Mr. Barton's question, which was very specific, is so important, this interagency team and who is doing what as we are trying to get a clear vision for the future.

The Chair recognizes Mr. Lampson.

Mr. LAMPSON. Thank you, Mr. Chairman.

VISION FORMULATION AND THE INTERAGENCY PROCESS

And I, too, believe that same thing, Mr. Chairman. I think that we have expressed and tried to express from this committee and Members of it for several years a real vision for NASA to develop, some place to go, something that not just gives us a better concept of what the purpose of NASA is. But I honestly believe that that will go light years in keeping the excitement, the enthusiasm of employees of NASA, the dreamers of this country who wanted to go and do things in space, giving them the opportunity to have the continuity of program after program rather than wondering when we come up with the technology what might we then do with that technology.

So I think perhaps it is a matter of philosophy and which comes first, the chicken or the egg. I happen to be of the philosophy that you can achieve more technologically if you have some place to go and you develop the technology necessary to achieve those goals. And I hope that we can get about doing some of that. The Gehman report cites the lack of agreed—an agreed national vision for space—human space flight over the last three decades as an organizational cause of this accident. And I want to follow-through with some of the questions that were asked by Mr. Barton a few minutes and come back to some of the same points that were being made by Mr. Barton immediately before me. Are you personally aware of who is in the meetings on the—with the review committee?

Mr. O'KEEFE. Yes, sir. There are a variety of participants.

Mr. LAMPSON. You are familiar with each and every one of them?

Mr. O'KEEFE. They vary.

Mr. LAMPSON. From meeting to meeting?

Mr. O'KEEFE. Yes, sir.

Mr. LAMPSON. Can you give me an idea of how many different agencies are represented in these meetings——

Mr. O'KEEFE. Sure.

Mr. LAMPSON.—from time to time?

Mr. O'KEEFE. Sure. Exactly, as I have just described for Mr. Barton—or for Mr. Gordon a little bit earlier is the President's Science Advisor and his staff, the Defense Department, the Commerce Department, Office of Management and Budget. There is a range of other participants that will enter into that equation, as necessary, to draw on those expertise to look at what the longer-term exploration agenda objective——

Mr. LAMPSON. Including people from the outside?

Mr. O'KEEFE. No, sir.

Mr. LAMPSON. It is all within the White House?

Mr. O'KEEFE. Just strictly within the Administration. It is an interagency process within the Administration to work through these issues as a first start in order to serve this up for the President's consideration of our options.

Mr. LAMPSON. When might the second step come?

Mr. O'KEEFE. I don't know. I will get back to you very shortly, though.

Mr. LAMPSON. Okay. But you said some time ago in some of your testimony or statement some place that you wanted to solicit public input. At what point will the public have its opportunity to give its input?

Mr. O'KEEFE. We have been—there have been lots of different ways that those avenues have been adjoined of late. And again, the oversight hearings. There has been a range of outside witnesses who have been called.

Mr. LAMPSON. Before that committee?

Mr. O'KEEFE. Before lots of Congressional committees. This is not a committee. It is an internal, interagency process that is very similar to what every Administration does. So this is an internal process for the purpose of advising the President on the options to be available.

Mr. LAMPSON. Is it something like the Cheney Committee?

Mr. O'KEEFE. No, sir, it is not.

Mr. LAMPSON. Let me switch a little bit. Is the group looking at costs and benefits of humans going beyond low Earth orbit or——

Mr. O'KEEFE. Yes, sir.

Mr. LAMPSON.—just robots?

Mr. O'KEEFE. No, sir. I think it is looking at, again, the full range of U.S. space exploration policy objectives, which then includes the tactical questions you are raising: how do you perform it; what platforms, as the Admiral just observed, might be used? All of those questions need to be resolved after you have answered the first top level set of questions, and that is what we are really beginning at.

Mr. LAMPSON. Has that committee considered the goals that have been set by China, to go to the moon?

Mr. O'KEEFE. I have not—I don't recall specifically whether it has been adjoined at any level at this juncture, but I have no—have a specific recollection of that point. I am aware of it. Certainly, that is an observation that many have made. It has been written about extensively——

Mr. LAMPSON. In magazines and such, but it has certainly not been brought to the public's level of awareness that, in my opinion, it should. Do you have a feeling that we should push harder to let the public be aware of the goals that other nations have set to go to the moon? Is it important that others get there before we are? Is it—do we need to care about that?

Mr. O'KEEFE. Again, as a matter of policy, that ought to enter into the debate. And I, with you, agree fully that there ought to be a wider understanding within the general public of exactly what the intentions may or may not be of other national interests to achieve that objective.

Mr. LAMPSON. Is there one person that sits in the chair of this committee considering these things or does it, too, change from time to time?

Mr. O'KEEFE. It is like every Administration does interagency coordination process: to pull together the options for the President's consideration.

Mr. LAMPSON. But who is doing it? Do you do it?

Mr. O'KEEFE. I am one of the participants. There are others.

Mr. LAMPSON. But there is no chairman?

Mr. O'KEEFE. Not particularly. No. It is more—again a coordination process is established as part of the interagency functions.

Mr. LAMPSON. Okay. Let me take my 10 seconds to sum up my statement. I have now talked, probably 2½ years, maybe, about the exploration—Space Exploration Act. You are familiar with that——

Mr. O'KEEFE. Yes, sir.

Mr. LAMPSON.—bill that I introduced before. I will be reintroducing that bill today. The bill calls on NASA to establish a phased series of goals over the next 20 years, including human visits to the Earth/sun libation points and Earth orbit crossing asteroids, deployment of a human tended research and habitation facility on the moon, humanness expeditions to the surface of—and to moons of Mars. And as we work to return the Shuttle to flight, we need to move outward beyond low Earth orbit, and in the process, we will revitalize our space program. We will energize industrial and academic sectors of this country. We will create new opportunities for international cooperation. And more importantly than anything, I think, it will inspire young people. And I firmly believe that we have got to do it with what we have been talking about here, not the concept that you are going. And I would plead with you to please make that point to whatever this committee is, and maybe we will find out a little bit more about the committee as we go along.

Thank you, Mr. Chairman.

Chairman BOEHLERT. Thank you. The gentleman's time has expired.

The Chair recognizes Dr. Bartlett for five minutes.

Dr. BARTLETT. Thank you very much.

EXTERNAL TANK FOAM AND THE USE OF FREON

In an attempt to put this accident in perspective, my colleague, Mr. Barton, asked about the probability of a fatal accident in the Shuttle Program and a possibility of a fatal encounter in our fighter pilots over Iraq. There are two little statistics I would like to get on the record to put this in perspective. In the roughly hour and a half since our hearing began, seven people have been killed on our highways, just the number of the astronauts, and 81 of our fellow citizens have died prematurely from smoking cigarettes. I wonder where the outrage is over this statistic?

I would like to get something straight for the record that if you have only the previous—there were some questions about the application of the foam and that in earlier flights, and I don't know exactly when this was changed, that the foam blowing agent used chloroflurocarbons. In an attempt to reduce pollution, NASA then changed to HCFC–141B blowing agent, which resulted in increasing loss of foam due to popcorning. I am not sure that at that earlier hearing it was made clear that there are two different techniques for applying foam and that the agent was changed in only one of those. You might conclude from that earlier hearing that the probable cause of the foam coming off, which caused this accident, was because of the change in the use of this agent. Would you explain, please? I know you do this in your accident report, but that may not be as widely read as the record, and in this previous hearing, the implication was that if we hadn't been so concerned about

the environment and kept on applying the foam with the chloroflurocarbons that we probably wouldn't have had this accident. Can you set the record straight?

Admiral GEHMAN. Sir, I presume that that is—may I answer that question?

Dr. BARTLETT. Yes, sir.

Admiral GEHMAN. Yeah, right. Yes, sir. You are exactly right. The change in blowing agent, even though it did cause, in the next two flights, a dramatic increase in the number of pieces of foam that came off, that was fixed right away and was immediately taken care of. And the Board attributes not at all the change in blowing agent to this accident. Besides that, we are talking about two different foam areas. The popcorning occurred in the vast acreage foam that goes around the tank, and we are talking here about the bipod ramp, the—that wedge shape, handmade piece of foam, which has come off only seven times that we know of.

Chairman BOEHLERT. And Admiral, that foam was never changed, is that correct?

Admiral GEHMAN. That foam has never been changed.

Chairman BOEHLERT. Thank you.

Admiral GEHMAN. It has been laid up the same way all of the time, so the change in blowing agent had nothing to do with this accident.

Dr. BARTLETT. I appreciate that explanation, because when I sat through that former hearing, my impression I came away with was that gee, we changed the application of the foam and that caused a whole lot more loss of foam, which is true. But it is a loss of popcorning, which I gather, were tiny flakes of foam, which really were not a risk.

Admiral GEHMAN. I don't know that they are not a risk, but they did not cause this accident. And it—in any case, it was fixed. And the incidence of foam coming off was immediately statistically reduced back down to——

Dr. BARTLETT. What do you mean by fixed? Do we now use chloroflurocarbons for their application?

Admiral GEHMAN. No, sir. No. Thousands of little tiny pinholes were drilled to the acreage foam to allow venting, to allow normal venting of the compressed gases.

Dr. BARTLETT. Admiral, in the grand scheme of things, the amount of chloroflurocarbons that would be used in these once in a while application of foams to the—to this craft, that really wouldn't amount to a—much of an impact on the environment, would it?

Admiral GEHMAN. I have no earthly idea to know how much. The main reason—the testimony we received was that the main reason they shifted blowing agents was to the—was because of the lack of availability of Freon, as we used to call it. They just couldn't get the hundreds and hundreds and hundreds of tons of it that they used to need.

Chairman BOEHLERT. Thank you, Dr. Bartlett.

Dr. BARTLETT. Thank you.

Chairman BOEHLERT. Your time is expired, and I thank you very much, the very distinguished scientist that you are, for bringing that to our attention, because the theory advanced by some that

this tragic accident occurred because NASA was required to adhere to certain environmental law. That theory doesn't hold water. Secondly, NASA has had repeatedly exemptions from EPA. And so I am so glad, Dr. Bartlett, that you brought that to our attention. And it means more coming from a distinguished scientist. Thank you very much.

The Chair recognizes Eddie Bernice Johnson.

RTF WORKFORCE

Ms. JOHNSON. Thank you very much, Mr. Chairman. And I apologize for having to run to the Floor for resolution. I would like to express my appreciation for you continuing these hearing, and I would like to thank Administrator O'Keefe for agreeing to appear here today and the Admiral for returning to answer our questions on this most important hearing on the *Columbia* Accident Investigation Board report.

Today, we are brought here again to discuss the accident and the report to protect the safety and integrity of the future of this country's space program. We must learn from the mistakes of the past. The report from this investigation will allow us to see what went wrong, how to prevent it from happening again. It is essential that we put forth concerted effort to protect the safety of our astronauts.I21Unfortunately, we see in the report that there was pressure from the leadership that led unsafe practices. One of the biggest concerns I have had with this current NASA administration has been the privatization and competitive souring of governmental functions. Throughout the '90s, the Shuttle workforce has shrunk. And from 1992 to 2002, NASA's Shuttle workforce was reduced by more than 50 percent and the Shuttle contractor workforce by more than 40 percent. The report documents these facts as well as the fact that the diminished capacity of the NASA Shuttle workforce as a factor in the *Columbia* accident, and I find this quite alarming.

We can no longer pass blame or hide behind ignorance when we discuss safety of our astronaut corps. It is time we stand up and face the music of the mistakes made, if not only to honor our brave heroes who have passed because of our arrogance or failure to see the errors of our ways, that is the least that we owe to their memory.

So Mr. O'Keefe, I would like to ask you how many people will you be hiring within NASA to enable you to meet the return-to-flight recommendations?

Mr. O'KEEFE. We are just beginning to develop the—an estimate of exactly what kind of internal hiring of U.S. Government public servants would be required. It will be at least on the order of a couple of hundred. It will be associated with the NASA Engineering and Safety Center that we announced a couple of months ago. And it will be initiating on the 1st of November. And then looking at all of the recommendations that have been made and the options we will choose to implement them, we will hire, as necessary, engineering, technical, and management staff, as appropriate, in order to carry out the options we may choose to go forward with the recommendations, on the basic assumption, though, of what the distribution is of what we do at NASA as a public service relative to contractor folks comparison. There was a very instructive Congres-

sional Budget Office report that was released about a month ago that compared what we do within the Shuttle Program Office with a number of other major program integration efforts, systems integration efforts that go on across the government and have found that what we are doing is not substantially dissimilar in that regard.

So Mr. Chairman, if you would, I would like to at least submit this CBO report for the record as an interesting——

Chairman BOEHLERT. Without objection.

[The information referred to appears in Appendix 2: Additional Material for the Record.]

SCHEDULE EFFECTS ON WORKFORCE

Mr. O'KEEFE.—observation that I found that—in reviewing a number of other comparable major programs that require systems integration work, we are, you know, roughly of the same order and magnitude of that same kind of distribution and comparison of public versus private functioning. But we will be looking at additional folks to be brought in in order to assure that independent engineering expertise that the Board has called for in the course of its commentary as well as to sure up the safety objectives that we need for public servants to do so.

Ms. JOHNSON. Okay. As you know, the report reinforces Goldin's and McDonald's conclusions that the workforce was being severely strained by schedule pressures and by the inability to oversee the contractor workforce effectively and concludes that the balance between NASA and the contractor workforces have become skewed and strongly implies that NASA needs to beef up its workforce significantly. So once the Shuttle has returned to flight, how many people will NASA need to hire in order to assure a safe Shuttle program?

Mr. O'KEEFE. I don't know. We are going to need to inventory, again, each of the options that we would select for compliance with each of these recommendations, and that then will yield a number of how many people we hire.

Ms. JOHNSON. How much will that augmented workforce cost on an annual basis? I guess if you don't know how many you are going to hire, you don't know that, but how much have you requested in the budget?

Mr. O'KEEFE. Again, the budget right now has not been amended or adjusted in order to reflect what we believe to be return-to-flight costs. When those estimates have been developed, we will certainly submit it expeditiously to Congress for your consideration.

Chairman BOEHLERT. Thank you very much.

Ms. JOHNSON. Thank you very much.

Chairman BOEHLERT. The gentlelady's time has expired.

The gentleman from Florida, Mr. Feeney for five minutes.

Mr. FEENEY. Thank you very much, Mr. Chairman. And we are grateful for both of you being here. We appreciated Admiral Gehman's testimony last week.

NASA/NAVY BENCHMARK

Mr. O'Keefe, you and I were together on a very sad occasion on February 1. We were with, amongst others, Congressman Weldon, from Brevard County, and of course, Majority Leader, Tom Delay, during a very, very sad day. I want to focus briefly on some conversations you and I had before that disaster, because the truth of the matter is that I really respected what you were doing and where you were going, getting the full accounting, not just of the accounting books and balance sheets for NASA but also the resources, the capabilities, and you and I talked about developing a long-term strategic vision. And I understand, while I have been busy in two other committees, that you have talked a great deal about that vision. And of course, we will be continuing to pursue that, because all of us are looking forward to the future.

But I will suggest that one of the things we have also talked about is that there has to be a balance in terms of safety but also getting things accomplished. This is an inherently risky business. I think most people that support manned space flight accept the notion that this is an inherently imperfect process as long as human beings are going to be involved in it. The safest advice I gave my clients when I was lawyer but I had to stay out of court was to stay in bed every day. And the truth of the matter is, you get very little accomplished if you are going to be using safety as your only goal. And I think that Admiral Gehman and his suggestions have been very important in noting that we can do a lot better on safety with respect to technical aspects, the culture, et cetera, but that safety can't be the only goal or we will never launch men and women again into orbit.

I am interested in the conversation you and I had before the disaster, and that was one of the first things you did when you took office was to use the benchmark study of the Navy's nuclear submarine program. I think you and I had talked about how instructive that could be in many ways, and it becomes even more pertinent after the disaster on February 1. I want to quote a letter that you sent to the Navy Secretary back on June 13 of 2002. You said, "NASA's Space Shuttle and International Space Station program managers are facing many challenges, including maintaining product quality and safety, accomplishing required performance and safety upgrades, and maintaining a skilled and motivated workforce in the face of budget and schedule pressures."

I think you basically encapsulated a lot of the challenges facing NASA that sort of, in some ways, all came to a head on February 1. A lot of which you had to say before the disaster parallel what the CAIB report is suggesting that we need to do to improve NASA. Six months before *Columbia*, something about NASA's safety culture caught your attention and your eye, and I wonder if, in the firsthand, you can share that with us, and secondly, I wonder if, with respect to Kennedy Space Center's quality assurance procedures, General Deihl, as part of his contribution to the CAIB report, said as follows: that NASA ought to "perform an independently led, bottom-up review of the Kennedy Space Center quality planning requirements document to address the entire quality assurance program and its administration." You have been very

proactive and very generous in accepting the critique in the Gehman report. I think you have accepted it in a most magnanimous and important fashion. I hope that everybody throughout NASA will do that, but I would like to note specifically with respect to General Deihl's recommendation, how you intend to approach that.

Mr. O'KEEFE. Yes, sir. Thank you very much. On the first set of issues, in terms of what were the influences that kind of provoked me to look towards the benchmarking within, not only the submarine service but also the naval reactors community. And I guess it kind of goes back to in vitro. A—one of the originals within the Navy nuclear engineering program spent an entire career in the submarine service as an engineer. And so I grew up with this around the dinner table listening to the kinds of concerns that that community has and the ethos that that community has about safety and the objectives that need to be accomplished there.

When the Thresher went down in the '60s, when I was a little kid, I can recall very specifically an awful lot of real tight-lipped, tight-jawed folks around the Portsman Naval Shipyard, which is where we were stationed at that time. And it was the beginnings of what then became what is now known as the Sub Safe Program. And years later then, having the privilege of serving as Navy Secretary and working with the naval reactors community, submarine force again, in that capacity, I found the ethos of what they are engaged in and the way they diligently pursue these efforts for safety as well as operational conditions and balancing both objectives as being the closest comparable community to our own.

And in that regard, I asked Admiral Skip Bowman, who is now the successor to Admiral Reichover's legacy as the naval reactors chief today, attended the very first launch I ever went to. He was with me there, and that was the first he had seen one. We compared the processes and the systems to the complexity of a Trident submarine, you know, and the very same kinds of approaches have to be taken there. And he then helped, along with then-Secretary Gordon England, who is on his way back to that capacity, to initiate, at our request, a benchmarking effort that, again, as you cite, in December released its first effort to—for that particular benchmarking procedure within the submarine program and then within the naval reactors community, most recently in July of this year. So an awful lot of what we have garnered from this effort that went on well before the accident occurred just didn't mature in time, clearly. And it has—but it is the same thing. We are not going to slow up on that effort. It is something we have got to redouble our efforts to implement. The cooperation and the assistance from the naval reactors community, from Admiral Bowman specifically, and from all of his principle staff has been exemplary. Our chief engineer today is a fellow who was—spent an entire career in the naval reactors community and has been brought over as the chief engineer of NASA. So there is a lot of cross pollination going on here in order to assure that that ethos is infused.

As it pertains to the second part of your question and the other observations offered by members of the *Columbia* Accident Investigation Board, we will treat that like everything else. There are two categories in our Implementation Plan, which very clearly de-

lineate 29 recommendations that have been faithfully recorded by the Board, and then what we characterize as the raise-the-bar inputs. And in that will be all of anybody and everybody's inputs to include other members of the Board who offered supplementary views or whatever else. We are not going to discriminate between and among the—where the origin of various ideas may come from. Instead, we want to work through each of those and make sure there is careful consideration to all inputs that we receive. We want to make sure that we make this a stronger, safer procedure before we return-to-flight.

Chairman BOEHLERT. Thank you very much. The gentleman's time has——

Mr. O'KEEFE. Thank you very much. I appreciate the inquiry.

Chairman BOEHLERT.—expired. The Chair recognizes Ms. Jackson Lee.

Ms. JACKSON LEE. Thank you very much, Mr. Chairman. Again, let me thank the Chairman and our Ranking Member for the Full Committee and as well our Chairman and Ranking Member for the Subcommittee on Space and Aeronautics for these detailed hearings that I find very, very effective.

ACCOUNTABILITY

Mr. O'Keefe, I want to join in the premise of the Ranking Member that we are not attempting to find blame for blame's sake. And I join him in that. But my approach has been that until you hold individuals accountable, until you respond to the very core of the problem and begin to shine a light, it will be difficult to correct whatever the culture might be represented to be. And certainly NASA has had a wonderful history. Needless to say, as we began the hearing last week, I read the names of the *Columbia* 7. We could read a number of names of individuals who sacrificed their lives in the course of the great mission of NASA. I think we owe all of them enormous debt of gratitude, and I mentioned last week that we hope we will get Congressional gold medals for the *Columbia* 7, but we owe them an enormous debt of gratitude by way of such recognition. But we know that we owe them a debt of gratitude by way of what we do from this day forward. So I first want to say to you that I think the return-to-flight effort report that came out certainly has a lot of strength to it.

And I want to note, in particular, two points about starting the review of the several thousand waivers of Shuttle safety requirements to determine whether they were justified. And I would imagine the public would not even be aware that we engage of thousands of safety waivers and with no notice to the public as to whether they were justified or not, I am sure there were individuals who thought so. But certainly, in light of the tragedy, we would raise the question.

The other, I think is very worthwhile, and that is, of course, to add cameras to the Shuttle and the International Space Station to try to document launch damage and use imagery from ground aircraft and ship-based sources. Again, a simple feature, a camera, that wasn't even on-board in place in 2003. We have had cameras around for at least a century. So I guess my line of questions will lead as follows. And I would like to engage NASA on the premise

that I said not blame for blame's sake, but to be able to find good solutions to work with my colleagues and might I mind my manners and say to Admiral Gehman again, we will say it over and over again, and to your Board, a very, very effective report of which we can use as a very effective, if I might use the terminology, road map to get us where we would like to go.

But as I have looked over some of the regulations and processes in NASA, I think more work needs to come. So Mr. O'Keefe, let me refer to some testimony that was given last week by one of the—by—I think it was Major General Hess. I asked him to give me a sense of how the military operates. They operate by way of finding out what happened and then accountability. And there is a level there where there are individuals who are removed. First, I would like you to give me a list, not by names, I can engage you one on one on that, positions that we now know people who have been moved. I would like to know what has occurred with respect, I believe, to the Deputy Administrator who was in charge of flight operations, if you will, again not calling names, but whether there has been any action. But I want to know the list of positions that individuals held that no longer are in place or that they have been moved as a response to the *Columbia* 7 tragedy.

I also will be, as I indicated, filing a whistleblower protection legislation within days dealing specifically with NASA. I am not happy with the approach. I understand there is a hotline that the OIG utilizes. I will be seeking to find out whether the OIG received any such calls during the course of the *Columbia* 7 launch and what happened with those calls. Not knowing whether or not the OIG is to be a witness, Mr. Chairman, but I would want to call the OIG to this hearing room and to ask what circumstances or what actions occurred around *Columbia* 7 and whether any calls came in at that time.

This is a question to you, Mr. O'Keefe, and I thank you for your presence here. On August 29, there was a message sent out to the NASA family. In that e-mail, you addressed a perception reported in the CAIB report among some employees that it is not safe to report problems without risking retaliation. It is noted that this is not something that is attributable to you, Mr. Chairman. It has happened in past Administrators. There is a fear that if you tell about problems, it may not be that you are immediately eliminated, but your life becomes a life of misery, that many of the individuals at higher positions are those who happen to be friends of the Administrators. And so if these criticisms are true, or even if they are perceived as true, you have a huge challenge on your hands. How can we get the talented technical people at NASA motivated to speak truth to power, terminology used by a civil rights group, within your organization when they see in—see it run by "yes people" and they fear for their careers? And can we assure that there is no way for NASA management to discover who has made a complaint to the NSRS system so that these employees can be protected?

Finally, it is interesting that out of almost 300 interviews conducted by the CAIB, no line employee ever chose to treat their interview as a public, unprotected event. Every one of them wanted secrecy. How can we break this culture? And when are we going

to start breaking this culture? And as well, in noting the report on the return-to-flight, I think it was very admirable that Inspector—excuse me, Associate Administrator for Space Flight, William Ready, said—he is a flight engineer and a pilot, I believe. He doesn't know anything about this culture thing. There was a culture that stifled communications that somehow we have to eliminate. He doesn't know anything about it. We have got to get some other people in here to help him. Where do we go from that—from here on those questions?

Mr. O'KEEFE. I will attempt to respond to all of the points you have attempted to raise here, and I will try to be brief, and that will be a challenge here. But I think you have raised some very important questions.

The first issue on accountability, there is no question. There is no doubt. Please, make no misunderstanding. The accountability starts with me. And I am responsible for what the activities are of what goes on in this agency, and I am personally accountable for that activity. I offered a witness statement to the *Columbia* Accident Investigation Board. It is not a privileged statement. It is open testimony, so it has to begin with me, and it has to begin with every leader in this organization to make that kind of change. Now to your—to one of the questions that you raised in the course of your commentary, there have——

Ms. JACKSON LEE. It goes to people that have been moved.

Mr. O'KEEFE. Yes, I was just about to get there, and I apologize for not getting there promptly enough. There are four Space Flight Center Directors. All four of them are new within the last year. Three out of those four are new within the last seven months. The Deputy Directors of those four Space Flight Centers, two of those four are new in the last seven months. Within the Shuttle Program itself, 14 of 15 of the senior management of the Shuttle Program are new in the last seven months. So the—and I will give you a fuller accounting, for the record, of every other move that has been made, because I believe this to be not just a space flight, not just a Shuttle Program set of issues, not just any individual center, it is across the entire agency. And so as a consequence, you have seen very significant change in the last year in the senior leadership at almost every position. Three-quarters of the leadership of this agency is different today than it was a year ago. And in the course, that is the leadership team, I believe, that is going to lead us to—from this point forward, to be responsive in these situations. And as a consequence of that, those who are not have been removed for a variety of reasons.

They have either left the agency. They have been reassigned. They have been relieved, any number of different cases. And each is a different story, which gets to the second point, I believe, powerfully you made in your commentary, which is the last thing I want to do in the course of this is contribute to this retaliatory atmosphere that is asserted very clearly by the *Columbia* Accident Investigation Board's report and the conclusion that each of the Board members have reached, which is they have witnessed this same behavior themselves in addition to recording how they believe that acted its way through in the investigation, which is what prompted me to put out the message that you very thoughtfully read. And

again, it is one that I am—I stand by. I think we must enforce. We must be serious about it. And the very clear message to all leadership of this agency is we can not tolerate that repression or suppression of any observation of safety concerns, difference of view. But we also have to have responsibility to resolve those issues and move forward. I think, as Congressman Feeney very thoughtfully observed, we have to balance those two or else we spend all of our time debating the question.

So as a consequence, it works both ways. The leadership must set the tone for that. I believe the leadership team that is in place today have been put there recently, comparatively speaking, because they manifest that kind of characterization. And they will remain there until such time as they fail to demonstrate those characterizations as well as behaviors in the future.

Finally, one approach that we will look to to try to sort through and be sure that anyone out there, if they don't want to use the OIG hotline, they don't want to use the NASA safety reporting system, which again permits anonymous reporting, none of which was recorded during the course of the operation or during the STS–107 flight at all. There are any number of ways to ensure that, and we would like to create yet another possibility to do that, which is anyone on any day at any time to observe that if they feel that they can not raise their point of view or if it is suppressed in that process, that we create a system that is so common in so many other agencies in order to assure that these are run to the ground and resolved. But first and foremost, it has to start and stop with the leadership mentality and attitude. And that is what I am committed to ensure that we infuse in this agency. I think we are going down that road to do so. The changes have been made in order to implement that. And this leadership team is up to that challenge.

Chairman BOEHLERT. Thank you very much.

Ms. JACKSON LEE. Would you be happy to——

Chairman BOEHLERT. The gentlelady's time has expired.

Ms. JACKSON LEE. Mr. Chairman, could I just get him to——

Chairman BOEHLERT. The gentleman is recognized—Dr. Ehlers——

Ms. JACKSON LEE. Would he work with me on the whistleblower legislation?

Chairman BOEHLERT. The gentlelady should understand, this is a committee of nearly 50 Members. This committee tries to be indulgent to every single Member. Five minutes opening questions. Your opening question lasted seven minutes, just the question. The Chair is trying to be very fair to each and every panel Member, but each panel Member has to be fair to other panel Members.

Ms. JACKSON LEE. I respect that, Mr. Chairman.

Chairman BOEHLERT. The Chair now recognizes the gentleman from Michigan, Dr. Ehlers.

Ms. JACKSON LEE. And I have been fair to others, as I have listened to them go over the time. This is an important question, and I respect——

Chairman BOEHLERT. Every Member has important questions, Ms. Jackson Lee.

Ms. JACKSON LEE. And I respect—and I——

Chairman BOEHLERT. I would like to emphasize that.

Ms. JACKSON LEE. Correct. And I respect that aspect.

Chairman BOEHLERT. Your time consumed 14 minutes, and each Member is allocated five minutes. There will be a second round——

Ms. JACKSON LEE. Well, I will look for the documentation of 14 minutes.

Chairman BOEHLERT.—and the Chair will be generous again. The Chair recognizes Dr. Ehlers of Michigan.

Mr. EHLERS. I hope that interchange didn't come off my time.

Chairman BOEHLERT. It did not.

Mr. EHLERS. Thank you, Mr. Chairman.

VISION

And I would like to just also add to Mr. Feeney's comment: the only safe place is bed—staying in bed. And I should point out that more people die in bed than anywhere else. So he—you can't win.

I apologize for having to step out for a few minutes, because I had to give a speech elsewhere, and I was going to ask you about the next space vehicle. I understand that was asked. While trying not to repeat this, but I am anxious to get past the *Columbia* and get—and we have a complete report on that. We know what went wrong. We will try to correct the procedures. But I would like to look down the pike. People talked a lot about a grand vision or a vision, and that is part of it. But I think we should be thinking 30 or 40 years from now. Where do we want to be? And in particular, I think a very basic decision is to what extent do we want to engage in human exploration of space. There are people who talk about going to Mars. I don't—I think that would be a very unwise decision to make unless we develop far better propulsion systems, far better life support systems. At this point, given what we know, it is simply not worth the dollars. And we ought to recognize that.

We have the Space Station up there. We have to service it, but it looks like we don't even have enough money to do that. And we—and NASA basically, intrinsically, is a science agency. And we have to make sure we have the money to do the science that is important. And I understand that $40 million was cut from that program recently, and I don't know if it is going to be used for the Shuttle or other things, but over the years, NASA's total budget has gone down, but particularly its science budget has had difficulty.

I—that is all preliminary to just asking you, Mr. Administrator, and I am very impressed with you as a person and I am impressed with the work you have done. I am pleased to see you there. But I am interested in your personal vision, how you plan to tackle these problems, first of all, guiding the American public and, therefore, the Congress in decisions we have to make about human space flight, because that is the expensive part. Secondly, what is your long-term vision of the science, how we should handle that, what we are—how we are going to allocate resources to that? So I am getting a bit at what you see, and I don't want you to—I will specifically say that neither I, nor the world, should tie you down to what you say right now, because you may not have had time to think through all of that. But what is your thinking about the process you are going through? And then particularly, in designing the next space vehicle, the last one I was totally—the last attempt, I was totally unimpressed with. I went out to look at the project,

came away with the idea that this was not going to fly. It was a waste of money, and a year later, it ended at, I think a total expenditure, of $1 billion, public and private. We need a thoughtful, careful approach. How do you plan to approach that?

Mr. O'KEEFE. Thank you, Congressman.

I guess the first observation would be at the premise of your commentary, at the very beginning, or preface of it, I should say, is we want to look past *Columbia*. And while that is true in terms of looking at what these larger and broader exploration agenda objectives should be, I must tell you, in all sincerity, I can't look past this accident. There is no way. I can't take my eye off it for one second, because we have got to learn from this, institutionalize that learning, fully understand what the lessons from that are to assure that we lower the probability that this will ever, ever happen again. You can never eliminate the risk, but we sure can do better than we have done. And this is one that I don't want to even forget about that for a second of the day, because it is imperative that what we do today, tomorrow in the near-term must be done as safely as we possibly can, but at the same time, driving towards those larger objectives. So I take your point, but I appreciate your indulgence on the clarification of that issue that I have really got to deal with. It is a responsibility. I think it is something that is absolutely insurmountable. There is no way we can move past that.

In terms of where do we want to be, well, you could put your finger to it right. It is—in the strategic plan that we have developed and the approach we are using now in order to try to lay out what that broader exploration policy objective should entail, we have got to begin with the premise, as you said so, I think, exactly. There are limitations on power generation, propulsion, and human endurance that we must conquer or else we are just dreaming. And so every one of those are the kinds of things that the Congress, this committee has been extremely supportive of. The House demonstrated its commitment on this point, I am impressed to say, at the end of the last—well, prior to the time before the August recess on a contest of exactly this point when the issue was raised on reducing the resources necessary. There had been budgets, part of the President's budget for Project Prometheus, which is specifically designed in order to conquer these limitations on in-space propulsion and power generation. If we don't move past where we are today on chemical propulsion and the basic way we will be doing business with improvements of incremental nature, of course, for the last three to four decades, we are never going to get out from underneath the limitations that are always going to stop us from any exploratory effort that requires you to get there sooner and do it in a way that doesn't require nearly the fraction of mass that today is a—just inhibitor. It stops you cold, because it requires so much volume.

So moving in that direction, we have put in a very aggressive program in that direction. Project Prometheus is funded to the point of being able to demonstrate that technology on future missions, and as a consequence, the support from the Congress has been absolutely unbelievable, very impressive, and we are deeply appreciative to you, to all Members, for exactly that focus.

On the issue of human endurance, I think that is exactly what Station is giving us today is the capacity to understand what it is going to take for folks to survive this experience for extended periods of time. In part, it relates, as you know far better than I by virtue of your scientific background, an understanding of the human capacity in order to sustain through some very unusual conditions relative to what we experience here on Earth. And we can only discover that, really understand those effects, aboard International Space Station. So so much of what we are doing, in terms of the scientific portfolio or the agenda, is driven by, principally, biological and physical research and materials research on International Space Station. That is the liberation that has come from the remap exercise that we engaged in just last year that Dr. David Shirley, a nuclear physicist, and Dr. Ray Silver, a chemist, helped us get to with all of the disciplines necessary represented in order to identify where should those priorities be aboard Station for what the scientific objectives ought to be in order to understand that. And it principally turns on issues of human endurance and the capacity of people to withstand the unusual combination, the amazing combination, that only exists in that microgravity condition of rapid acceleration of cell growth, in some cases, and rapid deceleration in others. We can't explain that. And until we do, that question of broader exploration objectives, et cetera, become something that is inhibitor constantly, in terms of longer term human objectives. So in the end, those three issues. If we can conquer those technology limitations and the capacity of humans to endure, we can do this.

Finally, on your point of exactly where the science priorities ought to be and how do we balance those, today, ⅓ of the overall NASA initiatives are related to space flight objectives for which humans are involved. The other ⅔ focuses on robotic means, a number of different capabilities that, again represented by the strategic plan, are intended to be the stepping stones, the pathfinders, if you will, in order to determine exactly the approach we would use to conquer those three objectives. And so the ultimate vision or objective would be that we are starting with, as we begin this larger exploration policy vetting process that we are into now, is to start with this as a baseline, recognize those three primary limitations on any vision objective that needs to be conquered, redouble our efforts to be sure that we do so, and to again to continue to encourage the Congress to support, as it has been so handsomely demonstrated, that we move ahead with the budget proposals we have already made and that are fully financed in order to conquer those three objectives. That is extremely helpful. That is the direction we are going. And as we refine this particular vision, as manifested in the strategic plan, I think that is going to give us a greater path in that direction.

Chairman BOEHLERT. Thank you very much, Mr. O'Keefe.

The gentleman's time has expired. The Chair recognizes for five minutes, Ms. Lofgren.

Ms. LOFGREN. Thank you, Mr. Chairman. Before I get into my questions, I would like to express my thanks to you, Admiral Gehman, for your hard work and an excellent report and great leadership.

SHUTTLE UPGRADES

I am a fan of the national archives. And on the outside of the national archives, it says, "The past is prologue." And I think it is worth thinking about that phrase. And so I would like to revisit how we got here, and one of the things I think it is important to do is to follow the money. Administrator O'Keefe, if you will recall during our first House—joint House Senate hearing into the *Columbia* accident, I asked you a question about Shuttle safety upgrades. And to refresh your memory, the question was were there any Shuttle safety upgrade proposals, recommendations, or projects presented to you, either as NASA Administrator or in your former capacity at the OMB, that you did not support, and if so, what were they and why did you reach the conclusions that you did? And you said that you could not recall any. Recently, the Committee received a written response for the record that, I think, is misleading. And it states, in part: "Administrator O'Keefe has not rejected any Shuttle upgrade proposal as NASA Administrator or during his tenure at OMB.

The Administration prepared and submitted to Congress in November 2002 an amendment to the fiscal year 2003 budget request to increase the funding for upgrading the Space Shuttle system by approximately $660 million for the fiscal year 2004–2008 time frame." The response goes on to detail several specific safety upgrades that were, in fact, canceled during this Administration, including the electric auxiliary power unit because of "cost growth of technical immaturity," and I am not sure I know what that means. The Administration's position seems to be that safety upgrades will be funded unless they cost too much, in which case, they will be canceled. And I think this is a funny way to run a safety program, since canceling an expensive program does not mitigate risk, it only mitigates cost.

One final issue, I think, of note, this committee, on a bipartisan basis, has been attempting to obtain full budget documentation over the past 10 years for the Shuttle Program and for NASA's safety program. Chairman Boehlert and Mr. Hall have requested in writing from you internal NASA budget request, NASA's request to OMB, and NASA lawyers, I understand, have been claiming deliberative process protection while they are reviewing the documents. I think it is unfortunate that this committee will probably not see any of these documents unless our Chairman is forced to issue subpoenas for them. Mr. O'Keefe, your earlier response to me, on the record, indicated that you have not rejected any Shuttle safety upgrade proposal, either as NASA Administrator or Deputy Director of OMB. I would point out, however, that the CAIB report notes that the Administration's fiscal year 2003 budget request for Shuttle upgrades was a 34 percent cut from the fiscal year 2002 planned level, that is on page 114 of the report. The report fails to note, but it is a fact, that the fiscal year 2002 level also represented a significant cut from the fiscal year 2001 planned level. In other words, by fiscal year 2003, you had made cuts totally hundreds of millions of dollars over five years from the totals approved by your predecessor, Mr. Goldin. When the Bush Administration canceled any hope of the Shuttle replacement when they termi-

nated the X–33 program in 2001, it became obvious that the human space flight program was going to be dependent on the Shuttle for a very long time. At that very point, when the termination lengthened the effective life span, OMB cut the Shuttle upgrades budgets by hundreds of millions of dollar over the next five years.

So I have four questions. First, do you dispute these figures showing significant cuts in the Shuttle upgrades program while you were at OMB and at NASA? Number two, why did you make these cuts? Number three, the Committee's leadership, on a bipartisan basis, has asked you in writing for copies of budget documents that would give this committee an assessment of how Shuttle safety budgets have been created by NASA, OMB, and Congress over the past 10 years. This is not a partisan request. And in fact, most of the time period covered is in the Clinton years. You have, so far, not provided us with these documents. Will you commit to us today that these documents will be provided so the Committee, on a bipartisan basis, can perform its constitutional oversight function? And finally, I find it disturbing that, as I understand it, $40 million has been shifted from centers who are doing basic science research, and my question is when will that money be returned to the centers?

Thank you.

Chairman BOEHLERT. The gentlelady exhausted four minutes and 53 seconds with that question. And we will give the Administrator, because of the importance of the question, some ample time to respond to that.

Mr. O'KEEFE. We have not, to my knowledge, nor of anything I have seen presented, reduced the specific upgrade requested. Indeed, if anything, as part of the amendment to the President's budget last November, attempted to, as part of the Service Life Extension Program, inventory all of the upgrades that may be candidates in approaches to taking improvements to the Shuttle Program in an organized way and a more comprehensive way as we go through this and have funded it as such.

The second question was why the cuts. I don't know that we did. And again, I am—prepare to be corrected in that view when I go back and take a look at the side-by-side comparisons you have so thoughtfully offered here of what is involved. I have been looking at page 114, and I guess it doesn't jump out at me right away, of where this is. Today, the Shuttle upgrade budget is, by what has been documented in the report, a $347 million, which relative to what it was just at the end of the last decade, was 175, so that is still near doubling of that across the way. So—but let me get you a more precise answer to that, but I am looking at the same graphic, and I see that we have been increasing in that regard. Is—there—to my knowledge, there has—and again, I emphasize——

Ms. LOFGREN. It is the third paragraph on the second side.

Mr. O'KEEFE. Okay. Third paragraph on the second side. "Responding to NASA's concern, the Shuttle required safety related upgrades, the President proposed NASA's budget for '01 proposing safety upgrades initiative. This initiative had a short life span." Is that the paragraph?

Ms. LOFGREN. No, "A year later, the fiscal year 2003 request contained a plan to spend 1.220 billion, a 34 percent reduction.

OMB PASSBACKS

Mr. O'KEEFE. I see. Okay. Excuse me. "A year later, the fiscal year 2003 request contained a plan to spend—a 34 percent reduction." Let me go back and see what the exact comparison is there, because again, as part of the '03 budget, if you recall the President's budget included a specific entry to corral up all of this into the Service Life Extension Program to then organize and prioritize those specific upgrades that would be required to increase the Shuttle safety as well as improve its service life performance over the time of that. And to the extent that we have got a disconnect here, let me reconcile that, and I will go back and dig into the numbers and see where we are.

Yes. The third question you asked is the Committee request for information. I apologize. I thought, Mr. Chairman, that—and to Mr. Hall or Mr. Gordon, that there was a specific understanding with the Office of Management of Budget, I am advised, in which they are prepared to walk through all of that with members of staff, with Members, whatever, that may go through that entire accounting in the last decade. That is where I left this a couple of—a few months ago, and I thought that had been done. I will go back and assure that that is the case, but my last discussion with the OMB General Counsel was a more than willingness to engage in that discussion——

Chairman BOEHLERT. They have not yet indicated that more than willingness attitude toward us, and we will look forward to hearing from them.

Mr. O'KEEFE. I will fix that. As soon as I leave this hearing, I will make—the next call will be to our friends over there who have assured us on several occasions that they are prepared to sit down with staff and Members at any time to walk through what those comparative differences were over the course of the last decade of various agency submissions to the Office of Management and Budgets——

Chairman BOEHLERT. We will be real receptive to that message from OMB. And I would like to ask Admiral Gehman if he would care to comment on this general thrust of the questioning.

Admiral GEHMAN. The Board attempted to document as best as we could the fact that the Shuttle upgrade program has been underfunded for decades. And our point was not to point blame at either the White House or the Congress or at OMB or at NASA but to document the point that the reason why the Shuttle upgrade program is continuously underfunded is because of a lack of an agreement of how long the Shuttle is going to serve us. And therefore, no one can agree how to amortize billions of dollars of upgrades, whether we have to amortize them over five years or 25 years, because nobody knows how long the Shuttle is going to last. So that is what our point was.

Chairman BOEHLERT. Thank you very much. The gentlelady's time has expired.

Dr. Gingrey.

Ms. LOFGREN. Could—Mr. Chairman, I don't want to belabor this. There was one more question, and maybe I can get that in writing from the Administrator, the fourth question.

Chairman BOEHLERT. By all means. You can submit it in writing, and the response will be in writing.

Dr. Gingrey.

INDEPENDENT TECHNICAL ENGINEERING AUTHORITY

Mr. GINGREY. Thank you, Mr. Chairman. I will try to shorten this up a little bit for you. My colleague on this side of the room, the gentleman from Florida, Mr. Feeney, earlier commented that his advice to some of his clients, he is an attorney, is the only way to totally eliminate risk is, of course, don't get out of bed in the morning. And as a physician, when I took the Hippocratic Oath many years ago, I remember most vividly the admonishment in the first place, do no harm. And I think really this whole discussion, this whole hearing, the whole issue is about balancing achievements in the program and safety and not putting anyone at unnecessary risk. And I don't think we can overstate that or overemphasize that. I would like to ask Admiral Gehman to comment on this. It does seem to me that in the report, and in the hearing, and the questions, and—that the concern is that a great deal or too much complacency developed within NASA and not enough attention was directed to the unscientific Murphy's Law. And I would like for you to comment on that, Admiral Gehman.

And more specifically, Administrator—Mr. O'Keefe, the *Columbia* Accident Investigation Board apparently believes in the past the Shuttle Program had too much unchecked authority to write itself waivers. And in fact, some 2,000 were written for the *Columbia* flight. Yet it now appears that NASA plans to have the Shuttle Program review its own waivers before returning to flight. My question to you is shouldn't NASA wait to conduct this important job until it puts in place the Independent Technical Engineering Authority, or some other oversight authority, other than the internal?

Admiral GEHMAN. Yes, sir. The—you have hit on probably the building block or the fundamental finding of the Board, and that is that over the years, due to forces on NASA, some forces internal, some forces external, but nevertheless due to forces that acted on the Shuttle Program over a decade or more, the investments that were made were made to increase the chances of meeting the schedule. And other things, such as basic research and development, basic engineering, basic studies into aging aircraft, attempts to fund, for example, engineering efforts to reduce the number of waivers the Shuttle was flying with rather than just keep adding, all of those kind of overhead kind of programs were left unfunded. In other words, it is kind of the cost of doing business. And that is alarming to the Board and, we believe, contributory. And it is part of the cost of doing business in human space flight, and you have just got to pay those costs. And we think that we need to reverse that trend. Complacency is the word you used. That is not the word we would have chosen to use, but it clearly was a—it was a trend toward spending money on those kinds of things, which assured—increased the assurance that you could meet the schedule

at the expense of the underlying engineering and research that needed to be done to assure safety.

Mr. O'KEEFE. Congressman, thank you for your very thoughtful question on both the waivers and the independent technical authority. This is a really important set of issues. The waivers—I think, given the background that I come from, which again is more of a national security Defense Department kind of approach to what a requirement means, is more like what most people think the definition of requirement is. You ought to be required to do it. I have come to find at NASA that requirements mean goals, objectives. It is much like the processes and procedures that we use for a variety of different activities.

I think what has come out of this report is a real, you know, scales falling from my eyes kind of event, that I have found, is that our procedures, the way we define things, what we do, the process that we engage in is a lot like the stop lights in Naples, Italy. They are all advisory. Follow them if you like; don't follow if you don't. And that is something that has got to stop. Our definition of what a requirement is can't be just this goal that we put out there and say, "We would like to achieve that some day. And maybe we will and maybe we won't." It has got to be something we require that we do. And to the extent that there is a deviation from that requirement, we have got to have a clear justification to that. And again, that is one of the really important things that I think Congressman Feeney brought out in his commentary.

There is a discipline in the way that, for example, the naval reactors community conducts this where there is a clear understanding of why something doesn't comport with precisely the requirements and what you are going to do to go fix it and how you deal with that. And that is the same ethos we have to adopt. We have got to get out of the mood of saying we have goals and objectives, but we can achieve some of them and not all of them on each and every flight. So we have got to go back and revise that. And that is—so in that context, I think that is more what we are talking about by doing a close-order drill examination of these waiver procedures now, as opposed to later, because it really cuts at the mindset we use here. We have got to reverse that to mean something that, again, I think is replete in this report. Prove to me it is safe. Don't put the burden of proof on folks to show that it is not safe. You have got to go to the other way to demonstrate that overabundance of caution.

It cuts to the second point, I think very perceptively, that you raised, which is you really can't afford to pass or take your time figuring out how to do an important function that they have identified in the recommendations here, which is to sever the specification and control of those specifications, the configuration control, if you will, of what the orbiter looks like and what all its moving parts entail from the cost and schedule pressures. That is a very profound commentary about the organization of the way we manage ourselves as well as the procedures that we put in place that we sometimes kind of follow. And that is an important distinction is to say that there is—we have got to look at options soon rather than later, in my judgment, to sever those functions of the engineering specification configuration control independence from the

cost and schedule functions. I think that is something that not only pertains to the Shuttle Program, it pertains to everything we do, every program we are involved in.

If you have got the folks with the schedule, costs, and the engineering specification pressure all in the same room, then tradeoffs are going to get made that will always be to the deference of the immediacy of today's problem. The closest dog to the sled will always be what gets the attention rather than the kind of configuration control integrity that the Board refers to and, again, is more reminiscent of the organizational background I come out of within a Defense establishment that really always has held that as a set of principles.

So inasmuch as that recommendation, which encompasses many, many things as it pertains to independent technical authority doesn't necessarily need to be done by one monolithic organization or institution. It can—those individual functions can be divided into different organizational efforts. But the paramount principle that I read that is really quite profound in my mind is there has to be a severability between the independence of the engineering function and the configuration control folks who really maintain the waiver authority, if you will, from those who are driven by the cost and schedule and daily operational pressures that we all live with all of the time.

Chairman BOEHLERT. Admiral Gehman, would you care to comment on that?

Admiral GEHMAN. No, sir. He has got it right. The basic building block, basic finding of this Board is that the morphing of the Shuttle Program over many, many years to wring out of it the most cost-effective, most efficient kind of an organizational structure was done so at the cost of basic engineering and safety.

Chairman BOEHLERT. Should NASA wait until an independent authority is set up to review the waivers, or should there be some temporary system put in place? I mean, there are 3,000 or so waivers.

Admiral GEHMAN. Right.

Chairman BOEHLERT. Some of them are more—1,000 of them are more than a decade old.

Admiral GEHMAN. The Board wrote in its report our attempt to answer that question, and that is that we are confident that the zeal and the diligence and the vigilance that are associated with the first half a dozen launches after this tragedy will be so intense that they will leave no stone unturned, but that like all big bureaucracies, over the years, they will migrate back into bad habits. And it is that migration back into bad habits is what our organizational changes are designed to do. So we think that—we don't have—we have no reason to believe that they can't review all of those waivers and get it right for the first couple flights.

Mr. O'KEEFE. Mr. Chairman, if I could real quick, because this is a very important point. And it is a difference in the way the Board has taken this on in terms of the—how expedient we need to be about making decisions about this. They have set it aside, I think, very thoughtfully as get a detailed plan together before you return to flight on how you do this. I don't think we can afford that. I think the approach we have got to come to closure on sooner

rather than later because for the same reasons I think Admiral Gehman and your commentary exchange just reveals, over the course of time, the urgency starts to drift off. The urgency is now. People are really focused on this. Everybody's attention is had. So as a consequence, making this kind of organizational change, I think, is something that we do it sooner rather than later and make a determination on how to do that we are better off than saying let us study the plan as we go down the road.

Chairman BOEHLERT. Well, how long is it going to take to do a proper review of the waivers?

Mr. O'KEEFE. Again, I think the first step is if you do the major step that the Board recommended, which is to have a severability between specification and configuration control from cost and schedule program management, then it will really mushroom from there. I think it will really snowball in its effect of how fast you can do it, particularly if you take another observation elsewhere in the report that says that the design, the drawings of the Shuttle itself are in lots of different places. I mean, the original drawings are in one place. The engineering notices were somewhere else. The engineering changes were in another location. So just the act of pulling all of those together then is going to have the effect, in this new independent technical authority, wherever it is assigned and whatever option we choose, is then going to grant a level of ownership, I think, to the engineering team that says, "Now I know exactly where all of these pieces are. I have got to put it on some kind of computer aided design system. I can look at it 3–D, and I have got all of the updates of the engineering notices," and that is the equivalency of starting down this road seriously to examine why waivers ought to be granted, if at all, in any of those individual categories.

Chairman BOEHLERT. Thank you very much.

Mr. Matheson.

Mr. O'KEEFE. Thank you very much, Mr. Chairman. I appreciate your indulgence on that.

Mr. MATHESON. Thank you, Mr. Chairman.

STAFFORD/COVEY

Mr. O'Keefe and Admiral Gehman, welcome to the Committee. I have a question for Mr. O'Keefe. As I understand it, many of the Gehman recommendations are meant to be implemented in a one to five-year time frame. And as I also understand it, the Stafford/Covey return-to-flight panel, which you have created, is expected to function for about eight months. And I am wondering what mechanism you would recommend to oversee the longer term, the one to five-year Gehman recommendations. There seems to me—I will just throw out three options before you answer. And that is should the Aerospace Safety Advisory Panel assume the function or should Admiral Gehman be called back every year for the next five years or should a new group be created? Or how do you think we ought to handle that longer time frame?

Mr. O'KEEFE. Well, thank you. I appreciate the question.

The first step, again, in this very immediate near-term, is we have assembled a group led by General Tom Stafford, a former *Gemini* and *Apollo* astronaut, and Dick Covey, who is the pilot on

the return-to-flight post-*Challenger* in the September of '88 effort. And they have, along with 25 other colleagues representing lots of different disciplines of engineering, technical management change, organization culture change, academics, industry types, you name it, are on that particular team to oversee, over the next two years they have been chartered to do, the functions that we will be doing in order to implement these recommendations. The intensity of their focus, of course, will be between now and return-to-flight. And Admiral Gehman has got it right. We are going to be all over this like a bad habit, I am sure, for the next few flights, but again, institutional change is what is absolutely imperative that we do over time.

So in that regard, what we are looking to, again, as the invitation, I think, the Chairman has issued for Admiral Gehman and his colleagues to come back in a year and take a snapshot picture of where we are, we would welcome that and look forward to the opportunity to try to see where that progress ought to go. The report of the Appropriations Committee just the other day is now recommending that the Aerospace Safety Advisory Panel be revised to more akin to what was intended when the Congress enacted this capacity in the post-*Apollo* fire period, 1968, that we go back to its roots and think about using that organization or that entity as a means to do it as reconstituted and with a new set of fresh eyes to it. So we are going to take that seriously, and that is an interesting suggestion, and I think Admiral Gehman has opined about that in this committee as well a week ago. So all of those, when combined, I think is going to provide, in addition to the extensive thorough oversight already provided by the Science Committee here as well as the Commerce Committee on the other side and the Appropriations Committee a continuing diligence that we will adhere to.

Mr. MATHESON. Let me go to a different question. A separate issue. The Gehman report included a section on a possible rescue mission for the *Columbia*, leaving an impression that a rescue might have worked. What have you and others at NASA concluded about whether either a repair effort or a rescue mission involving another orbiter may have succeeded?

Mr. O'KEEFE. I think the learned judgment on the part of all who participated in the exercise led by the Flight Director on the 107 mission, as a matter of fact, who organized it and responded to the Board's findings, and I prepare to be corrected by Admiral Gehman in terms of how that went down, conclude that it could have been done. It is possible, but it would have been very difficult. But that would, under no circumstances, have prevented us from doing so. I think anything it would have taken, and had we really focused and been able to concentrate on all of the facts, had we been more diligent, whatever, in order to understand all of the issues that were pertaining here, would have done anything and everything to have saved those folks. And I don't think there would have been anything spared in the process of doing it, even if it was a long shot.

Admiral GEHMAN. May I follow up on that?

Mr. MATHESON. Yes. Please do.

Admiral GEHMAN. Just briefly, because I know time is of the essence here, we were really trying to dispel myths. There were myths going around that foam can't hurt shuttles. There were foam—there were myths going around that we couldn't have done anything anyway. There were all kinds of myths going around, and we felt it necessary to start blowing holes in those myths. And whether or not this rescue mission was plausible or not, it is extraordinarily risky, as Mr. O'Keefe said. A whole lot of ifs had to end up. But our real point was to start putting myths in their proper place.

Mr. MATHESON. Thank you, Mr. Chairman.

Chairman BOEHLERT. We add to that list of myths that we all acknowledge the adherence to environmental laws somehow contributed to the accident. Thank you very much.

The Chair now recognizes Mr. Gutknecht.

Mr. GUTKNECHT. Well, thank you, Mr. Chairman.

ATTITUDE/CULTURE

This has been a very interesting hearing, and I want to thank everybody here. Many of the questions that I would have asked have already been asked, but I want to acknowledge Kathy Sawyer from the *Washington Post.* And I don't know if you guys have seen this, and all of us have a difficult time wading through all of these reports. But it really, for Members who haven't read it, it is probably the best chronology. It appeared in the August 24 issue of the *Washington Post.* And I just want to give her credit. And as I read it, it was interesting to me that the night before I read this, there was a documentary, and I am not even sure which channel it was on, about *Apollo 13.* And I was just struck, especially as I read this, how far we had drifted from the days of Gene Kranz and "Failure Is Not an Option." And I happen to believe that one of the most important words in the English vocabulary is the word "attitude."

And as I read this, and particularly the story—the thing that is the most haunting to me is the story of the engineers requesting the images. And then as it is well documented in your report, Admiral, there were numerous missed opportunities. And I am just curious, I mean—and for the Members who don't understand and maybe haven't followed this as closely, I mean, there were a number of requests, beginning on January 21 from—as the *Washington Post* says a large group of Houston engineers responsible for troubleshooting, they asked—wanted to make a formal request to get some images from our spy satellites, which may or may not have proven anything. We don't know that. We will never know. But the truth of the matter is, we might have known very early on that there was a serious problem, and perhaps a hole, in that wing. And let me just—for the Members, let me just read what it—what the article says. And I think the article is actually fairly generous. It goes on to say, "As *Columbia* orbited, Manager Ham heard in phone chat that there had been a request for imagery and spent most of the day trying to track down its source."

Admiral, wouldn't it be fair to say that what really happened was she tried to quell that discussion?

Admiral GEHMAN. We—I believe that our report did a really fine job of pinning that down quite well. And our conclusion was that

because they had a preconceived idea, an unshakable, deeply held, preconceived idea that foam couldn't hurt the orbiter, management considered that these requests for imagery were stray voltage and that she wanted to know where it was coming from. It wasn't that she was trying to quell it; she was trying to figure out where it was coming from, and it was—she was—there was noise in the background, but she couldn't pin it down. Now that action about trying to pin down where it was coming from could be construed as intimidating. It certainly could be construed, but we didn't demonstrate—we didn't prove that.

Mr. GUTKNECHT. Well, Admiral, with all due respect, no, you didn't prove that. Nobody can prove anything today, but it seems to me your report is actually pretty damning on that front. And I guess the real bottom line—and the question really is for you, Admiral. How do you change attitudes? Because it just reads to me like—and I think Mr. O'Keefe even said, you know, that this has become bureaucratized, and it is a job. We still use the word "mission", but it is much more of a job, it seems to me, the way I read this. And how do you get back to that sense of failure is not an option?

Admiral GEHMAN. Yes, sir. Well, it is very difficult. And the Board spent many hours trying to answer that question and to make sure that our recommendations were couched in terms that would hit that problem directly on the—directly. And what we felt was that counting on really good people to be able to overcome organizational difficulties or mal-organized systems is a very poor way to do that. It would be better to fix the organization. To bet that you can have heroic, brilliant, fantastic people at every single position and that they can overcome organizational difficulties is a bad bet and that we need to change the organization and not pick on the people. That is one thing.

The second thing is it this much more difficult issue of, you called it attitudes, we call it cultures. And that can only be fixed by leadership. It can't be fixed by—you can't organize yourself out of cultural problems was our view. But not—and not just leadership at the Administrator level. He is going to have to have layers and layers of leadership below him buy into this belief.

Mr. GUTKNECHT. But Admiral, but if I could just ask you to kind of go through this, why do you think that the request from Mr. Page and Mr. Rocha and the others never got above a certain level?

Admiral GEHMAN. Mr. Chairman, I am going to have to take a minute to answer this question, if that is all right.

Chairman BOEHLERT. Proceed.

Admiral GEHMAN. That is a—it is complex, but I believe that the answer to your question that there are two answers to your question. The first answer is all of those management people really did believe the commonly held knowledge that foam can't hurt the orbiter, and therefore, all of this e-mailing and all of these questions about photography and things like that were distractions, not relevant, waste of time, not well proved out. The second—which is erroneous, of course. It is wrong, but they—it was so widely held. And I believe that we have tons and tons of documented evidence in here to prove our points.

The second answer to your question is a little more disturbing. We have, in our report, suggestions that because—I have got to be careful here, because I want to make sure I say what is in the report and not go beyond it. The flight schedule for the next 16 months included 10 flights. That is not possible. It is not physically possible to launch 10 in 16 months. I believe that the mangers were aware of that tight schedule. And they were being careful not to allow administrative impediments. By "administrative impediments," what I mean was hazard reports or in-flight anomalies to rise up, which would delay a flight readiness review. I believe these managers knew the future schedule and therefore, anybody who was bringing up problems was bringing up issues, which were going to have to be resolved at higher levels and would slow down the launch process.

I believe the tight schedule was in the back of their minds. We elude to that in our report, but once again, can't prove it. So you have this deeply held basic understanding, wrong, and it is coloring the decisions.

I am sorry for the long explanation.

Chairman BOEHLERT. Thank you. And that was very—it was a comprehensive response, and it was illuminating. Thank you.

Mr. O'KEEFE. Mr. Chairman, would you mind if I comment very briefly?

Chairman BOEHLERT. Mr. O'Keefe.

Mr. O'KEEFE. Thank you, sir. I am guided by what the report says that program managers may have begun to be influenced by these schedule pressures. A lot of qualifiers in that. That tells me we have got to strike that balance between schedule and safety objectives and be sure we are diligent about it all of the time. And we have got to build in institutionally the forces that create those checks and balances. And one of the ways to do it, I think that you have touched on it very eloquently at the very beginning of your commentary, was to reach back into that ethos that everybody relates to in this agency. Gene Kranz manifested.

I have been reading more of the historical, you know, biographies of so many of these folks in the last few months than I ever imagined or anticipated I would. I just did finish Kranz's "Failure Is Not an Option." And what I found impressive is the guy must have spent a ferocious amount of time every single day just writing up procedures, because he describes how in every incident he went back and rewrote the rules and the procedures. And that is true. We have got to continue to do that, and we have got to be more diligent about it. But then, the really important that I think comes out of this report is then follow them. Really mean them. Don't write them down just as an advisory thought. There are so many different procedures that we have in place that this report very clearly says, "If you look at this just kind of clinically, should be just great to fireproof any of the process." And then you find that we conveniently follow some, not others, interpret it differently. It kind of takes on this informal process of how it goes on.

And the thing that comes out of Kranz's book that I found to be very impressive is write the procedures and then follow them like you mean them or amend them, abolish them, or rewrite what is there, but mean what you have got in place until demonstrated

otherwise. Had that been the case in this instance, the natural instinct on the part of engineers, flight directors, flight controllers, all of these folks, would have been more akin to the ethos he came from, which is I don't know the answer to this question. People are assuming they know the answer. Let us go prove it as fact or not. And that is what we want to reinstall as a mindset, and that begins with this set of challenges, I think, as a culture matter of saying write the procedures and then really follow them like you mean them or change them.

Mr. GUTKNECHT. Thank you.

Chairman BOEHLERT. Admiral Gehman, did you—okay, fine.

Mr. O'KEEFE. Thank you, Congressman.

Chairman BOEHLERT. All right. The Chair is tempted to come in, because you raised a number of questions about scheduling, but I am going to finish the first round before we go to the second round, and I am not going to take advantage of this position indifference to my colleagues.

Mr. Bell.

Mr. BELL. Thank you, Mr. Chairman, and Mr. O'Keefe, Admiral Gehman. Thank you for being here again. Thank you for your testimony.

OSP AND ISS

Mr. O'Keefe, I would agree with you that I think we face a very unique and wonderful window of opportunity. I do believe the focus is on the space program like we haven't seen in recent memory, and it is our duty now to take advantage of it. And nobody wants to see manned space flight continue any more than me. And I think many of my colleagues on this committee share that belief. But I think, also, in the wake of the tragedy that we witnessed last February and in wake of the CAIB report that we have all read that we have to do so—or go forward with a new sense of purpose and not just sign on to projects and get behind projects because, well, NASA says that is the next step so it must be a good idea.

We really have to look at what we are trying to accomplish. And of course, in saying that, I am talking about the orbital space plane, because from what I have read and heard, you have taken Admiral Gehman's recommendation that the Shuttle should be replaced as the "Clarion call" for accelerating development of the OSP. Is that a fair statement? Am I reading the reports correctly?

Mr. O'KEEFE. It certainly is an option, and it is one that clearly is observed in the course of the *Columbia* Accident Investigation Board report as a requirement in order to provide crew transfer vehicle reliability, if you will, between and to International Space Station.

Mr. BELL. And that——

Mr. O'KEEFE. Accelerating it is going to be a challenging statement. There is no doubt about it.

Mr. BELL. And that is what I would like to talk to you about just a little bit today. And let me provide a scenario for you and see if you could respond to it. And if it is confusing, I would be glad to repeat it. But if we maintain the International Space Station until the year 2020 and move toward a full station complement of six to seven crew members, and there is no OSP, under those cir-

cumstances, what would you estimate—or how many Shuttle flights would you estimate would be needed to service the International Space Station until 2020?

Mr. O'KEEFE. I don't know. Let me—off the top of my head, I don't know. Let me get it for you for the record, though. I just don't recall off the top of my head.

Mr. BELL. Okay. Well, let me just share what staff has learned and informed us of is that it is somewhere between 60 to 80 flights would be needed, Shuttle flights if that—under that scenario. Does that strike you as unreasonable?

Mr. O'KEEFE. I have no basis to think that it is or it isn't.

Mr. BELL. Okay.

Mr. O'KEEFE. I don't know.

Mr. BELL. And if you look at a different scenario, a little different angle, let us say you have an orbital space plane in 2010, how many Shuttle flights would be needed to service the Station until 2020? Under that scenario, do you have any idea?

Mr. O'KEEFE. I don't know. I just—again, I would be guessing, and it would certainly—among the things it would be, it would certainly be wrong.

Mr. BELL. Well, it surprised me, too, Mr. O'Keefe, because staff informs that what they have been told by folks who do know is that you would still need 60 to 80 Shuttle flights, even with the OSP having been developed. So if we are looking toward a replacement vehicle, and if those numbers are accurate, how does the OSP actually replace the Shuttle? What is that sense of purpose?

Mr. O'KEEFE. It supplements the capacity of a cargo-carrying asset, like Shuttle, what it is, because what we have designed the requirements to do is two—at least two primary things. The first one is to perform crew transfer vehicle function from the Earth's surface to the International Space Station on a regular routine basis that is a lot less constricted by the roll out time and—necessary for Shuttle. That takes 30 to 45 days. You have got to do something that is a lot more on-demand, if you will, than that.

The second thing it has to have is an expansion of the launch window. There is currently no real, robust, on-board propulsion capacity on the Shuttle to permit a launch on almost any window. You have got to hit that ten-minute parameter during the course of a day or else you might as well forget it for the day, because that—unless you hit that exact orbital maneuver, you are never going to rendezvous with the International Space Station. So it has got to have some on-orbit maneuvering capacity to do so.

Mr. BELL. But even with that, wouldn't you still—the point is, wouldn't you still need the Shuttle until 2020 for the transport of certain supplies and to service a six or seven-member crew?

Mr. O'KEEFE. For cargo capacity, yes, indeed. It is a—it is the work horse asset that will provide that capability and could, either autonomously or with individuals on-board, astronauts on-board. So there are a lot of ways to look at it. And there may be other approaches we could use in looking at cargo-carrying assets. But at least it isolates the question to that. And once you complete International Space Station, the next objective, then, is how do you get the down mass necessary for the science yield that comes off of it, and that doesn't require nearly as much mass as what the Shuttle

can provide. So in sum, the objective behind the orbital space planes is to provide the crew rescue capacity, crew transfer vehicle capacity on a near, on-demand—near, you know—no notice launch capacity as well as the ability to provide that capability using modern technology that may inform what the next evolving generation of capability will be thereafter.

Mr. BELL. And are you—are we married to the idea of developing the OSP, or are you willing to look at other options as we move forward?

Mr. O'KEEFE. We are headed down the road here, in the course of the last year, I think at the instruction of lots of external commentary, to get more precise about what it is we want to build. While we don't—you know, by no means do I have a closed mind on this. We are marching down the road towards trying to develop a crew transfer capability as well as the crew rescue requirements that will go along with that. And that is the primary requirement. And if we grow it beyond that to include a cargo asset, we get back in the same kind of design predicament that they were in 25 years ago when they settled on Shuttle and compromised on every one of those requirements by saying we will do all of them kind of mediocre but none of them in an exemplary manner. And that is what we don't want to get into. We would rather have a more limited asset that performs, in an exemplary manner, one or two of those requirements and then keep moving our way through this in order to assure that we not try to pile everything into one asset.

Chairman BOEHLERT. The gentleman's time has expired.

Admiral Gehman, did you have a point that you wish to make?

Admiral GEHMAN. Well, I just will point out what the report said, sir, and that is that we suggest that the process that ought to be followed by the Government of the United States is, first of all, determine what you want to do. Don't design the vehicle. Agree on what you want to do. And what we suggest that concept is that you should separate the crew from the cargo. And if you do separate the crew from the cargo, is develop the requirements—the numbers come out for the same number of Shuttle flights because of the up mass.

But if you put the cargo in a different category, you wouldn't—then you would not need the Shuttle. But if you—as long as you have the up mass requirement and you don't have any other way to get the cargo up there, you have got to keep flying the Shuttle. So we suggest decide on what you want to do. Don't design the vehicle. Decide on what you want the vehicle to do. And what we suggest the answer to that riddle is separate the crew from the cargo, design a vehicle optimized for crew, and some way other—some other way to get the cargo up there.

Chairman BOEHLERT. Thank you very much. The gentleman's time has expired, but Mr. O'Keefe, I need some clarification here, because I think you have added a new dimension to the issue. In response to Mr. Bell's question, you can send the Shuttle up autonomously, I think that was your word, or with people. You mean you can send the Shuttle up without people?

Mr. O'KEEFE. Under its present configuration, you can't, but there is—it is not a leap, and it is not a technology impossibility to design the appropriate technology into the Shuttle. It is not

going to be a major leap to make it an autonomous capacity to launch it unmanned. Yes. It is conceivable. It is one of the options we are looking at as part of the Service Life Extension Program effort that was introduced last November. Is it the optimum one? Don't know yet, but it certainly is possible. It can be done. It is operationally not, you know, prohibited by——

Chairman BOEHLERT. Well, let me suggest, the Gehman Commission Board got it exactly right. You have got to decide what you want to do, then you design the vehicle.

Mr. O'KEEFE. Oh, yes, sir. No. No.

Chairman BOEHLERT. Okay.

Mr. O'KEEFE. And we are in the same pew. I mean, there is no doubt about it. I think exactly the discussion with Mr. Bell was what we decided is we want to have a crew transfer vehicle. We want to have the capacity to separate people from cargo, just exactly what the Board said. And we were down that road as part of our integrated space transportation plan before. One of the options to continue to service the cargo requirement is to continue to use Shuttle either autonomously or with humans. And there are any number of different ways that you can accomplish that task for cargo as a separate derivative question. But the first milestone was, as Admiral Gehman just articulated, the Board—and the report says to separate the crew from the cargo. Make the determination. What do you want to do? We have done that.

That is what OSP is designed to do. And it is intended to be a crew transfer vehicle and a crew rescue capacity for people. Cargo assets is a separate question. And we will have to work through that as we go on. But we have designed the level one requirements, frankly, on a single sheet of paper to comply with a very limited number of requirements so that it is technologically doable.

Chairman BOEHLERT. Thank you.

Mr. Weldon.

Mr. O'KEEFE. Thank you.

Mr. WELDON. The Russian or Soviet side was Igor Kurchatov, and the two of them in the end of their lives, before they passed, both said the same thing, and I had the privilege of talking to Dr. Teller earlier this year, that they only had one regret, that in the end, that all of their work in physics was not originally designed to kill people, but rather, for the peaceful use of nuclear energy for science. And in fact, we are considering legislation right now, as a part of our defense bill, to create the Teller-Kurchatov Alliance for Peace, which would do exactly that.

So, I think it is appropriate that on this committee, we acknowledge one of America's great leaders who did so much for our freedom. The passing of Dr. Edward Teller. Mr. Chairman, I thank you for this hearing. I want to start by thanking both of our distinguished colleagues for their work. Admiral Gehman, as you have done throughout your career, and I have seen you many times on the DOD side, you have performed in an unbelievably outstanding fashion, and we appreciate that. Many of the questions have been asked. Administrator O'Keefe, I want to tell you I admire the work that you have been doing, and I think you are an outstanding leader under some very difficult, if not impossible conditions.

I want to acknowledge first of all not just the purpose of this hearing, but your personal effort to restore the rotocraft research effort within NASA. That is an issue that I have been raising all throughout this year, both in this committee and the Defense Committee. You personally have taken it on within NASA, and I want to acknowledge the success that you have achieved, although it is early, and let you know that we appreciate that work among all of your other tasks and responsibilities and assignments.

ASAP

I only had two questions that I would either ask you for the record or to respond to, one you alluded to earlier while I was here, and both of these involve actions on the part of the other body, the Senate. One relates to the Aerospace Safety Advisory Panel and the recommendations of the Senate, as opposed to some of the calls by our colleagues for some new, independent entity, and what your feeling would be toward the Senate's proposal that we reconfigure that original advisory panel and perhaps reconstitute it as a way to have the kind of short and long-term monitoring that is no necessary, as defined by the report done by the Admiral. And the second is what is going to be the impact of the $200 million proposed cut by the Senate appropriators on the human space flight program, so that we in the House can respond to our Senate counterparts on both of those issues.

I would ask you to respond either right now or for the record to this committee, thank you.

Mr. O'KEEFE. Well, thank you, Congressman, for your very thoughtful observations, and again, I appreciate your commentary on the rotocraft effort. We have, indeed, attempted to work that very hard, and I appreciate your recognition of it. On the two issues you have raised, the Aerospace Safety Advisory Panel, again I was intrigued to read the Committee report on that matter, that we ought to go back and look at the original charter and objective that was enacted in statute. The post-*Apollo* fire in 1968, by then, the sponsor of the legislation was then Congressman Don Rumsfeld from Illinois, and the proposition was to create this particular panel for the purpose of really having a constant, vigilant oversight, and therefore, shouldn't we go back to its origins and reconstitute it for that purpose, and that is a very compelling argument, one that I am really pretty struck by, because the Congress enacted that for a reason. We ought to make it perform the way it is supposed to, and clearly, the performance has been not as diligent as we could have received, and I think the observation by the Board is even if it were, we wouldn't have the disposition to follow it, so we have got to cover both ends of this particular equation.

The second part is—and I think that is far preferable to creating yet another oversight function. When the reviewers outnumber the doers, we are in big trouble. And we are kind of at the point where it is a foot race, right now, and so we are trying to, you know, maintain absolutely all the appropriate oversight necessary, but let us invigorate the ones that are there, to assure we get the right performance.

EFFECTS OF THE PROPOSED $200 MILLION CUT TO HUMAN SPACE FLIGHT

On the $200 million cut to space flight, I just did see that the other day, and I can assure you that now is a time that is going to be incredibly difficult to accommodate something like that. This—the return-to-flight activity is going to cost something. It is going to be greater than zero. I don't know exactly what yet until after we make the selection of the options on all 29 recommendations and then make a determination of how much that is going to cost. So surely, it is going to be greater than what we have already budgeted. I don't think it is going to be a show stopper, there is nothing I have seen that looks like—just eyeballing it, it is going to be ghastly expensive along the way, but it sure is going to be more difficult if we are starting out in a hole that is $200 million deeper. And so as a consequence, this is an opportunity, I think, to follow through on the report's recommendation, too, that Congress be a partner in this particular equation in helping to kind of set the baseline for this, and the President's budget is a baseline we think is properly priced for the International Space Station and for Shuttle to continue operations, and we would appreciate your support for that, and I thank you, Mr. Weldon, for your observations.

Chairman BOEHLERT. Thank you very much. Mr. Miller.

POLITICAL APPOINTEES AND BONUSES

Mr. MILLER. Thank you, Mr. Chairman. Mr. O'Keefe, you have spoken of the changes in leadership since the *Columbia* disaster, and I am very pleased we haven't really spent a lot of time, because I think, as Admiral Gehman points out, the career NASA employees were under a great deal of pressure. I think Admiral Gehman mentioned or spoke of pressures, internal and external pressures, which I am sure translated, for those employees, as irreconcilable pressures from above and from below. But I am very concerned about the kind of forces on NASA that was being exerted from the top levels. By all accounts, or evidently, at least before this *Columbia* disaster, you were very pleased with the performance of the political appointees in the Administration. The year before the *Columbia* disaster, 11 of the 11 political appointees in NASA got performance bonuses. NAS was the only agency in the Federal Government in which every political appointee got a performance budget. In fact, there has been a great deal of criticism for using those bonuses for political appointees at all, because they are intended to retain, reward and retain career Federal Government employees. And this is pretty remarkable for that level of satisfaction with the performance of those top people in an agency that now appears to have been mal-managed in many ways.

First of all, are all those 11 still there? When you talked about the changes in management, are they there, or are some of them gone, and second, what were the criteria that you used to judge their performance that all 11 got performance bonuses?

Mr. O'KEEFE. Thank you for the question. Yes, there are some folks who have departed, and have withdrawn. And again, as you properly cite, that was more than a year ago, based on the prior

year's activities of the individual appointees who were either Schedule C or specific folks that have been appointed by the President in these chances. I am not one of those. I am not eligible for any of those, and so therefore, this doesn't pertain to those who are appointed by the President and confirmed by the Senate, all right, so that we are not in that equation. Of the roughly dozen folks you are talking about, some have left. The criteria that the Chief of Staff to the President outlined in terms of how that needs to be complied with were issues that went through very specific acts, things that folks did in order to earn those performance awards, and so, in going through that 10 or 11 folks, I could walk you through each of them in terms of what their individual performance was that earned them that recognition, and would be happy to do that, either here or at any other time of your convenience.

Mr. MILLER. Five minutes is probably not enough, but I would certainly welcome that. But the purpose of having political appointees is so that an Administration can exert its control on the various agencies of the Federal Government. I understand that, I suppose that. You have got to do that to get control of this huge federal bureaucracy, but certainly, some of the pressures, some of the forces on NASA that the report spoke of do appear to be politically driven pressures, budget pressures. Representative Lofgren asked about those, about the failure to do the budget for the upgrades that were pointed out from below that bubbled up, that were needed. Also, the concern about outsourcing, and that was a criticism made a couple years before, three years before the *Columbia* disaster, by the Space Shuttle Independent Assessment Team, and then, also, was pointed out by the CAIB Report. The CAIB said that years of workforce reductions and outsources have culled from NASA's workforce the layers of experience and hands-on systems knowledge that once provided a capacity for safe oversight.

Were those considerations, cutting budgets, outsourcing as much as possible, were those coming from below? Were those part of what you wanted your political people to be doing in NASA, and are you still as committed to those considerations, those forces, as you were?

Mr. O'KEEFE. I guess, first of all, as a statistical matter, we are talking about 10 or 11 folks out of an agency of about 18,000.

Mr. MILLER. Those are the ones that you control.

Mr. O'KEEFE. No, those are the ones who were appointed separately than this career civil service force appointment system. Several of them were appointed by the previous Administration, and are still with us, and are doing an exemplary job, so they are Schedule C appointees per se, but they not necessarily there because of their political focus of how to exert policy matter. I think that is a responsibility for leadership, and it is independent of the question of your partisan view of these question.

The President has laid out a management agenda with five primary points to it. That is the understanding, the mantra, within every agency and department across the Federal Government. Those are the five that the senior management, whether they are career appointees, whether they are appointees of the President of the United States confirmed by the Senate, or whether they are Schedule C appointees, all of us have an obligation to pursue those

five management goals, and so those, I think, are independent of the question of your partisan leaning, or whether or not there is an influence of that political agenda. There are five basic fundamental management things that I can think we can all agree to, are the kinds of things that we need to be cognizant of, and are really management 101 kind of objectives.

[Material requested for the record follows:]

In 2002, how many political appointees were there?

Non-Career SES	**6**
Total Awards	**4**
Total Amount	**$35,000**
Schedule C	**7**
Total Awards	**6**
Total Amount	**$11,700**

What were the criteria for their bonuses?

Individuals were granted bonuses for substantial achievements that were well beyond the performance of routine duties.

What was the Democrat/Republican count for the political appointees?

Non-Career SES	**2 Republicans, 2 Independents**
Schedule C	**5 Republicans, 1 Independent**

Chairman BOEHLERT. The gentleman's time has expired. Just let me observe that the Gehman Report, some place in there, it said something to the effect that the budget didn't meet NASA's ambitions. Now, here is someone who has been very supportive of the space program and the Shuttle program. But when that situation occurs, it seems to me that NASA has to tailor its ambitions to meet the realities of the budget. That does not mean in any way, shape, or manner that safety is compromised or sacrificed. It just means it is a wake-up call, and you have got to deal with the everyday realities.

Mr. O'KEEFE. If I could quickly observe, Mr. Chairman, you know, you are right on the mark. But at the same time, and there is no question, that does not absolve us whatsoever from any obligation that we really must balance and make more prominent the safety objectives over the mission objectives and so forth. That said, I have never been associated with any public entity, agency, function, department, anything, in which all of the aspirations were satisfied with the resources that were allocated. That is a null set proposition. Never seen it. I would be delighted to see one the first time.

Chairman BOEHLERT. No, no, and I know exactly what you are talking about. I have been around this place a few years, too, and I have seen some of the same things you have.

Mr. O'KEEFE. And I thank you.

Chairman BOEHLERT. The chair recognizes——
Mr. HALL. Chairman——
Chairman BOEHLERT.—Mr. Hall.

BUDGET CUTS

Mr. HALL. I know we have to hurry, because we have three more and we are going to be voting pretty soon, but it is my recollection that Vice President Gore, who was in control then of the space program, or had been assigned that by the President, told us to cut 25 percent. It has always been my fear of cutting, because I didn't know where to cut for fear of safety, but I knew there were those within NASA who knew how to, and Mr. Sensenbrenner and I, as my recollection went to him and asked Mr. Goldin to cut it the 25 percent. He could it with a surgeon's knife, or we would do it with a baseball bat. He cut it 34 percent, and didn't appear, at that time, to have done any definite damage to the program. It seemed like a pretty intelligent cut, but it turned out we have lost a Shuttle, and we have lost a crew, and I don't know whether you can tie that to that or not, but those are the hard, cold facts of the past, and we operated with the facts we had at that time, and the best information we could get from an entity that we approved of and that we trusted, and that is NASA, and still do.

Chairman BOEHLERT. Thank you. We learn from the past, but we prepare for the future. Mr. Nethercutt.

Mr. NETHERCUTT. Thank you, Mr. Chairman, and welcome, gentlemen. I am glad to have you here. Let me follow up on that line of questioning relative to preparing for the future.

SUPPLEMENTAL REQUEST

Mr. O'Keefe, as you look at—as we look at the Return-to-Flight Program and recommendations in the CAIB Report, and all that goes with it, and the needs to stress the safety of future missions and Shuttle operations and the Space Station, it is going to cost some money. The reprogramming that was requested earlier, I understand, was not granted. I think it was $1.7 billion earlier this summer. $87 billion is what we are looking at in the war effort, that the supplemental appropriations will be presented next week. I am on the Appropriations Committee, and you have a history of appropriations, I know. I understand there won't be any request for NASA. I heard your response to Mr. Weldon, relative to not knowing exactly how much it is going to cost to return-to-flight, and implement the plan that is out there. Can you be more specific? I know the Senate's down $200 million, I mean what—it seems to me you are looking at bigger numbers, and should, in order to assure safety, but also, to meet the expectations of the mission that you have in mind, and that the CAIB Report has in mind.

Mr. O'KEEFE. Sir, now thank you for the question. The answer to how much it is really going to cost us to implement, on the 29 recommendations that have been made the Board, there are lots of different options we could choose from to be compliant with the recommendation. Depending on which we choose, that is ultimately, then, going to arithmetically give you the price tag at the end. So rather than start with a number, and then back into the answer

of what the options ought to be, we are going to the other direction, vetting through what are the best options we can do, airing with the Stafford-Covey external review group that I referred to earlier, and then make a determination on how much it is going to cost based on that. Based on everything I can see, just again, eyeballing it, not any scientific or really analytical, there is really nothing here that looks like it is going to be a major redesign effort, so the cost involved in those cases is probably going to be a longer-term thing. Institutionally, when we start this NASA Engineering and Safety Center, it is going to cost you not a whole lot to get started, because you are talking about initial expense for the folks assigned for a very small fraction of the year, and then, as time goes on, though, that will escalate, because you have got a full year cost associated with more people, all that stuff. So really, it is the out year tails of this, the out year costs and implications, that are the part we really need to be mindful of.

The initial expense to do this, I don't think is going to be anything that is really going to really amaze anybody. The bigger cost is going to be to follow through, for example, on discussions this committee has had on several occasions, as well as what this report asserts, which is get on with a crew transfer vehicle capacity, sooner rather than later. That is not in the President's budget. What is in the President's budget right now is an assumption of an Orbital Space Plane crew transfer vehicle that will be developed and produced between now and 2010. This is saying step that up and get on with it, stop, you know, waiting around. That is going to cost, and it isn't going to be cheap, and whether or not that option is selected or not by the President is a different question, and I wouldn't speculate at this juncture exactly how that will come out.

Mr. NETHERCUTT. Have you—mindful that the VA/HUD Bill is headed for conference, have you submitted, or do you intend to submit any budget requests or alternate budget requests, or other information that the conferees can take to the conference and try to help you reach those goals in the next fiscal year?

Mr. O'KEEFE. Well, there is a number of alternatives, in terms of avenues, you know, off-ramps that can be pursued here, either amendment or a supplemental or part of the '05 submission, all of which are on the table right now, and I wouldn't speculate on which one the President will choose.

Mr. NETHERCUTT. But my question goes to the next 30 to 45 days.

Mr. O'KEEFE. Yeah. I don't—there is nothing there that will be a show stopper that says if we don't have bucks within the next 30 to 45 days, we can't do things. There is the '04 Budget, again starting $200 million bucks in a hole would be a real big problem relative to the President's budget request, but it is, you know, the resources are sufficient to make the kind of thoughtful, you know, step by step decisions that we are looking at right now, and I don't see a real huge bill requiring emergency, urgent requirement to respond to now.

Mr. NETHERCUTT. I understand. I guess what I am wanting to make sure is clear is you don't expect to have any reprogramming or new budget requests for the fiscal year coming up that has to

be decided in the next 30 to 45 days relative to the conference between the House and the Senate. Am I right on that?

Mr. O'KEEFE. I don't think so, but you know, again, the way this deliberative process may come out internal to the Administration, it is conceivable, but I just think that is an unlikely prospect, but, you know, we will see. I mean, again, I don't want to—I just don't want to foreclose any option at the President's disposal at this point.

Mr. NETHERCUTT. Thank you both. Thank you, Mr. Chairman.

Mr. O'KEEFE. And thank you.

Chairman BOEHLERT. I am particularly interested in your response to that question being the appropriator that he is.

Mr. NETHERCUTT. Yes indeed.

Chairman BOEHLERT. The chair recognizes Mr. Nick Smith.

Mr. NETHERCUTT. Thank you, sir.

MANNED VS. UNMANNED SPACE FLIGHT

Mr. SMITH OF MICHIGAN. Thank you and Mr. Hall for having this hearing, and gentlemen, thank you for your patience through all these questions. I know the charge of the CAIB Report was look at the causes and what can we do to increase safety. But I want to talk about a larger policy decision in light of what appears to be a rush back to business as usual, with a possible March launching date. It seems to me that there are reasonable arguments why manned space flight should be, in effect, put on the shelf, and it seems to me this committee, Mr. Chairman, this nation, needs to evaluate where we go—where we are going, what we want to accomplish, what should be the role of unmanned space flight. We already know that we have the technology to Shuttle some of the accommodations for the Space Station with robotics, with unmanned flight. We know that with new technology, nanotechnology, microtechnology, we have the capacity to more efficiently explore outer space than with manned space flight, and so I guess part of my question is is by setting the goal of a March launch date, it almost feels like business as usual at NASA. The CAIB Report cited unreasonable expectations for the Shuttle program, both by Congress and NASA as one of the factors that detracted from the attention of some of the safety concerns.

Last week, Admiral Gehman, you told us, that the committee, that NASA has a history of promising more than it can accomplish. I am very concerned about trying to charge—what appears to be a charging ahead to keep going with the March launch date. If it is successful, then there is going to be some kind of an impression that things are good again, and we can continue the program as-is.

And Administrator O'Keefe, you have said the Shuttle will not return to flight until it is fit to fly, but with the target date for six months away, I am concerned that adequate consideration of that is not going to be made. So first, Mr. O'Keefe, you have been quite supportive of unmanned space flight and exploration for the accommodations that it can make, but don't you believe we need to more deeply discuss what our goals are, and what can be accommodated by manned space flight versus unmanned space flight, versus some of this money going into additional ground research. I chaired the

Research Subcommittee, and where are going to get our best bang for the buck on scientific research?

Mr. O'KEEFE. Yes, sir. Now, I appreciate the question and thank you. Please let me reassure you there is just no question we are going to follow this implementation plan and assure that we have achieved these milestones, and when we have done so, when those milestones are met, that is when we are fit to fly.

Mr. SMITH OF MICHIGAN. No, but what I hear you saying, you are going on with space—manned space flight as usual, with the same kind of priorities as before.

Mr. O'KEEFE. Well, in part, in response, as we have discussed with—Congressman Ehlers went down a very thoughtful path with this as well, which is that this the means by which we facilitate the completion of the International Space Station to yield the science objectives that can only be accomplished in that microgravity condition. Can't duplicate that anywhere else. We can do it for a very short span of time, but we can't sustain it the way that exists as——

Mr. SMITH OF MICHIGAN. To my knowledge, there hasn't been a good quantitative evaluation of what can be accomplished with robotics and nanotechnology to accommodate a lot of this research that is being conducted. Testimony in my—in our Research Subcommittee over the past five years indicate that a lot of it can be more effectively, more efficiently done with unmanned space flight, especially for outer space exploration, but also for the scientific experiments that have been conducted.

Having high schools design scientific experiments is not the kind of research. It adds excitement, but it doesn't accommodate the kind of research goals that I think we should be setting.

Mr. O'KEEFE. But that is not the dominant priority of what goes aboard. I mean, I take your point, and it is very well-taken, and it is a thoughtful approach, but it—nonetheless, in those kinds of scientific objectives, that is again referred to, this is one acronym I had never heard until I went to NASA. It is referred to as gas can experiments. And I said what the hell is a gas can? Well, it is a getaway special, in other words, additional room, that is it, you got a spot over in the corner, put it in there. The primary focus of what goes aboard Shuttle on the way to station, utilizing that is the microgravity condition for biological and physical research and some materials research that can't be done anywhere else.

Mr. SMITH OF MICHIGAN. Well, that is what you are saying, but I think we need a better evaluation, a better study, because that is contrary to some other testimony we have heard. Mr. Chairman, a quick question to Admiral Gehman.

Mr. O'KEEFE. Sorry.

Mr. SMITH OF MICHIGAN. And that is——

Chairman BOEHLERT. Make it quick.

Mr. SMITH OF MICHIGAN. In the 1960s with the *Apollo* fire, we set up the Advanced Safety Advisory Panel. Should that be changed, enhanced, if it is going to continue?

Admiral GEHMAN. The answer to your question is the Board believes that a periodic review of NASA's implementation does need to be done. We don't have an opinion on what is the best committee to do that. We recommended that as one of several options.

Chairman BOEHLERT. Thank you very much. Mr. Lamar Smith.

RTF COSTS AND SCHEDULE

Mr. SMITH OF TEXAS. Thank you, Mr. Chairman. Mr. O'Keefe, did I understand you correctly a few minutes ago, when you said you did not feel that the resumption of the Shuttle program would lead to greater costs this year compared to the greater outlying cost?

Mr. O'KEEFE. I don't see the additional cost in this fiscal year coming, in '04——

Mr. SMITH OF TEXAS. Right.

Mr. O'KEEFE.—as being exorbitantly more expensive than what we have seen in the past. These—this is no substantial hardware redesign required here.

Mr. SMITH OF TEXAS. Right. Right. But I assume that there were still—that there are still unanticipated costs——

Mr. O'KEEFE. Oh, yeah.

Mr. SMITH OF TEXAS.—of making the Shuttle safer——

Mr. O'KEEFE. Yes, sir.

Mr. SMITH OF TEXAS.—that it—okay——

Mr. O'KEEFE. Absolutely.

Mr. SMITH OF TEXAS. Now——

Mr. O'KEEFE. That was a very narrow answer to the question of '04——

Mr. SMITH OF TEXAS. Right.

Mr. O'KEEFE.—that Mr. Nethercutt's request of do we see anything that needs to be acted on in the next 30 to 45 days for this coming fiscal year——

Mr. SMITH OF TEXAS. Right.

Mr. O'KEEFE.—and the answer is I don't see it happening——

Mr. SMITH OF TEXAS. I understand.

Mr. O'KEEFE.—in that narrow time window.

Mr. SMITH OF TEXAS. Well, given the unanticipated cost, and given that you haven't requested a substantial increase in the budget, what programs are, then, going to be cut to transfer or to allow for the funding of making the Space Shuttle program safer.

Mr. O'KEEFE. The first step has got to be to look at the recommendations, determine what options we choose, to implement——

Mr. SMITH OF TEXAS. But you have admitted there is going to be additional costs. I am just wondering what other programs are going to have to——

Mr. O'KEEFE. Haven't identified any at this time to be the bill-payers.

Mr. SMITH TEXAS. Will there be some other programs that will be cut a result?

Mr. O'KEEFE. It could very well be that there is additional funding requested. I don't want to preclude the President's option on any count.

Mr. SMITH OF TEXAS. Okay. Thanks. My next question is if you don't make the March deadline, and I hesitate to use that word deadline, which is—has a negative connotation these days, but if you don't make that, what is your backup plan to complete the Space Station and to maintain the Hubble Telescope?

Mr. O'KEEFE. Again, we will fly when we are fit to fly and the milestones are achieved. In order to achieve——

Mr. SMITH OF TEXAS. Yeah.

Mr. O'KEEFE.—that set of recommendations before return-to-flight. There are several different launch windows that would permit that, and we need to flexible enough to accommodate that to assure optimum safety.

Mr. SMITH OF TEXAS. Thank you. But my question really went, though, if you don't make the deadline, if you don't make the March deadline, or a subsequent deadline, and make that open window, then what plans do you have to maintain the Space Station or the Hubble—or—either the Space Station or the Hubble Telescope?

Mr. O'KEEFE. Thank you, I am sorry sir. I misunderstood. The current activity we are engaged in to maintain the Station in its present configuration is the Russian Soyuz capsule, as well as the Russian Progress Logistics Resupply Capsules. The International Space Station Partnership of 16 countries have done an impressive job of maintaining that——

Mr. SMITH OF TEXAS. They will continue to pick up the slack on——

Mr. O'KEEFE. That is the anticipation, and as recently as a month ago, that seems to be the disposition on the part of all the partners.

HUBBLE

Mr. SMITH OF TEXAS. And then what about the Hubble?

Mr. O'KEEFE. The next servicing mission was planned to be in late Fiscal Year '04, early '05, and we will have to assess exactly when is the earliest opportunity when we will be able to——

Mr. SMITH OF TEXAS. Okay.

Mr. O'KEEFE.—to do that next servicing mission of Hubble.

Mr. SMITH OF TEXAS. So, even if the Shuttle doesn't stay within that March goal, you still think you will have sufficient time to service the Hubble even if you don't make the March deadline?

Mr. O'KEEFE. We will have to see. I don't want to kid you on this, and I don't want to deceive you. I don't know what the consequences will be with all the different program impacts, as we move down the road for the unknowns of what it is going to take to implement what is necessary to do this safely. I don't know.

Mr. SMITH OF TEXAS. Okay. Thank you, Mr. O'Keefe. Thank you, Mr. Chairman.

Mr. O'KEEFE. No, thank you, Congressman. I appreciate your questions.

SCHEDULE PRESSURE

Chairman BOEHLERT. Thank you very much. That completes round one. We are advised that momentarily we will have a series of votes on the floor, and that will draw the hearing to a logical conclusion, because it is unfair to ask you to wait while we go over to the floor, and some of the games we play over there with procedural motions and things like that, but let us go to round two right away.

Mr. O'Keefe, I want to get back to a question I asked earlier about scheduling and the pace of schedule. The Young Commission determined that not more than four flights could occur in a year. Do you agree with that?

Mr. O'KEEFE. No, they started that as a working assumption of what——

Chairman BOEHLERT. Yeah.

Mr. O'KEEFE.—that couldn't occur, but that was their working assumption of what would occur. They argued that the sequence of the deployment ought to be based on the systems integration schedule, and——

Chairman BOEHLERT. And are you still assuming that four flights a year will occur?

Mr. O'KEEFE. It is four to five.

Chairman BOEHLERT. All right, and the scheduling of four to five flights a year, but in the next year, we are talking about scheduling four flights between mid-March and mid-December. Is that consistent with the basic recommendation of the Young Commission, and how can NASA expect to function with fewer than two months between launches?

Mr. O'KEEFE. Well, it is consistent with the Young Commission, the Young Panel's view, which is to build a Space Station at the optimum systems integration schedule that you can achieve, in other words, send the modules and the components up when they are necessary to fit into the array that they ought to be. Whether or not this is an achievable schedule or not, we will see. We will see what is dictated by the implementation of each of those milestones, and we will adjust it accordingly in order——

Chairman BOEHLERT. Well, Young was pre-*Columbia* and pre-Gehman, and there are a lot of changes that are, you know, 15 hard recommendations that we have embraced totally, you have embraced totally. You have got to address them.

Mr. O'KEEFE. Yes, sir.

Chairman BOEHLERT. That is prior to return-to-flight.

Mr. O'KEEFE. Yes, sir.

Chairman BOEHLERT. There are going to be a lot—there are a lot of sort of turmoil if you will, or activity is a better choice of word, and a lot of change going on.

Mr. O'KEEFE. Yes, sir.

Chairman BOEHLERT. And you know, if we have got the schedule pressure that everyone is concerned about, and you share that concern——

Mr. O'KEEFE. Absolutely. Absolutely.

Chairman BOEHLERT. As Admiral Gehman and everybody on the Commission acknowledge, you have to have targets, you have to have goals, and all that sort of thing, but undue pressure is something else altogether. With all this change occurring to address those 15 specific points, and the reorganization and the culture being addressed, how can you even hope to have a schedule that has four flights from March to December of next year?

Mr. O'KEEFE. We may not achieve that. What is—again, we are trying to reconcile is, let us get the optimum systems integration schedule that the Young Panel called for, because we have got all the material stacked up at the Kennedy Space Center. It is ready

to go. But at the same time, not press the schedule to achieve that simply because we have to. We have got to make sure that the safety objectives, all the things, the findings in the report are done, and we will do this at a pace in which that balance is attained, and if we have to adjust that schedule, so be it, and the message I got from this discussion, as well as from the report, and several discussions with Admiral Gehman is, we have to make sure every person in this Agency, down to the guy turning the wrench, knows that that schedule is flexible, in order to understand what the safety imperatives are.

At the same time, we have got to also look at what do we do to build the International Space Station. That is an imperative that everybody has leveled, and so, as a consequence, we are moving in that direction, but not at the expense of any schedule objective. When we can fly, that is when we will fly.

Chairman BOEHLERT. I think it might be more realistic to make an adjustment earlier rather than later, but——

Mr. O'KEEFE. Well, Mr. Chairman, if you would—you are raising a very important point as to whether you do it in front or in back. One way you tease out or bring out the issues of what are impediments to attaining some set of mission objectives is to lay out what is the optimum systems integration schedule, and then have folks contest as to why you can't achieve it. The point that I think that the Board made is listen to them, and incorporate that in your scheduling activity. I got that message, and that is exactly what we have got to do, but that doesn't mean you go abandon the approach that says this is an optimum systems integration schedule that the Young Panel spent all its time working on, and then just throw that out and say well, we have got a launch going, anything we want to go in the back. But——

Chairman BOEHLERT. Well, all right——

Mr. O'KEEFE.—that is not——

Chairman BOEHLERT.—we could have this——

Mr. O'KEEFE.—throwing the stuff——

Chairman BOEHLERT.—discussion all day long, but——

Mr. O'KEEFE. Yes, sir.

Chairman BOEHLERT.—the fact of the matter is you are not going to snap your fingers and just develop the type of culture that Gehman——

Mr. O'KEEFE. That is true.

Chairman BOEHLERT.—and Congress and everybody wants, and you yourself have acknowledged you want.

Mr. O'KEEFE. That is true.

Chairman BOEHLERT. And it seems to me it would ease the pressure on scheduling if we were a little bit more realistic in looking at next year, and not scheduling four flights between March and December, but it is a which came first——

Mr. O'KEEFE. I got it. I got it.

Chairman BOEHLERT.—the chicken or the egg type of thing.

Mr. O'KEEFE. I got the message and I appreciate that, Chairman.

HUBBLE

Chairman BOEHLERT. In my few remaining seconds left, let me ask you about the Hubble Telescope figuring into NASA's return-

to-flight plans. Will the Hubble take a back seat to the Station even though it is far more important to science?

Mr. O'KEEFE. I certainly hope not, and that is not our intention. There is going to be some challenges to the next Hubble servicing mission, given the fact that there is no means for that mission to then dock with the International Space Station if there is a problem, and that is one of the issues called out in the report. So we are going to have to work through that, and that is—our intention is not to sacrifice the continuing viable operations of Hubble for more convenient missions. That is not the objective at all, but we are——

Chairman BOEHLERT. When do you anticipate or project the next Hubble launch, Hubble-dedicated launch?

Mr. O'KEEFE. Gosh, I have forgotten the date. It was scheduled for—before the accident, early '05, and it is—I have just forgotten now.

Chairman BOEHLERT. Okay, but it is not one of the '04——

Mr. O'KEEFE. I don't believe so.

Chairman BOEHLERT.—objective, okay.

Mr. O'KEEFE. I don't believe so.

Chairman BOEHLERT. Thank you very much. Mr. Gordon.

Mr. O'KEEFE. No, thank you, Mr. Chairman.

Mr. GORDON. Thank you, Mr. Chairman. Just a couple quick questions. Mr. O'Keefe, you have stated on a number of occasions that you want to embrace all of the recommendations of the Gehman Board, and one of those recommendations, as Admiral Gehman has pointed out today, was that we have national goals, more specifically, what do we want to do in space, and what are we prepared to pay for. Is that a goal that you hope to have an answer to when they come back in a year and do their snapshot?

Mr. O'KEEFE. Yes, sir.

STAFFORD/COVEY

Mr. GORDON. Good. Thank you. And Admiral Gehman, this sounds sort of, I guess, a little bit déjà vu, the Return-to-Flight Task Force is a—I think a good faith effort by Mr. O'Keefe to try to get, as he says, some new eyes to look on your recommendations in return-to-flight, but when you look at this, you see this is a commission that was recruited by the Administrator, appointed by the Administrator, reports to the Administrator, many have economic ties to NASA. One of the vice chairman, who I am sure is a very honorable person I don't know, and very able, but is a vice chairman of the largest contractor with NASA. What advice would you have for this group in terms of, with your experience, of you know, trying to get it right, as well as give the public the confidence that it is going to be done properly.

Admiral GEHMAN. Mr. Gordon, I have, both myself and the Board has had several interactions with the Stafford-Covey Return-to-Flight Group, and we have told them in the strongest possible terms what our concerns are, where the pitfalls are, where the shortcuts might be taken, and we have found them to be very aggressive. They actually had—they actually came back at us, why didn't you do this, why didn't you do that? They actually had other things, so I—they are very independent, very aggressive. I have

confidence they will do a great job, and my advice is just to—just watch over it, and I am confident in them.

Mr. GORDON. Thank you.

Chairman BOEHLERT. That it? Mr. Rohrabacher.

ALTERNATIVE ACCESS TO STATION

Mr. ROHRABACHER. Thank you very much, Mr. Chairman. I would like to thank you for your leadership again. I would like to thank your staff for the hard work that they have been putting in to putting this meeting together today, and I think that we have—this has been a very invaluable effort, and we all profited from it. There is some specific—something specific I would like to ask Mr. O'Keefe in terms of some problematic areas here, but let me just say that overall, if anything has come out of this hearing, it seems to be that there needs to be a vision statement by the President of the United States, and I would—I don't want to speak for the whole Committee here, but I would suggest that the message of this hearing is loud and clear to us that the President of the United States needs to act, needs to give a vision statement, needs to give some personal direction. I would recommend that on December 17, that he be down in Kitty Hawk, North Carolina, or some other venue, at the 100th anniversary of human flight, to give us a statement of the United States of America and perhaps all of humankind on what our goals should be for human space flight in the future, and I think that would be appropriate, and I think that this—after hearing the testimony today, everybody is calling out for some leadership from the White House on this, and I think that the 100th anniversary of manned flight would be a very good forum for that.

But with that said, I would like to ask you some—a couple specifics. Especially—it seems disturbing to me again, we are talking about mindset as being a major cause for this accident. If anything came out of this—mindset—foam can't be a threat was a mindset in NASA that contributed to the factor. Then, the schedule should not be hurt because of something that is not a threat was also a mindset, and so we see how those two mindsets worked together to cause this tragedy. There seems to be another mindset at NASA, and that is we need to get back to flight as soon as possible, and I keep hearing even though safety is going to be taken into consideration, but there are other options. There are other options to bringing back the Shuttle, and Mr. O'Keefe, I understand that resupply flights being—bringing food and water and propellant and other things to the Space Station, not people, can be done by alternatives, by our partners, or by alternative—private sector alternatives, yet NASA seems to be saying that they are going to bring the—take the Shuttle up to help resupply the Space Station. What is going on here? Is this another mindset?

Mr. O'KEEFE. No, sir. I hope not. The approach that we are—been using since the accident, in supporting the Space Station, is to use the Russian Progress vehicles.

Mr. ROHRABACHER. Right.

Mr. O'KEEFE. Which incorporates, and has the capacity——

Mr. ROHRABACHER. But Mr. O'Keefe, I'm talking about your plan——

Mr. O'KEEFE. Yes, sir.

Mr. ROHRABACHER.—in the near future.

Mr. O'KEEFE. I apologize.

Mr. ROHRABACHER. Okay.

Mr. O'KEEFE. Just let me finish that last sentence.

Mr. ROHRABACHER. Yes, sir.

Mr. O'KEEFE. It has—the Progress flights can carry a small fraction of what Shuttle can, so the issue is not resupply, it is how do you use that capability for the science objectives. We are really maintaining right now.

Mr. ROHRABACHER. Right.

Mr. O'KEEFE. And I apologize. You were going to go on to——

Mr. ROHRABACHER. Well, I would suggest that the figures I have seen is that the Space Station can be resupplied by the Russians and by private sector alternatives that are out there, and yet, it seem to me you are telling us that the Shuttle will be assigned to carry supplies to the Space Station.

Mr. O'KEEFE. Let me go back and take a look at that based on what your findings are on what it is we could do without Shuttle——

Mr. ROHRABACHER. Okay.

Mr. O'KEEFE.—to maintain logistics, resupply, science, all the things, and by the way, get the modules up there, too.

Mr. ROHRABACHER. Right.

Mr. O'KEEFE. If we have got other alternatives to Shuttle to do that——

Mr. ROHRABACHER. Right. Well, I am not suggesting that. I am suggesting that there are certain missions for the Shuttle that can only be done by Shuttle, and need to be done by Shuttle in terms of finishing the Space Station, but those missions that do not need to be done by Shuttle should not be done by them, and it seems to me that NASA, by pressuring out, by actually holding off alternative access to the Station in terms of the private sector, and by our Space Station partners in Russia, have made it—are trying to maneuver a greater dependency on Shuttle than we need to have. Now, Mr.—Admiral Gehman, I asked you this at the first hearing. It is—is it not your finding that the Space Station should be resupplied, if possible, by—not by the Shuttle, but by other sources?

Admiral GEHMAN. In the mid-term, yes, sir. As soon as possible, it should be the policy of the United States to do cargo by some other means.

Mr. ROHRABACHER. Okay, so let me put that on the record, Mr. Gehman. I would hope that as soon as possible, and that means if there is another alternative, it should be used, rather than the Shuttle. It is risky other—too risky otherwise. The Shuttle can be done for those things that only the Shuttle can do. Thank you very much, Mr. Chairman.

Chairman BOEHLERT. Thank you. The gentleman's time has expired. Mr. Hall.

INTERAGENCY WORKING GROUP PARTICIPANTS

Mr. HALL. Mr. Chairman, I will be brief again. I used most of my time to ask my question, and gave you the chance to answer it with a yes or a no. It took a little longer to say yes than it did

no, and you gave me a yes, and I appreciate it. I wanted to ask a question from Mr. Lampson to where we can get this on the record. He is not here. I think you overanswered this question, but you didn't actually directly answer it, because he wanted a name or a position or something as to who he could talk to. A little girl went to her mama when she was 12 years old and said Mom, I have got to ask you a question, where did I come from, and the mother said oh, my God, this is the time I have got to give an answer and took an hour to answer her, you know, and she said well, I just wondered, Johnny said he came from Chicago. So I want a straight answer, and if it is I came from Chicago, why give it to me, but this White House set up, and if it is—if you give me a General Haig answer, like "I am in charge here," you may be the one. But he wants to know. He is dying to know. He is probably upstairs crying now because you didn't—you wouldn't tell him, or Dial-a-Prayer, or something. I don't know what he is doing, but we—the White House set up the interagency team, or interagency review, and you must have talked to somebody, so let me make it simple. Did you talk to the President? I know his name. I can give him that name.

Mr. O'KEEFE. Yes, sir. Yes, sir.

Mr. HALL. And then he is in charge really, just really, but then, the Vice President——

Mr. O'KEEFE. Yes, sir.

Mr. HALL.—is—has he been——

Mr. O'KEEFE. Yes, sir.

Mr. HALL.—designated?

Mr. O'KEEFE. Well, he is definitely involved.

Mr. HALL. All right, and how about Andrew Card?

Mr. O'KEEFE. Peripherally, yes.

Mr. HALL. Karl Rove?

Mr. O'KEEFE. No.

Mr. HALL. I will scratch him off of here. Don Evans?

Mr. O'KEEFE. No, he is—the Commerce department representatives are, though.

Mr. HALL. Okay. Oh, and you know, like the former President put the Vice President in charge, overseeing kind of.

Mr. O'KEEFE. Yes, sir.

Mr. HALL. Do we have anybody like that that is overseeing interagency review?

Mr. O'KEEFE. It is being set up through the usual policy operation——

Mr. HALL. And who do you——

Mr. O'KEEFE.—there isn't——

Mr. HALL.—no one kind of directing that are going to.

Mr. O'KEEFE. There is not a permanent chair. There is not someone yet. Maybe there is—will be one, maybe not. But again, the objective is coordinate all of those opinions, advice, and offer them to the President for his judgment.

Mr. HALL. Okay, all I can tell him is that Karl Rove is not one of them.

Mr. O'KEEFE. Well, no, I think you can say me.

Mr. HALL. Okay.

Mr. O'KEEFE. I am a member of that——

Mr. HALL. Yeah.

Mr. O'KEEFE. I am a party to it. I am involved in all these discussions. Certainly, the President's Science Advisor, Dr. Jack Marburger, as well as other members of the Administration as necessary to offer the views to the President on where we ought to go with this particular process. If he wants to communicate with the Vice President on his—or anybody does, those are the kinds of things that I think we are all looking forward to hearing inputs on that point. I am not trying to be coy or cute with this, it is just not a—there is no committee, per se, there is not—it is the same kind of process that you use on this committee in consultation with your staff and other Members. There is nothing formalized about it. It occurs——

Mr. HALL. There should be and there will be, won't—there is somebody who will finally have the final answer, the final say, we don't have to come to the President with everything we want to know about it.

Mr. O'KEEFE. It will be framed up in a set of options in which the President will then have an opportunity to choose where he wants to go.

Mr. GORDON. All right. And you promise me you will tell my friend Mr. Lampson when that happens, won't you?

Mr. O'KEEFE. Yes, sir. Absolutely.

Mr. GORDON. Back.

Mr. O'KEEFE. And you, sir. Thank you very much. And I am from Chicago.

Chairman BOEHLERT. Mr. Barton.

Mr. BARTON. Thank you, Mr. Chairman. I didn't say this at the start of my question round, but I want everybody to know, especially the Administrator and Admiral Gehman, I am a supporter of the U.S. space program, and I am specifically a supporter of the manned space program for the United States. So I am not anti-space, and I am not anti-NASA, and I am not anti-O'Keefe, but I am anti using the Shuttle to put Americans at risk. If you will look back there on that wall, on that left corner, that gentleman's name is Olin E. Teague. He was a tank commander for General Patton in World War II. He came back to College Station at the end of the war, introduced Dwight David Eisenhower to about 30,000 veterans at the football stadium, Kyle Field, and announced that he was going to run for Congress, and he didn't even have an opponent. He later became Chairman of the Veterans Committee, he became Chairman of the Science Committee, and he and a guy named Lyndon Johnson were the two guys that kind of put the muscle behind John Kennedy's vision of putting a man on the Moon by the end of the 1960s. After he left Congress, Phil Gramm became the Congressman for the Sixth District, and after Phil Gramm became the Senator from Texas, I became the Congressman for the Sixth District, so I have a history in the space program, and I want it to continue, but I believe if we could go from John Glenn in the Mercury Program going around the Earth, first American to orbit the Earth in February of 1962 to Neil Armstrong becoming the first American to step foot on the Moon in July of 1969, that is seven years. That is seven years, where we had no technology, and we just had a vision. We can surely come up with

a space plane that puts Americans into space safely and a way to get the cargo up to the space station in less than six or seven years.

OSP

Now, here is my question. If we direct you, we being the United States Congress and the President, if we were to direct NASA to build a new space plane or a crew capsule that was just manned-specific, no cargo other than the necessary elements for to protect the crew and sustain them as they go to the Space Station, how long would that take? If money was no object and we just said do it, you know, how long would that take?

Mr. O'KEEFE. Based on the inquiries of this committee over the course of the last several months of saying what would it take to accelerate the Orbital Space Plane to 2008, it is conceivable. It can be done.

Mr. BARTON. So you think five years.

Mr. O'KEEFE. Yes, sir.

Mr. BARTON. In a crash program, high priority, that is going to take you five years.

Mr. O'KEEFE. Matter of fact, the pace in which this works is pretty brisk, but I would hardly call it crash. It is not a 24/7——

Mr. BARTON. I don't—maybe I shouldn't use crash.

Mr. O'KEEFE. No, no, but——

Mr. BARTON. High priority.

Mr. O'KEEFE. Yeah. Exactly. I understand your point. It is a very attentive program, it is going to have a lot of folks attached to it, and you bet, within five years, we should be able—if we stick to the level 1 requirements that we have levied, and said here are the things we want it to do, the working assumption is we could attain that within five years.

Mr. BARTON. All right, now, what would it take and how long would it take if we also directed you to retrofit the three remaining orbiters for cargo only, as you—I think you and the Admiral said, autonomous operation, how long would that take and what would that cost? If you were directed, not given a——

Mr. O'KEEFE. Yeah.

Mr. BARTON.—go study the dadgum thing, we just told you do it.

Mr. O'KEEFE. Don't know with precision, but certainly, a lot less time than that.

Mr. BARTON. Two years?

Mr. O'KEEFE. I don't recall, but let me get back to you for sure——

Mr. BARTON. Can you have your——

Mr. O'KEEFE. Absolutely.

Mr. BARTON.—experts——

Mr. O'KEEFE. I will give you a call this afternoon.

Mr. BARTON. Get the Chairman——

Mr. O'KEEFE. I will call you this afternoon.

Mr. BARTON.—an answer.

Mr. O'KEEFE. I will call you this afternoon.

Mr. BARTON. And do you know what is—do you know what—give me an approximate cost number.

Mr. O'KEEFE. Don't know.

Mr. BARTON. Now, if we direct you to do these things, to make it a high priority to build a new crew capsule, and to make it a high priority to convert the three orbiters to cargo only, would NASA be amenable if we put that in a supplemental spending bill, so we did it outside of the normal budget process, and if you were cooperating with us in your meeting the Gehman Report estimates and all that, you tell us what it is going to cost, give us a program that we sign off on, and we put it in a supplemental so that it doesn't come out of your existing budget, what is your reaction to that?

Mr. O'KEEFE. Be happy to provide whatever advice or commentary, costing, whatever the Committee needs on an issue like that. The President's budget position, the way it is——

Chairman BOEHLERT. Would the gentleman yield for a second?

Mr. BARTON. Be happy to yield.

Chairman BOEHLERT. Would you also include in whatever analysis you give what we would do with the Hubble, how we would service the Hubble? Admiral?

Admiral GEHMAN. Sir, don't forget to include in your estimates that when you build a crew transport capsule, that you also are going to have to get some kind of propulsion system to get up there. And just sticking this thing on the top of a Delta Four is not going to do it.

Mr. BARTON. I am not the expert on how to do it, but I strongly believe until people like us and the President tell you what to do, you are going to be walking in the—you are going to wander around in the wilderness.

Mr. O'KEEFE. I am with you, but just in—remember there are there two parts to it.

Mr. BARTON. I understand that. I yield back my time.

Mr. O'KEEFE. And in fairness, again, the answer of five years can't be attained if you are talking about getting up there by a different launch system.

Mr. BARTON. Well, of course, I have—my—that caveat is a show stopper.

Chairman BOEHLERT. Your time—you still have time.

Mr. BARTON. My premise is different than anybody on this panel. My premise is not one more American is going to go strapped in a Shuttle. You know, if I can stop it, I am going to stop it. I am just not—I am not going to play that game any more. I have watched 14 Americans get killed, and I am—I have had with that. But I also, since I support the space program and manned space component of the space program for the United States, I have an obligation to come up with an alternative that still lets us operate the Space Station, but gives us a new capability, and hopefully, get a new vision like President Kennedy gave to the American people in the 1960s, and Congressman Hall was very polite in his questions about who have we got to talk to, you got to talk to, but all those people that he mentioned by name are personal friends of mine, and I am talking to them, and I am even talking to Karl Rove, even though he is not on his list, and I think what Congressman——

Mr. HALL. I may have missed the most important one.

Mr. BARTON. Yeah, what Laura—you didn't put Laura Bush on that list. And she is probably——

Chairman BOEHLERT. The gentleman's time has expired.

Mr. BARTON. So anyway. I apologize to Mr. Chairman.

Chairman BOEHLERT. Ms. Jackson Lee.

ACCOUNTABILITY

Ms. JACKSON LEE. Thank you very much, Mr. Chairman. Let me thank Mr. O'Keefe and Admiral Gehman for their patience. We have run about 50 miles since I last saw you between meetings, and I thought it was very important to come back to raise a number of questions, and I think it is important to note that Members are on this Science Committee because there is a degree of passion and commitment, and every Member's inquiry is an important inquiry, and so I appreciate your patience and you were trying to be responsive to my inquiries, and I thank you for the thoroughness in which you offered it, which I would not have wanted to interfere with your expressing unto the best of your ability the answers to my questions, and so I respect you for that and I thank you, and would not in any way suggest that you should not have the opportunity to continue on your answers as I would likewise for my fellow colleagues on this committee.

My work is serious here, and I think it is important that we try to find solutions. That is why we are here. So I have four questions that tie in to the original line of reasoning that I offered in the earlier series of questions. The first one that I was attempting to seek a response as we were concluding is to secure and enlist the collaboration of NASA on the issue of anti-retaliation legislation or policies, and my simple question to you, will you work with us on this issue of putting a new light, a new atmosphere into NASA with actual procedures, and we may engage you on legislation, but we are going to be very thoughtful. Would you help us with that?

Mr. O'KEEFE. Yes, ma'am.

Ms. JACKSON LEE. On the issue of individuals who were held accountable, you gave me who was moved. Do you have the numbers of individuals who were terminated, pursuant to any actions or inaction that might have occurred around *Columbia* 7, and again, I have said numbers versus names.

Mr. O'KEEFE. Yes, just off the top of my head, there are at least three who have departed the Agency.

Ms. JACKSON LEE. In their own way, as someone would say, not necessarily through termination.

Mr. O'KEEFE. Correct.

ISS SAFETY

Ms. JACKSON LEE. And that I will want to pursue with both of you, maybe in some other discussions about that structure. The other question is related to the International Space Station, and my discomfort with—and I am going to tie two questions into that, my discomfort with whether or not the Space Station is safe, whether or not, in all that we have done, have we included, just to be safe, embraced the Space Station, and I mentioned this return-to-flight issue, and I am not sure whether it covers the Space

Station, but again, what struck me, start the review of the several thousand waivers of Shuttle safety requirements to determine whether they were justified, and I would like both you and Admiral Gehman to just refer that, even though that is not your report, Admiral Gehman, but I guess it is responding to your report, my last point is, just to follow up my good friend from Texas, he wants $30 billion more I last heard from him, and so he knows that I am very supportive of Congressman Barton's effort to secure more dollars that will hopefully embrace the word safety. I think there is no NASA without safety. There is no tribute or respect to those who lost their lives without safety, but the Orbital Space vehicle, I understand you want to put it on an Atlas or a Delta launch. What is the comparison of safety, it is my understanding that that success rate, you might tell me, is worse than or no better than the Shuttle, or we are not getting any—gaining anything by using it in that way, and I would like to be informed on that. If you could answer those questions, I would greatly appreciate it, and I will look forward to working with you on the anti-retaliation effort.

Mr. O'KEEFE. Thank you very much, and you as well. I mean, am committed to doing that. We want to be sure that there is no one in this Agency who feels like they can't speak up, and that if they do, that there is consequences for their opinion having been offered. It is, I think, a profound observation in this report that not only did the members say that they had investigated that behavior, but that they witnessed it themselves, and that is unacceptable under any circumstances, so we are committed to assuring that does not happen. And there is a lot of ways we got to go about doing it, and I want to work with you to find acceptable ways to do that.

On the second issue of—it really cuts to the inquiry and the dialogue we had on the Independent Technical Authority on the waivers, which is—I think you can accomplish several things that the Board recommended by procedural change that we really have to figure out what the appropriate options are, but it first starts with the proposition that the Board articulated very forcefully with no ambiguity, which is to sever, separate, remove, get out of the Program Management Team, the functions related to specifications and configuration control from the program management imperatives of day in and day out cost/schedule operational imperatives, hiring people, bringing folks in, getting talent. So that first step, I think we need to make sooner rather than later. The time is now, because focus and attention is on it, and we need to come to closure on a number of very thoughtful ways to go about achieving that objective organizationally, but we have got to pick one and pick one sooner rather than later. Then, the step becomes justify the waiver authorities you may be looking at, because now you have an organizational entity that has the capacity to push back and say prove to me, or demonstrate to me why such a requirement needs to be waived, versus telling me it is just a neat goal that we would like to attain in order to achieve that task.

Lastly, on your questions about the expendable launch vehicle, that is the only way that anyone now knows how to get folks off this rock and into space. If there is another idea that comes up on how to achieve that, we are all ears, but it is the only we know of right now to make it happen, and if that is an unacceptable ap-

proach, we've got to move away from all that and give this up, and that is an acceptable answer to some Members, but to others, it would be viewed as just not feasible, because there is—until we mature some of the other technologies of how to do it, chemical propulsion is where we have been stuck for 40 years, and we are trying to get out of that, and I commend the Committee and the Congress for having stood up to the efforts to try to diminish the Project Prometheus efforts, which is the first serious effort to get out from underneath that challenge.

Thank you, Mr. Chairman.

Chairman BOEHLERT. Thank you very much, Mr. O'Keefe and Admiral Gehman. To show you how much influence we have over the House, they waited until we had the last word in this committee before scheduling any votes in this very busy—I wish on behalf of the entire Committee to salute both of you for your continued cooperation through this whole very difficult process, and for your outstanding contributions to finding out what went wrong, so we can fix it and get on with the program.

Thank you all very much. The meeting is adjourned.

[Whereupon, the Committee was adjourned.]

Appendix 1:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Sean O'Keefe, Administrator, National Aeronautics and Space Administration (NASA)

Questions submitted by Chairman Sherwood Boehlert

Q1. According to the Columbia *Accident Investigation Board report NASA assigned a working group an action to resolve the foam issue after STS–112. How far along was the assignment at the time of the* Columbia *accident? Are there any written materials that were produced as a result of this assignment? Who was responsible for this assignment? Are the individuals responsible for carrying out this assignment also involved in the return-to-flight efforts?*

A1. The Lockheed Martin Chief Engineer was responsible for authorizing the preparation of a change proposal to the Space Shuttle Program Requirements Control Board (PRCB) following STS–112. The PRCB issued Action Item S062151 to determine the cause of the bipod ramp foam loss on STS–112 and to suggest corrective actions. At the time of *Columbia*, the Action Item team had identified the probable foam loss mechanism and was in the process of formulating recommendations to eliminate this mechanism. The work status for these corrective actions was to be presented to the PRCB in early February 2003. The individuals responsible for this action are still with the program and are involved in the ongoing bipod ramp redesign effort for return-to-flight.

Q2. The Columbia *Accident Investigation Board recommended that NASA "initiate an aggressive program to eliminate all External Tank Thermal Protection System debris-shedding." NASA's current Return-to-Flight plan indicates that it "Will evaluate the potential for debris loss in all areas," but does not identify acreage foam as one of the areas for study despite the fact that small flakes of acreage foam are shed on every flight. What is NASA's current understanding of the threat posed by acreage foam? What analysis is that based on? Is NASA going to examine concepts to eliminate shedding of acreage foam? If not, please explain the rationale.*

A2. The NASA Return-to-Flight Planning Team is overseeing parallel efforts that will characterize the types of debris (including External Tank [ET] foam) that can lead to critical damage to the Orbiter during launch, and the mitigation strategies necessary to prevent the generation of this kind of critical debris. Full-scale impact testing of reinforced carbon-carbon (RCC) and tile continues at the Southwest Research Institute in order to gather data and validate computer models of the vulnerability of the Orbiter's thermal protection system (TPS) to foam debris of various sizes, including "acreage" foam, and impact speeds. Using the results of this testing, the ET project is working to reduce individual foam loss mass across the entire ET down to less than that which will cause critical damage to the Orbiter TPS. This ET foam loss mitigation strategy includes the identification of additional testing and characterization requirements necessary to determine the size of flaws in the ET foam that can lead to the generation of debris above the critical size, improvements to the ET manufacturer's foam application process, and the development of nondestructive examination techniques to detect critical ET foam flaws.

Q3. The Administrator was asked at the Senate Commerce Committee hearing on September 3rd to perform a cost-benefit study of the human space flight program and to deliver its findings to Congress within six months. What steps is NASA taking to perform this study? Will it include a comparative analysis of the costs and benefits of human space flight with those of robotic space flight?

A3. NASA recognizes that space flight continues to be an endeavor characterized by significant cost and risk. The Agency's goal is to design missions the yield the greatest possible return. To accomplish this goal, NASA understands the need to continuously evaluate the best way to use human and robot resources. This study will provide an important input by defining the costs and benefits associated with flying people in space using quantitative measures to compare humans and robot performance.

To provide a fresh look at this challenging topic NASA has contracted with an independent external firm, the Center for Naval Analysis, to provide an objective cost-benefit analysis. There are many sociopolitical factors associated with flying humans in space that will be addressed in the study. However, since NASA believes that these factors are well documented, the study's effort will focus on a task-based comparative analysis on options for conducting a vibrant space research and explo-

ration program. The study will compare the costs and benefits of having humans or robots perform these tasks, as well as various combinations of cooperative human-robot partnerships. The study will also project the path of robotic technology and computational power to account for rapid evolution in these areas.

NASA assembled an advisory board for this activity in October. The results of this comparative analysis will be ready for briefings by mid-March 2004 and a final public document printed by the end of March.

Q4. NASA submitted an update to its FY 2003 Operating Plan on September 4, 2003. In the plan, NASA requests to transfer $40 million from the Science, Aeronautics, and Technology Account to the Human Space Flight Account. Please expand on the Administrator's testimony from the hearing on the reasons for this transfer; will this funding be used to support activities related to the Shuttle program? What specific activities will the funding be used for? What specific activities within the Science, Aeronautics, and Technology Account were used as the source of funds for the transfer? What is the impact on these activities?

A4. NASA's September 4, 2003 Operating Plan includes a reallocation of institutional funds between SAT and HSF, under the conduct of the two-appropriation budget concept. This change does not reflect a transfer of funds to a program but rather reflects a re-allocation of institutional resources against those activities budgeted under the HSF appropriation in the HEDS Institutional Support account, including Space Station as well as Shuttle. During any given year, there is a certain amount of shifting of the civil service workforce among programs to best apply the agency's technical expertise where needed. Under the terms of the two-appropriation budget, along with the reallocation of direct civil service salaries, travel, research operations support, and general/administrative support salaries are also reallocated in a representative manner against the program area. Under the two-appropriation budget, the allocations of direct civil service workforce is assumed to help represent the portion of the center's institutional capabilities that are likely to support the Enterprise's programs in some manner, directly or indirectly. This approach will be more program specific under full cost starting in FY 2004.

This most recent allocation of institutional resources to HSF is actually a rebalancing of an over-adjustment that was made in the initial operating plan. The initial operating plan had projected that approximately $80M of institutional resources would be allocated against Science, Aeronautics, and Technology program activities rather than Human Space Flight activities as proposed in the original budget. However, with added attention to Human Space Flight Programs this year including recovery and investigation and added planning and extension of activities under International Space Station and Shuttle as a result of the accident, approximately $40 million of this original $80 reallocation of institutional support from HSF to SAT is now being reallocated back against Human Space Flight activities.

Q5. According to the Return-to-Flight plan, NASA "will develop a plan to re-certify the Space Shuttle as part of the Shuttle Service Life Extension Program." Precisely what will this re-certification effort involve? When will NASA decide whether it intends to fly the Shuttle beyond 2010? What criteria will be used to make that decision? Does this decision assume a date for when the Orbital Space Plane will be available? If so, what date is assumed?

A5. On January 14, 2004, following months of interagency deliberations, the President unveiled a new vision for space exploration. In his speech that day, the President stated that the Space Shuttle will be retired from service in 2010. Because the Shuttle will not be flown beyond 2010, re-certification of the entire vehicle will not be required. The Space Shuttle program will continue to monitor the health of various components and subsystems to maintain safety and reliability standards.

Q6. You have said that the Stafford-Covey Task Group will be in existence for two years and have implied that they will review NASA's Implementation of the Columbia *Accident Investigation Board's recommendations even after return-to-flight. Yet, the members of the Task Group describe themselves as having a more narrow mission that will end one month before the launch of STS–114. What precisely is the assignment of the Task Group? If it is broader and longer in duration than STS–114, why hasn't this been communicated to the Task Group? Will the Task Group be reviewing NASA's plan to implement recommendations R7.5–1 and 7.5–2?*

A6. The Return-to-Flight Task Group, chaired by former astronauts Thomas Stafford and Richard Covey, was formed by the NASA Administrator specifically to address the Space Shuttle program's Return-to-Flight activities for STS–114. The scope of the Task Group includes all Return-to-Flight activities, including the ade-

quacy of NASA's reorganization strategy for the CAIB Recommendations 7.5–1, and 7.5–2. The two-year duration set in the charter represented NASA's conservative "best guess" as to the amount of time necessary to implement the CAIB Return-to-Flight recommendations at the time that the Task Group was commissioned. The charter allows the Administrator to extend or terminate the Task Group's service depending upon the timeframe for Return-to-Flight.

Q7. The Columbia *Accident Investigation Board emphasized the need to ensure independent funding for the Technical Engineering Authority and safety organizations. How does NASA intend to implement the funding independence advocated by the Board while complying with the mandate for full-cost accounting?*

A7. The NASA Administrator has asked the Associate Administrator for Safety and Mission Assurance to develop and propose a solution to the *Columbia* Accident Investigation Board's recommendations 7–5.1 and 7–5.2—the Board's recommendations that relates to the independent technical engineering authority and the safety organization. At this juncture, the Agency is still considering options for addressing this CAIB recommendation, so it is premature to provide an answer to this question. NASA's approach to establishing an Independent Technical Authority will be decided well before the decision to fly STS–114.

Q8. The Space Flight Operations Contract contains provisions dealing with "Fee Reduction for Catastrophic Loss." Those provisions require that the NASA Contracting Officer, in conjunction with a Board of Investigation, make a determination as to the cause of the loss. In his testimony before the Committee, Admiral Gehman stated that the Columbia *Accident Investigation Board is not the Board of Investigation referenced in the SFOC. Do the other contracts on the Shuttle program have a similar provision? Does NASA have plans to establish a Board of Investigation? If not, please explain why.*

A8. The Deputy Associate Administrator for International Space Station and Space Shuttle has established a Board of Investigation to assess the Space Flight Operations Contract (SFOC) catastrophic clause as it relates to the *Columbia* accident. NASA recently determined the award fee the United Space Alliance (USA) earned for their performance of the Space Flight Operations Contract (SFOC) during the rating period that included the *Columbia* accident. During this rating period, *Columbia* and its crew were lost. Also during this rating period, two Space Shuttle missions, STS–112 and STS–113, were successfully flown.

NASA's SFOC Fee Determining Official (FDO) determined a fee amount of $36 million out of an available amount of $81 million for the fee period running from October 1, 2002, through March 31, 2003. This represents a substantial reduction in the historical award levels given to USA in prior fee award periods.

Q9a. In light of the recommendations made by the Bahcall Commission, what is NASA's plan for future servicing missions and eventual de-orbiting of the Hubble Space Telescope?

A9a. On January 16, 2004, NASA's Administrator met with the Hubble Space Telescope Project team announcing the Agency's decision to not pursue any additional servicing of the Hubble Space Telescope. The decision to cancel SM 4 was very difficult, and made only after considerable deliberation and consultation with safety and Shuttle experts. The decision was not budget driven, was based on Shuttle safety considerations, and NASA's intent to fully comply with the *Columbia* Accident Investigation Board (CAIB) recommendations and ensuring astronaut safety. HST will be operated until such a time it will no longer support science investigations (currently estimated to be 2007 or later).

Q9b. Is a controlled de-orbit of the Hubble actually required or could the Hubble reenter in an uncontrolled manner?

A9b. Uncontrolled reentry of the Telescope violates NASA's safety requirements.

Q9c. What propulsion module options is NASA studying to de-orbit the Hubble?

A9c. NASA has reviewed most of the existing options and potential new designs for this mission element. It is our intent to proceed with a normal acquisition strategy, soliciting inputs from a wide range of industry and government organizations prior to deciding the best option to procure.

Q9d. Could the Interim Control Module developed for the Space Station be modified for the Hubble de-orbit mission?

A9d. A preliminary review of the Interim Control Module, along with many other existing STS- and ELV-compatible propulsion stages, indicated that they all had ex-

cess capability for the mission requirements, and that the program phasing was not appropriate.

Q9e. What assumption will be made in the Shuttle and Hubble program budgets with regard to future servicing missions and the de-orbiting mission?

A9e. On January 16, 2004, NASA's Administrator met with the Hubble Space Telescope Project team announcing the Agency's decision to not pursue any additional servicing of the Hubble Space Telescope. The decision to cancel SM 4 was very difficult, and made only after considerable deliberation and consultation with safety and Shuttle experts. The decision was not budget driven, was based on Shuttle safety considerations, and NASA's intent to fully comply with the *Columbia* Accident Investigation Board (CAIB) recommendations and ensuring astronaut safety. HST will be operated until such a time it will no longer support science investigations (currently estimated to be 2007 or later). Additional funding will be required for execution of the deorbit mission, and portions of that funding will be seen in the outyear proposals in the normal budget cycle. Early funding for the deorbit mission will come from existing budget elements.

Q9f. How will a delay impact the budget runout for the Hubble program?

A9f. On January 16, 2004, NASA's Administrator met with the Hubble Space Telescope Project team announcing the Agency's decision to not pursue any additional servicing of the Hubble Space Telescope. The decision to cancel SM 4 was very difficult, and made only after considerable deliberation and consultation with safety and Shuttle experts. The decision was not budget driven, was based on Shuttle safety considerations, and NASA's intent to fully comply with the *Columbia* Accident Investigation Board (CAIB) recommendations and ensuring astronaut safety. HST will be operated until such a time it will no longer support science investigations (currently estimated to be 2007 or later).

Q10a. The Columbia *Accident Investigation Board's report compares NASA's safety operations with three specific examples of independent safety programs that strive with considerable success for accident-free performance: the U.S. Navy Submarine Flooding Prevention and Recovery (SUBSAFE), Naval Nuclear Propulsion (Naval Reactors) programs, and the Aerospace Corporation's Launch Verification Process.*

A10a.

General

The key issue, regardless of organizational model or approach adopted, is one of establishing and maintaining safety-critical process discipline.

Naval Reactors (NR)

The NR "high reliability model" achieves and maintains critical process discipline through a unique multi-faceted approach including: highly selective staffing, technically experienced management, extensive recurrent training, relatively flat organization, insistence on individual responsibility, long-term ("captive") contractors, military discipline-oriented culture, long-term organizational stability, and comparative isolation from outside political/budget drivers.

The Naval Reactors organization (NAVSEA 08) does not have a formally structured, independent safety program. Safety is implemented as a holistic, embedded, ingrained, "mainstream" activity. NAVSEA 08 has neither a separate, distinct, in-line safety organization, nor an independent safety program. The NR "high-reliability" model provides an example where safety is achieved without an independent safety program.

For more information on the NR safety approach see: NNBE Progress Report, Volume II, page 13, Section 3.1.2 Organizational Attributes, Embedded Safety Processes.

(Reference: http://www.nasa.gov/pdf/45608main_NNBE_Progress_Report2_7-15-03.pdf)

SUBSAFE Program

The SUBSAFE Program involves only the specific hazards of flooding prevention and recovery. This program is one of multiple programs (weapons safety, Naval Reactors, industrial operations) that constitute the overall submarine safety domain. A central thrust of the SUBSAFE Program is robust independent compliance verification. The SUBSAFE Program also includes requirements definition, configuration management, material control, and training.

For more information on the SUBSAFE Program, see NNBE Interim Report, Volume I, Section 3.1, SUBSAFE Program.

(Reference: http://www.nasa.gov/pdf/45607main_NNBE_Interim_Report1_12-20-02.pdf)

Aerospace Corporation

The U.S. Air Force "Aerospace Model" provides another approach to high reliability program management. Over the long-term, this approach has worked relatively well as part of the USAF government/contractor assurance approach. Several failures in the late 1990's led to the CIA/NRO/DOD "Broad Area Review" which identified numerous contractor and assurance agent failures that resulted in a failure of critical process discipline. The "Aerospace Model" is an approach that works, but should supplement, not take the place of, an active internal safety and quality program that establishes and maintains safety-critical process discipline and ultimately ensures safety and mission success.

(Reference: Department of Defense. 2000. Broad Area Review: DOD Assessment of Space Launch Failures. General Lester Lyles, Vice Chief of Staff, USAF. Washington, D.C.)

Q10b. Given the differences in size, complexity, and missions between these programs and the Shuttle program, are these organizational models appropriate for the Shuttle program?

A10b. The SUBSAFE and Naval Reactors programs were specifically selected as benchmarks for NASA Human Space Flight Programs because of the many similarities that exist among these three highly complex, tightly coupled, high reliability systems. Although none of these programs is a one-to-one analogy with the Shuttle program, each has characteristics worth emulating.

Q10c. What issues with each of these models would need to be addressed prior to implementing organizational changes?

A10c. The ultimate objective is to ensure safety-critical process stability, capability, and control. There is no single organizational approach that will guarantee sustained critical process discipline. Rather, "organization" is only one of many factors that should be considered in formulating and implementing a revitalized approach to establishing critical process discipline. Establishment of specific safety policies, roles, responsibilities, functions, and authority must be appropriately coupled to the selected organizational structure.

NASA is actively considering a wide range of ideas and elements from various high reliability safety programs (including NR, SUBSAFE, and Aerospace) for incorporation into an approach for a revitalized NASA safety culture and safety assurance.

Q11a. NASA has created the NASA Engineering and Safety Center (NESC) at the Langley Research Center. Please provide the charter, organizational structure, and management plan for the NESC.

What role will the NESC play in preparation for return-to-flight?

A11a. The NESC is an independent organization, chartered in the wake of the Space Shuttle *Columbia* accident, which will conduct robust engineering testing and safety assessments of any engineering problem determined by the Agency as a concern, including activities associated with return-to-flight efforts.

[See Appendix 2: Additional Material for the Record for the charter, organizational structure and management plan for the NESC.]

Q11b. Will the NESC have any authority to direct or reject activities carried out by the Shuttle program?

A11b. The NESC will not have any specifically assigned authority to reject any decision made by the program but, based on independent technical analysis and assessment, will recommend to the Associate Administrator for Safety and Mission Assurance the rejection of any specific flight readiness decision by the Space Shuttle Program and Office of Space Flight. During a NESC inspection where a critical safety deficiency is identified, the NESC may issue a "Stop Work" notice on the delegated authority of the Associate Administrator for Safety and Mission Assurance until the program resolves the discrepancies to the satisfaction of the respective program board, with NESC member concurrence.

Q12a. In response to Congressman Barton's question regarding how long it would take NASA under directions from Congress to "build a new space plane or a crew capsule that was just man-specific, [and designed to carry] no cargo other than the necessary elements to protect the crew and sustain them as they go to the space station," you indicated that it would take five years.

What is the basis for this estimate?

A12a. In July 2003 NASA announced plans to accelerate the OSP Program in order to achieve crew rescue as early as 2008, but no later than 2010. To support an accelerated schedule, a number of essential near-term and long-term milestones and management actions were identified. This schedule, while aggressive, appeared reasonable when compared to other similar programs (e.g., Gemini, Apollo, Shuttle, etc.) Important management actions taken included approving streamlined procurement processes, and initiating co-locations and reorganizations. Critical OSP programmatic milestones included completion of the government System Requirements Review, and baselining of the Level II requirements documents. On a monthly basis the progress was evaluated by the Administrator and his key management team.

Consistent with the President's new vision for space exploration announced January 14, 2004, the OSP program will focus it's efforts on developing a new manned exploration vehicle, the Crew Exploration Vehicle (CEV), to travel beyond low earth orbit. NASA is also studying the possibility of transporting astronauts and scientists to the International Space Station on the CEV after the Shuttle is retired.

Q12b. What type of vehicle does this estimate assume NASA will build (i.e., a winged vehicle or a capsule, a re-usable or expendable vehicle, etc.)?

A12b. NASA was cautious under the OSP program not to direct industry design solutions for meeting the safety, performance, cost and schedule requirements. Capsules, winged vehicles, and lifting bodies, and variations within each broad category, were considered candidates to meet the needs of the Program. Although expendable systems were not precluded from consideration, early data suggested that a relatively small fleet of re-usable vehicles minimizes life cycle costs.

The design of the proposed Crew Exploration Vehicle has not been determined yet.

Q12c. How much would it cost to develop such a vehicle within five years?

A12c. The initial cost estimates under the OSP Program for the Crew Rescue Vehicle (CRV) Initial Operating Capability (IOC) as early as FY 2008 was $13.8 billion.

It is important to note that this estimate included significantly more than the traditional development cost. In addition to development cost, the estimate included production, operations, facilities, launch services and full cost (civil service personnel, contractors services, other corporate and general and administrative costs).

The President's 2005 budget will provide the necessary details to begin implementation of the Nation's long-term vision for space exploration, including the development of the CEV. As the OSP program transitions into the CEV program, program management will develop spending schedules and milestones.

Q12d. What technologies, if any, would need to be developed before producing such a vehicle would be possible?

A12d. The President's national vision for space exploration announced on January 14, 2004 reflects the priority for human and robotic exploration of the solar systems and beyond. The FY 2005 budget supports a variety of key research and technology initiatives to enable the new vision. NASA will invest in new transportation systems, such as the Crew Exploration Vehicles (CEV), research on long-duration space flight's impact on human physiology, and develop/demonstrate nuclear power and advanced propulsion technologies and other breakthrough exploration systems.

Q13. In response to Congressman Barton's question, Admiral Gehman stated that a crew transport vehicle would also require "some kind of propulsion system" and that existing systems, such as the Delta IV rocket, would be insufficient. In response, you said that using a "different launch system" would make it impossible to meet the five-year time frame. Do you believe that current propulsions systems could be used for a new crew vehicle? If so, why? What steps have been taken to man-rate existing propulsion systems? If a new propulsion system were needed, how many years would that add to your estimate of the time it would take to build a new space plane or crew capsule?

A13. Any new manned space exploration vehicle, including the proposed CEV, will have its entire system human rated, not any individual system element.

Q14. In a recent briefing at the Johnson Space Center, Mr. Halsell indicated that no resources were dedicated to studying the capability to develop and implement a fully autonomous Shuttle. Yet, Administrator O'Keefe's testimony indicated that an autonomous Shuttle is one of the options that is being looked at. How many people has NASA assigned to study concepts for an autonomous Shuttle? What level of funding is provided for this effort? Who is assigned to

lead up this effort? When will the study be completed? What limitations prevent the Shuttle from flying missions autonomously today?

A14. NASA tasked United Space Alliance, as an element of the Shuttle Service Life Extension Program (SLEP), to perform a study of the potential of developing an autonomous Space Shuttle capability once assembly of the International Space Station is complete. The Autonomous Operations Study statement of work is for $200,000 and was completed in November 2003. This study examined the engineering trades and rough-order-of-magnitude associated costs that would need to be made in order to refit the avionics of one or more Shuttles to operate without pilot input, and to do so in such a way that would not increase risks to astronauts aboard the International Space Station or to the general public during launch, operations on orbit, or reentry.

Q15. In response to Congressman Barton's question regarding "what [budget] would it take and how long would it take if [Congress] also directed [NASA] to retrofit the three remaining orbiters for cargo only," you replied that you would call Mr. Barton that afternoon with an estimate of how long it would take. For the record, what were the answers to these questions?

A15. Safe and successful Space Station assembly requires the full availability of the Space Shuttle's capabilities including availability of the Shuttle crew to support assembly operations. The development and implementation of a significant modification to the Shuttle configuration/operation will require substantial time and resources to design, test, and certify. This includes significant time spent in off-line reconfiguration of the vehicle(s). The current fleet of Shuttle Orbiters cannot support development of an autonomous capability until after ISS assembly is complete. In addition, autonomous docking of the Space Shuttle to the ISS is inherently risky and not a technology that is currently available. To that end, NASA has tasked United Space Alliance, as an element of the Shuttle Service Life Extension Program (SLEP), to perform an autonomous Shuttle study with an operational focus. Tasks to be performed in this study are to review, consolidate and summarize previous autonomous studies in the areas of:

- top-level requirements and types of missions/draft reference missions (DRM's) that an Autonomous Shuttle will perform;
- concept of operations;
- design concept/implementation trades;
- design concept/implementation analysis completed and remaining, and;
- rough-order-of-magnitude cost estimate and implementation schedules.

Q16a. As a result of the Columbia *Accident Investigation Board report, NASA has initiated a review of the waivers to the Space Station program's technical requirements similar to that being conducted for the Shuttle program. Who is assigned with leading the review of the Space Station program? How is the Space Station review being coordinated with the Space Shuttle review?*

A16a. The ISS Program has a team in place that has begun a review of the waivers, deviations, and exceptions to ISS requirements documentation to assess the cumulative risk and potential impacts to the ISS. The team is being led by the ISS Configuration Management Office.

The ISS Special Assistant for Return-to-Flight (RTF) is also the lead for JSC's Continuing Flight Team (CFT). This dual role provides a conduit for information to flow freely between the two teams.

NASA will develop a plan to incorporate a periodic review of the waivers, deviations, and exceptions and the risk accepted by the program.

In addition, the ISS Safety and Mission Assurance (S&MA) office integrates safety, reliability, and waiver aspects of the ISS Program, including International Partners, NASA centers, and other government organizations. It performs this function by direct staffing within the ISS Program office, Internal Technical Agreements (ITAs) with other centers, Letters of Delegation with other government organizations, and bilateral agreements with the International Partners.

Q16b. Does NASA plan on setting up an independent Technical Engineering Authority for the Space Station program as well? Could this Independent Technical Engineering Authority be the same one as the one for the Space Shuttle?

A16b. The NASA Associate Administrator of the Office of Safety and Mission Assurance (OSMA) has the action to address the recommendation from the CAIB regarding the ITEA (R7.5–1). The OSMA is preparing alternative concepts for independent technical authority(ies) to cover all of NASA's Enterprises. Presently, the internal

engineering and safety and mission assurance communities and NASA management are each reviewing these organizational concepts to assure a thoughtful and careful application of a solution in order to avoid any unintended consequences that may result from changes affecting organizations intended to have independence. NASA is looking at extending the concept beyond engineering, to all support organizations that deal with safety and reliability relevant standards. It is NASA's intent for the ultimately selected independent technical authority concept to apply to all NASA centers and programs, and not just the Space Flight centers and the Space Shuttle Program.

Q17. In light of the Columbia *Accident Investigation Board report, will NASA be reviewing the Space Flight Operations Contract or any other Shuttle contracts? If so, who is reviewing these contracts? What is the schedule for reviewing these contracts? Are any changes to any of these contracts necessary prior to returning to flight?*

A17. Prior to the Space Shuttle *Columbia* accident, a NASA intra-agency team had begun a review of the Space Flight Operations Contract (SFOC) in preparation for the expiration and renegotiation of that contract in September 2004. That review is ongoing and will incorporate lessons learned from the accident and the recommendations of the CAIB. While other contracts besides SFOC that support the Space Shuttle program are also being considered during the SFOC renegotiation process, NASA does not expect any additional changes to existing contracts to be required prior to Return-to-Flight.

Q18. Given the concerns with a lack of systems engineering that encompasses the entire Space Shuttle program, what is NASA doing to improve systems engineering, both within the government and within the contractor community? Is NASA considering tasking a contractor with the responsibility for systems engineering across the Space Shuttle program?

A18. The Space Shuttle Program (SSP) restructured its Shuttle Integration Office into a Space Shuttle Systems Engineering and Integration Office (SEIO). The SEIO manager now reports directly to the SSP manager, thereby placing the SEIO at a level in the Shuttle organization that establishes its authority and accountability for integration of all Space Shuttle elements. To sharpen the focus of the SEIO onto flight vehicle systems engineering and integration, the Cargo Integration function (and personnel) from the old Shuttle Integration Office are now relocated to the Mission Integration Office within SEIO. With this move, the number of civil service personnel performing analytical and element systems engineering and integration (SE&I) in the SEIO was increased from 16 to 36 by acquiring new personnel from the Johnson Space Center (JSC) Engineering and Mission Operations Directorates and from outside of NASA. SE&I functions at Marshall Space Flight Center (MSFC) and Kennedy Space Center (KSC) have been consolidated and placed under the direction of the Space Shuttle program SEIO at JSC. Critical technical panels, which are used for the day-to-day work of SE&I in the Space Shuttle program, are now co-chaired by JSC and MSFC Engineering Directorate personnel to ensure that their activities encompass the entire span of the Shuttle program and that full advantage is taken of institutional strength at the two centers. A systems engineering and integration "summit" was held at JSC in October 2003 to discuss further strengthening SE&I activities throughout the Shuttle program; personnel form the Stafford-Covey Task Group attended this meeting and are actively following NASA's progress in this area. Finally, SEIO is responsible for managing the return-to-flight (RTF) integrated schedule and writing the Systems Integration Plan for all changes associated with RTF. NASA has also assigned a member of the astronaut corps, Nancy Currie, to the Space Shuttle program, with responsibility for integrating the safety and mission assurance functions across all of the Space Shuttle projects.

In terms of contractor responsibilities for SE&I, the United Space Alliance (USA) contract Statement of Work names USA as responsible for systems integration and significant systems engineering duties encompassing the Shuttle program. To further improve SE&I functions, USA recommended an increase of 90 people. NASA has processed a change request for this resource level and USA is in the process of implementing these personnel augmentations.

In order to provide a continuing independent assessment of NASA's SE&I performance, the SEIO has initiated two processes. First, a "greybeard" team consisting of personnel from inside and outside NASA with experience in systems engineering complex systems has been established, and the group will evaluate NASA's performance on a quarterly basis starting in December 2003. Second, NASA has contracted with The Aerospace Corporation to provide additional systems engineering skills and assessment. The Aerospace Corporation will assess SE&I processes in the Shut-

tle program using a modified Carnegie Mellon University Systems Engineering Institute Capability Maturity Model, which will allow NASA to compare its SE&I with the best in industry and the government. The Aerospace Corporation will also provide advice on strengthening SE&I in the Shuttle program and perform selected SE&I tasks to show how better practices can be adopted in the Shuttle program. This activity is already underway at JSC.

NASA believes that these actions will deliver a world-class SE&I organization for the entire Shuttle program.

Q19. What is the role of the Space Flight Leadership Council in making decisions regarding the implementation of the Columbia *Accident Investigation Board recommendations? Who are the members of the Space Flight Leadership Council? What role do contractors play in supporting the Space Flight Leadership Council?*

A19. The Space Flight Leadership Council (SFLC) is the primary senior-level decision-making body for the Space Shuttle Program and is responsible for reviewing and implementing the CAIB recommendations. The SFLC is co-chaired by the Associate Administrator for Space Flight (Mr. William Readdy) and the Associate Deputy Administrator for Technical Programs (Dr. Michael Greenfield). Other members of the SFLC include the Associate Administrator for Safety and Mission Assurance (Mr. Bryan O'Conner), the Deputy Associate Administrator for the Space Shuttle and Space Station Programs (ex officio, Gen. Michael Kostelnik), and the Directors of the Johnson Space Center (Gen. Jefferson Howell), the Kennedy Space Center (Mr. James Kennedy), the Stennis Space Center (Adm. Donaldson), and the Marshall Space Flight Center (Mr. David King). During the regular meetings of the SFLC, Space Shuttle managers and engineers within both the government and the contracting community advise the Council on broad technical and organizational issues affecting the program.

Q20. By law, NASA is permitted to appoint up to four NASA employees to the Aerospace Safety Advisory Panel (ASAP). However, you have said you want to ensure that ASAP is viewed as independent. Do you intend to appoint any NASA employees to ASAP?

A20. While the ASAP charter reflects the statutory option for NASA personnel as members, NASA has no plans to use such authority. All of the newly designated members of the Panel are noteworthy by their current and prior experience in benchmarking agency, company, and/or academic best practices in safety, and organization management other than NASA.

Questions submitted by Representative Chris Bell

Q1a. Recent estimates from managers of the Orbital Space Plane program indicate that accelerating OSP's development may require as much as an additional $2 billion per year in NASA's budget. Even if the OSP eventually reduces the Shuttle flight rate to less than four per year, no significant savings will be generated because of the workforce required to support any Shuttle flight rate.

What is your current position on how long the Shuttle will be needed to supply the Space Station?

A1a. The Space Shuttle is needed to complete the assembly of the Space Station, currently expected by 2010, depending on return-to-flight. On January 14, 2004, the President unveiled a new vision for space exploration. In this new vision, the Shuttle is planned to be retired in 2010, following the completion of its role in Space Station assembly. The Space Shuttle's unique capabilities (rendezvous, docking and EVA) are essential for the assembly of the remaining modules and components of the International Space Station. NASA will acquire cargo transportation as soon as practical and affordable to support missions to and from the International Space Station; and acquire crew transportation to and from the International Space Station, as required, after the Space Shuttle is retired from service.

Q1b. What studies or programs are underway to provide a non-Shuttle method of transporting all cargo to and from the Station? Which NASA employee is directing these efforts?

A1b. The Aerospace Technology Enterprise (Code R) led the Alternate Access to Station (AAS) study with significant support from the Office of Space Flight (OSF). Four AAS contractors were given the complete U.S. portion of the ISS supply and return requirements (including mass, volume and science electrical power requirements) in August 2003. Results of the study are expected by early spring 2004. This

effort is now under the direction of Retired RADM. Craig Steidle, the Associate Administrator for the new Exploration Systems office.

Q1c. In what year, and with what capability, will the European Automated Transfer Vehicle provide cargo-carrying capacity to the Space Station?

A1c. The first flight of the Automated Transfer Vehicle (ATV) is currently baselined in CY 2004, but the launch date is under review. ATV is capable of transporting approximately 7600 kg of total cargo. ATV has no return cargo capability or electrical power available for science.

Q1d. In what year will the OSP and non-Shuttle cargo transporter(s) render the Shuttle unnecessary for supporting the Space Station?

A1d. On January 14, 2004, the President unveiled a new vision for space exploration. In this new vision, the Shuttle is planned to be retired in 2010, following the completion of its role in Space Station assembly. The Space Shuttle's unique capabilities (rendezvous, docking and EVA) are essential for the assembly of the remaining modules and components of the International Space Station. NASA will acquire cargo transportation as soon as practical and affordable to support missions to and from the International Space Station; and acquire crew transportation to and from the International Space Station, as required, after the Space Shuttle is retired from service.

Questions submitted by Representative Rob Bishop

Q1. What do you believe is the inherent value of human versus robotic space exploration?

A1. NASA's exploration strategy attempts to optimize the partnership between humans and robots. Both human and robotic exploration missions have yielded extraordinary results. Humans and machines are always partnered together in space exploration, sometimes remotely, as when scientists at a University receive data from a probe orbiting Saturn, and sometimes locally, as when mission specialists go to orbit in the Space Shuttle.

Robotic space probes can withstand environments that exceed human biological tolerances and robots can repeat patterns with high precision. Robotic probes have traversed our solar system and traveled beyond the heliopause, becoming human emissaries into deep space. Human explorers bring on-site intelligence and creativity to the mission that cannot be duplicated by machines and have demonstrated the ability for increased science return over purely robotic space missions. A human being's cognitive and adaptive reasoning, rapid learning ability, and extraordinary dexterity are poorly mimicked by current machine technologies and the presence of humans in space is also an important source of inspiration to the people of Earth.

When humans are present locally, they are highly effective participants in space exploration. They significantly improve the likelihood of success while accelerating the pace and increasing the return and benefits from investments in space activities. The human explorers provide enabling capabilities:

Ambitious future missions will take place in never-before-encountered, highly unstructured environments and in the inevitable "20-20 hindsight" of new scientific questions that emerge from the results of ongoing investigations. Humans enable serendipity, the immediate exploitation of emerging previously unexpected opportunities for discovery.

The human brain synthesizes an enormous set of information continuously and almost instantaneously in ways that no machine will be able to match for decades to come: integrating perception, education, training, and experience. Humans are able to rapidly reach sound decisions based on very little information. Exploration beyond low Earth orbit will involve time delays and reductions in bandwidth with increasing distance, even as communications technologies continue to advance dramatically. Beyond the Earth's neighborhood, these will amount to orders of magnitude reductions in the data and delays in time of response for remote human operators, compared to astronauts locally present. People who are present at the site of complex operations can decide and act much more quickly than will ever possible for remote observers.

Many projected future systems are sufficiently complex and the environments in which they will operate sufficiently distinct from those here on Earth that these systems cannot be integrated and/or adequately tested before launch. Design or development flaws will emerge only in space and system failures will occur. Humans are able to deal more effectively with unanticipated challenges in complex activities.

There are extremely important aspects to human exploration other than what specific task needs to be accomplished. Space exploration has inspired an entire generation of Americans to pursue careers in mathematics, science, and engineering. Moreover, U.S. leadership in human space flight serves as a highly visible example of how we can apply advanced technology toward peaceful ends and provides a uniquely positive legacy to future generations of what America today embodies, strives for, and stands for. Advances made to establish sustained human exploration beyond low-Earth orbit will enhance U.S. scientific and technological leadership and provide a vehicle for expanding peaceful cooperation among nations.

Q2. You have stated that NASA's mission is not "destination driven," but focused on developing the enabling technologies for human space exploration. Please explain why NASA has decided not to pursue a mission which is "destination driven?"

A2. On January 14th, the President announced his vision for U.S. Space Exploration. The vision forms the basis of the new U.S. space exploration policy. This policy is the product of months of extensive and careful deliberations. The importance of these deliberations increased with the findings of the *Columbia* Accident Investigation Board, which emphasized the importance of setting clear, long-term goals for the Nation's human space flight program. Inputs from Members of this committee and other Members of Congress informed the Administration's deliberations. Many others contributed their ideas for the future of the space program. These deliberations also formed the basis for formulating the President's FY 2005 Budget request for NASA, which will be released on February 2nd. A commission will advise on specific issues for implementation of the policy's goals within four months of its first meeting.

The fundamental goal of the new U.S. space exploration policy is to advance U.S. scientific, security and economic interests through a robust space exploration program. In support of this goal, NASA will implement a sustained and affordable human and robotic program to explore the solar system and beyond; to extend human presence across the solar system, starting with a human return to the Moon by the year 2020, in preparation for human exploration of Mars and other destinations; to develop the innovative technologies, knowledge, and infrastructures both to explore and to support decisions about the destinations for human exploration; and to promote international and commercial participation in exploration to further U.S. scientific, security and economic interests.

Q3. Assuming the Shuttle returns to flight next year, what is the role of the Space Shuttle in completing the International Space Station? How many Shuttle flights are required to get to U.S. Core Complete and how many to get to lnternationa1 Core Complete? How long will it take to reach these goals, once flights are resumed? How many of these Shuttle flights are logistics re-supply flights? Can these logistics flights be accomplished with any other launch vehicle?

A3. The Space Shuttle is necessary for ISS assembly due to its crew and cargo carrying capacity. ISS elements have been designed to take advantage of the Space Shuttle's large cargo capability, both in terms of weight and volume. In addition, visiting Space Shuttle crews have been trained, and have the primary responsibility for, on-orbit assembly and checkout of the elements they deliver.

Shuttle-based research and logistics delivery is primarily accomplished using the Multi-Purpose Logistics Module (MPLM) or the commercial SPACEHAB modules. The delivery modules are Shuttle-unique cargo delivery systems that provide ground-based rack integration and testing prior to launch, allowing for efficient and relatively simple on-orbit rotation of large racks. The Russian Progress Vehicle, European Automated Transfer Vehicle, and the Japanese HII Transfer Vehicle will deliver pressurized and/or unpressurized cargo that does not require the environmental control available in the Space Shuttle or the MPLM/SPACEHAB delivery modules.

The current plan achieves U.S. core complete approximately 17 months after return-to-flight and International Partner elements fully accommodated approximately five years after return-to-flight. Additional flights may be necessary and could extend the timeline for core complete. NASA and its International Partners are evaluating the specific number of flights and respective manifests necessary for completing ISS assembly. The first return-to-flight missions, STS–114 (LF–1) and the newly added STS–121 (ULF–1.1) will carry out key activities related to Shuttle return-to-flight, as well as support ISS logistics and utilization.

Q4. After the completion of assembly of the International Space Station, what is the role of the Space Shuttle in supporting the Space Station or other missions? Could the "Shuttle-C" concept of using the Shuttle stack (External Tank and Solid Rocket Boosters) along with a cargo carrier instead of an Orbiter provide a capability to transport cargo to the International Space Station? Has NASA studied the Shuttle-C concept for use with the Space Station? How much would it cost and how long would it take to develop the Shuttle-C concept? Could a Shuttle-C cargo container be made to return to Earth to meet NASA's downmass requirements? If NASA has not studied the Shuttle-C concept to support Space Station, please explain why?

A4. The Space Shuttle is needed to complete the assembly of the Space Station, currently expected by 2010, depending on Return-to-Flight. On January 14, 2004, the President unveiled a new vision for space exploration. In this new vision, the Shuttle is planned to be retired in 2010, following the completion of its role in Space Station assembly. The Space Shuttle's unique capabilities (rendezvous, docking and EVA) are essential for the assembly of the remaining modules and components of the International Space Station. NASA will acquire cargo transportation as soon as practical and affordable to support missions to and from the International Space Station; and acquire crew transportation to and from the International Space Station, as required, after the Space Shuttle is retired from service.

Following the loss of *Columbia*, NASA has begun reviewing its space transportation requirements in support of ISS, as well as the R&D needed to support future space exploration initiatives. This review has included the feasibility of adapting as much existing Space Shuttle infrastructure and engineering as possible in order to create heavier lift Shuttle derivatives like Shuttle C. While Shuttle C could significantly increase upmass capacity to the orbit of the Space Station to roughly 150,000 pounds or more (as compared to the current fleet's capacity of about 37,500 pounds to ISS), current heavy-lift Shuttle derivatives are not equipped with wings, landing gear, and other hardware necessary for reentry and, thus, could not supplant the Space Shuttle downmass capability for ISS science utilization or crew transfer.

Q5. Once the Columbia *Accident Investigation Board recommendations on the Space Shuttle have been implemented, how long does NASA plan to operate the Shuttle?*

A5. On January 14, 2004, the President unveiled a new vision for space exploration. In this new vision, the Shuttle is planned to be retired in 2010, following the completion of its role in Space Station assembly. The Space Shuttle's unique capabilities (rendezvous, docking and EVA) are essential for the assembly of the remaining modules and components of the International Space Station. NASA will acquire cargo transportation as soon as practical and affordable to support missions to and from the International Space Station; and acquire crew transportation to and from the International Space Station, as required, after the Space Shuttle is retired from service.

Questions submitted by Representative Jerry F. Costello

Q1a. The CAIB report points to schedule pressure as contributing to the accident and recommends that future goals be realistically tied to time and resources that are available to the agency. Specifically, the management goal of "core complete" by February 19, 2004, was having a negative impact on the line Shuttle workforce and changed the attitudes of managers in the program so that flight problems came to be viewed as threats to the schedule rather than threats to the safety of the astronauts. In Senate testimony you indicated that because flights had "slipped," workers and managers should have gotten the message that there was flexibility in the "core complete" goal. However, although the program repeatedly missing Interim checkpoints, the final goal date was never shifted.

How often were you briefed on progress towards "core complete" and who briefed you?

A1a. The Administrator conducted monthly video teleconferences prior to the *Columbia* accident. These conferences included executive management from NASA headquarters and the field, with briefings provided by the International Space Station (ISS) and Space Shuttle Program (SSP) Managers and various project managers on specific subject areas as the need was identified. The principal purpose of the conferences was to monitor ISS program progress toward compliance with the

recommendations of the IMCE (ISS Management and Cost Evaluation) Task Force. Progress toward the "core complete" milestone was provided at those meetings.

Q1b. Did anyone on your staff tell you that schedule pressure to meet the "core complete" goal was leading to reductions in inspection requirements and testing, an increase in tasks having to be done in parallel, deferrals of flight controller recertifications, the need for a third shift, overtime, and holiday work, and other examples of excessive stress on the Shuttle program.

A1b. No.

Q1c. Did any of your managers warn you that such actions and workloads could have a detrimental impact on Shuttle safety?

A1c. No.

Q1d. Did anyone on your staff or among the contractors tell you that by December 2002 there were no more days of slippage left on the "core complete" schedule and that contractors were actually projecting a shuttle launch for "core complete" in the range of 45 days after February 19, 2004? When did you learn this?

A1d. The ISS and SSP Programs were in the process of evaluating scheduled milestone targets at the time of the *Columbia* accident. Critical path analyses were underway which looked at both ISS launch package progress and SSP orbiter availability. As these analyses were being refined, SSP orbiter processing began to emerge as the critical path element. When schedule margin degrades, there are multiple options available to management, such as: (a) shifting production priorities; (b) increasing workforce authorizations; or, (c) adjusting schedule milestone targets to reinstate acceptable margins. Such approaches must be evaluated in the total context of cost, schedule and technical impact. The ISS Program was involved in these trades at the time of the *Columbia* accident and had not yet reached a conclusion as to the most effective solution for recommendation to the Administrator.

Q1e. What discussions did you have regarding the adoption of a more realistic date for "core complete" that would reflect the realities of Shuttle scheduling and provide more margin for safety of workers and managers? When and with whom did these discussions occur?

A1e. There were no specific discussions with the Administrator on this subject. The schedule challenges associated with ISS assembly are broadly recognized across the NASA and contractor workforce at all management levels. The ISS Program was working closely with the SSP Program to define and evaluate all options in a systematic manner. All SSP constraints were related to orbiter processing requirements that vary across the fleet and at no time were safety implications identified that would have affected the evaluations. Had the evaluations proceeded on a normal course without accident occurrence, the results would have culminated in a thoroughly substantiated recommendation to the Administrator when the need for final decision approached. The *Columbia* accident occurred a year in advance of the target date for Node 2 launch. Analyses and studies were underway at that time to develop the necessary data and information for Administrator review.

Q1f. How will you guard against an overly aggressive schedule on Shuttle return-to-flight? On OSP development?

A1f. The Space Shuttle program schedule, including the date for Return-to-Flight, will be milestone driven, not schedule driven. The Space Flight Leadership Council (SFLC)—co-chaired by the Associate Administrator for Space Flight and the Associate Deputy Administrator for Technical Programs—is the primary senior-level decision-making body responsible for Return-to-Flight issues in the Space Shuttle program. The SFLC holds regular meetings with Space Shuttle Program managers and engineers to monitor NASA's Return-to-Flight activities and to make decisions regarding cost and technical impacts on the launch schedule. During the most recent meeting of the SFLC on October 3, 2003, the Council decided to push back the Return-to-Flight launch opportunity from no earlier then March–April 2004, to no earlier than September–October 2004. Key technical factors driving the revised launch schedule include the need to perform additional technical analysis on debris transport, reinforced carbon-carbon impact tolerance, integration of boom and sensors to the Space Shuttle robotic arm for on-orbit inspection and repair of the thermal protection system, and External Tank foam loss. Should these or other technical issues compel the SFLC to further reconsider the Return-to-Flight date in order to ensure the safety of the crew, the vehicle, and the general public, and then the Council will do so. NASA will also seek the participation of independent experts from outside the

Agency, including the Stafford-Covey Task Group, Aerospace Safety Advisory Panel, the NASA Advisory Council, the NASA Office of the Inspector General, and others.

On January 14, 2004, following months of interagency deliberations, the President unveiled a new vision for space exploration. Consistent with the President's new vision for space exploration announced January 14, 2004, the OSP program will focus it's efforts on developing a new manned exploration vehicle, the Crew Exploration Vehicle (CEV), to travel beyond low earth orbit. As the OSP program transitions to the CEV program, program management will develop spending schedules and milestones.

Questions submitted by Representative Bart Gordon

Q1a. The CAIB uncovered a number of serious problems with the way in which potential safety problems were identified and treated in the Space Shuttle program.

What specific steps are you taking to ensure that there are no "accidents waiting to happen" in the International Space Station program?

A1a. The ISS Program has been critically re-examining systems and processes since February 1, and in light of the CAIB report. In addition, The ISS Continuing Flight Team (CFT) was chartered to review all CAIB results for applicability to the ISS Program. This team will ensure that all necessary steps are taken to apply the lessons learned from the *Columbia* accident to the ongoing operation of the ISS. Representatives from all NASA field centers supporting human space flight, as well the Astronaut and Safety and Mission Assurance offices, are members of the team. NASA will continue to work closely with its International Partners and keep the lines of communication open as NASA implements process improvements and enhancements as a result of lessons learned from *Columbia*. The first edition of NASA's Implementation Plan for International Space Station (ISS) Continuing Flight has been provided to Congress.

Q1b. What is your timetable for completing each of those steps?

A1b. The ISS CFT published the first edition of its report on October 28, 2003. Similar to the Space Shuttle Return-to-Flight Implementation Plan, the CFT continuous improvement activity will provide updates on the progress of the ISS Program in subsequent revisions.

Q2a. NASA's Return-to-Flight plan states that "all waivers, deviations, and exceptions to Space Shuttle Program (SSP) requirements documentation will be reviewed for validity and acceptability before Return-to-Flight."

Who specifically will carry out the review? Will it be an independent review by individuals outside of the Shuttle program? If not, why not?

A2a. Each project and element (Space Shuttle Main Engine, Solid Rocket Booster, Orbiter, etc.) will conduct an in-depth review of each waiver, deviation and exception against his or her assigned systems, hardware and software. This review will validate the basis for each waiver, deviation and exception. All elements have developed plans whereby the engineers within that element—both civil service and contractor, along with Safety and Mission Assurance personnel, and Systems Engineering and Integration personnel—provide a first level technical review of each waiver, deviation, or exception. This review ensures that working-level individuals with appropriate expertise for all Shuttle elements are involved in decisions regarding the technical rationale for not meeting the requirement, and that the process is thorough, proper, and, most importantly, provides the best assessment of the potential risks that result from the waiver.

After this initial activity, the project manager and chief engineer must review that waiver package for acceptance. Then, the waiver is presented to Space Shuttle Program management (Deputy Program Manager) at the Daily Program Requirements Control Board where all the elements of the program, including Safety and Mission Assurance personnel, and the four Human Space Flight Center engineering organizations are represented. These reviews are quite thorough and lengthy. Since this effort started in May, approximately 12 percent of the waivers/deviations/exceptions in the program have been reviewed. The current schedule is that this work will be completed next spring, well before the final Return-to-Flight reviews.

While the Stafford-Covey Task Group is not specifically charged with a detailed review of all waivers, deviations, and exceptions in the Space Shuttle program, this independent Group (co-chaired by former astronauts Thomas Stafford and Richard Covey) will report on the progress of NASA's response to the CAIB report directly

to the Administrator and may also make other observations on safety or operational readiness—including waivers, deviations, and exceptions—that it believes appropriate. Additional oversight is provided by the multiple NASA Centers, contractors, and other organizations within NASA that are involved in the process, many of which are independent of, and not beholden to, the Space Shuttle program. A full and complete review of any concerns with the technical rationale for each waiver is conducted and all dissenting opinions or questions are fully heard and answered with technical data.

At this time there is no specific independent technical authority to oversee these reviews. That reorganization topic is under review at NASA Headquarters. The data packages are being retained and at the point that an independent technical authority is established, they will be asked to review the decisions that are being made prior to its establishment.

Q2b. NASA's return-to-flight plan states that "all waivers, deviations, and exceptions to Space Shuttle Program (SSP) requirements documentation will be reviewed for validity and acceptability before return-to-flight."

Will there be a similar review of International Space Station (ISS) program waivers, deviations, and exceptions to ISS requirements documentation? If so, when, and who will carry out the review? If not, why not?

A2b. The ISS Program has a team already in place reviewing the waivers, deviations, and exceptions to ISS requirements documentation to assess the cumulative risk and potential impacts to the ISS.

NASA will develop a plan to incorporate a periodic review of the waivers, deviations, and exceptions and the risk accepted by the program. An independent review and assessment will also be an integral part of this process.

Questions submitted by Representative Ralph M. Hall

Regarding the interagency space policy review that was discussed at the hearing,

Q1. Who is heading the review?

Q2. Please list the agencies participating in the review, and identify which individuals are representing each agency.

Q3. What are the terms of reference and the schedule for the review, including the dates of meetings that have already taken place or are scheduled?

Q4. How do you intend to solicit Congressional input to the review?

A1–4. Since this activity was directed by components within the Executive Office of the President, any requests for additional information about the review should be directed to the White House.

Q5. An October 6, 2003 story in Space News indicates that you believe "that the Space Station can be operated and produce sufficient science with far fewer than the six or seven astronauts initially planned." On other occasions, including in meetings with me, you have indicated the Station crew will grow beyond the current "core complete" complement of three astronauts. I am left wondering about the possible range of numbers that lie between "far fewer than six" but "more than three."

Please state clearly your position on the number of astronauts that will be required to support the Space Station in configurations beyond "core complete."

A5. The Administrator's remarks as reported in *Space News* were taken out of context. He was highlighting the fact that through new efficiencies identified by the Program, the two-person crew on-orbit has been able to perform both operations and utilization activities at a level not previously envisaged. Nevertheless, the implication of his remarks that science requirements will drive the ultimate size of the crew on Station is consistent with what the Administrator has said previously. In December 2002, the ISS Partnership endorsed an ISS Configuration Option Path based on science priorities, rather than an arbitrary number of crew. This Option Path will ultimately increase the size of the ISS crew beyond three to meet the ISS utilization and resource requirements that had been re-validated in 2002. As the International Partners agreed in their December 2002 Joint Statement, the Program should undertake a "phased growth of ISS capabilities (with a) significantly increased quantity of crew."

Upon return-to-flight of the Space Shuttle, the ISS Program plans to continue implementation of its original assembly sequence, which includes U.S. Core Complete

with the launch of Node 2; this will allow accommodation of the remaining International Partner elements. Capability enhancement options to accommodate a larger crew are still under consideration. The Partnership is currently revising the ISS Program Action Plan for Selection of an ISS Configuration. This updated Program Action Plan will enable the Partnership to make a final determination of the Station's configuration by December 2004.

Questions submitted by Representative Nick Lampson

Q1. The CAIB report leaves the clear implication that the balance between NASA and contractors' positions, responsibility, and expertise had shifted too far in the direction of the contractors.

Q1a. How many people will you be hiring within NASA to enable you to meet CAIB's return-to-flight recommendations?

A1a. We are still reviewing the civil servant skill mix that will be required to implement the CAIB Return-to-Flight recommendations, and we will keep the Congress informed, as we better understand the necessary augmentations to our civil service skill mix.

Q1b. Once the Shuttle has been returned to flight, how many people will NASA need to hire in order to assure a safe Shuttle program?

A1b. After Return-to-Flight, we expect to continue supporting a larger civil servant workforce to provide additional government oversight into the Space Shuttle program. These new civil service positions are not expected to come at the expense of the existing contractor workforce.

Q1c. How much will that augmented workforce cost on an annual basis?

A1c. We will have a clearer picture of the budget impact of these personnel requirements once we fully understand the necessary augmentations to our civil service skill mix.

Q2. Please clarify for the record the activities that have been underway in NASA over the past 3 years to "contract out" or "competitively realign" parts of the in-house Shuttle workforce. Specifically:

Q2a. We understand the only Shuttle positions to be contracted out during this period were 42 FTE's associated with the Launch Processing System (LPS) at Kennedy Space Center. Is that number correct?

A2a. Forty-two FTE's associated with the LPS were identified for competitive realignment in NASA's Competitive Sourcing Plan. Upon further review of the Plan, it was noted that these individuals were already contractor employees, not civil servants. Therefore, no in-house Shuttle workforce activities were further contracted out in this case.

Q2b. What plans are in place or were in place at the time of the Columbia *accident to contract out or competitively realign Shuttle positions beyond the 42 in the LPS program? How many positions were involved?*

A2b. At the time of the *Columbia* accident, NASA was still developing its competitive sourcing strategy for the Space Shuttle Program (SSP). The *Columbia* Accident Investigation Board (CAIB), in its final report, made a series of findings and recommendations regarding the organization and operation of the Shuttle Program, which will influence NASA's actions in this regard. As a matter of interest, the independent Shuttle competitive sourcing study led by RAND in 2002 determined that, when measured by the expenditure of program funding, the Shuttle Program is currently 92 percent outsourced.

Q2c. At the time of the Columbia *accident, how was NASA complying with annual performance goal #2H21, as stated in NASA budget submissions from fiscal years 2002–2004, to "continue implementation of planned and new Shuttle privatization efforts and further efforts to safely and effectively transfer civil service positions and responsibilities to private industry"?*

A2c. NASA was in the process of developing a competitive sourcing strategy for the Shuttle Program that was intended to be implemented as a follow-on to the Space Flight Operations Contract (SFOC). To assist in this effort, NASA was assimilating the findings and recommendations of a number of studies on this subject to determine an appropriate course of action.

Q2d. At the time of the Columbia *accident, how was NASA complying with OMB's evaluation of the Shuttle program, released with the fiscal year 2004 budget, which stated "The Administration will incorporate the Space Shuttle in the President's Competitive Sourcing Initiative and make adjustments in the Shuttle infrastructure to help mitigate cost growth in Shuttle operations"?*

A2d. NASA was in the process of developing a competitive sourcing strategy for the Shuttle Program that was intended to be implemented as a follow-on to the Space Flight Operations Contract (SFOC). To assist in this effort, NASA was assimilating the findings and recommendations of a number of studies on this subject to determine an appropriate course of action.

Q2e. Is it true that at the time of the Columbia *accident, Shuttle Program Manager Ron Dittemore had set a goal of out-sourcing half of the Shuttle workforce?*

A2e. In a concept of privatization of the Space Shuttle Program (SSP), which Mr. Dittemore authored in 2001, he observed that since 1993 the NASA SSP civil service workforce had been reduced by nearly one-half as NASA pursued privatization of the SSP through contract consolidation. He further observed that, if privatization were to proceed, this trend would continue. While there was considerable discussion and debate on the subject of further privatization efforts ongoing at the time of the *Columbia* accident, no firm competitive sourcing strategy (and no firm goals for further outsourcing) had yet been established by the SSP.

Q2f. Have NASA's plans far contracting out or competitively realigning parts of the Shuttle program changed since February 1, 2003?

A2f. As noted in the response to question 1b above, the final report of the CAIB included several findings and recommendations regarding the organization and operation of the Shuttle Program. While no final determination has been made, implementing the CAIB recommendations will influence and possibly alter NASA's competitive sourcing strategy from the direction it was headed prior to the *Columbia* accident.

Q3. The CAIB report also leaves the clear implication that the Shuttle program is under-funded. Many past members of the Aerospace Safety Advisory Committee have reached the same conclusion.

Q3a. Once the Shuttle resumes flight, will additional resources (i.e., above the amounts appropriated in recent years) be required to operate it safely?

Q3b. If so, how much? If not, why not?

A3a,b. NASA accepts the conclusion of the CAIB report that the Space Shuttle is capable of returning to flight safely. There will be additional costs to the Space Shuttle operations budget to implement some of the CAIB recommendations. Once the Shuttle returns to flight, the resources required for both Shuttle operations and long-term, strategic investments will be vetted through the normal annual budget process.

Questions submitted by Representative Zoe Lofgren

Q1a. The Space Shuttle Independent Assessment Team (SIAT) report was issued in early 2000.

When did you first become aware of the SIAT report at either OMB or NASA?

A1a. After the *Columbia* Accident, officials in the Office of Space Flight briefed me on a number of Space Shuttle studies, including the SIAT report.

Q1b. Did you ever ask the SIAT chairman, Dr. Henry McDonald, to brief you on the findings and recommendations or the report? If so, when?

A1b. No.

Q1c. Did you take any specific actions in response to the SIAT report? If so, what were they, and when?

A1c. Most of the SIAT recommendations were aimed at bringing best practices from other high-risk organizations into the Space Shuttle Program, (SSP). Prior to my arrival at NASA, the Space Shuttle program had begun a series of regular senior management meetings that specifically addressed the issues of complacency and the inherent risk to the SSP relative to process and procedure change. After I became NASA Administrator in 2002, this review process was expanded to include the best

practices from the Navy submarine safety programs and working to incorporate this experience into all of NASA's programs, including the SSP.

Since the *Columbia* Accident and the subsequent *Columbia* Accident Board recommendations, additional measures are being taken to improve communication and streamline the reporting process. Initial management changes have been put into place, such as the establishment of a new independent NASA Engineering and Safety Center, initiation of Mission Management Team training and simulations, and a reorganization of the Space Shuttle program to include stronger systems integration. The Agency will take additional actions in the future as we work with representatives from industry, academia, and other government organizations to determine how best to institutionalize "best practices" into the NASA culture.

Q2. "Nearly two weeks after the Columbia *accident you (O'Keefe) testified to a joint House-Senate hearing that the foam impact on* Columbia *was like a foam beer cooler lid falling off the back of a pick-up truck at 50, miles per hour. The size weight (about two lbs) and velocity (about 500 miles per hour) of the destructive foam chunk were known by scores of NASA contractor employees within two days after the* Columbia *launch, as was the fact that the impact energy was orders of magnitude grater than that of a foam beer cooler lid traveling at 50 miles per hour."*

Q2a. Why nearly a month (actually two weeks) after the size and speed of the foam were widely known within the agency, did you so grossly misstate the potential foam danger in public and Congressional appearances?

Q2b. Who advised you on this matter?

Q2c. Did any agency employee ever tell you that the analogy would be misleading and not meaningful?

A2a,b,c. In the wake of the *Columbia* disaster, all of us were searching for the reasons as to the cause of the tragedy. With intense pressure from the press and public to understand what happened, there was much speculation and many people, myself included, tried to put some form to possible explanations. I do not fault any of my colleagues for searching and trying to provide me with scenarios of the possible and probable causes, especially not during the immediate weeks following the *Columbia* disaster. At that time, there were a variety of views among the experts about foam as a possible cause of the *Columbia* accident. NASA gave the CAIB the authority and the resources necessary to conduct a full, complete, and independent investigation into the ultimate causes behind the accident. The CAIB did so, and its final report provides NASA with a clear blueprint for the safe return-to-flight of the Space Shuttle fleet.

Question submitted by Representative Dana Rohrabacher

Q1. How quickly could NASA develop and demonstrate the capability to transport only cargo to the Space Station without using the Space Shuttle? What issues would need to be addressed to develop this capability? Does NASA intend to develop such a capability? If not, please explain. If a decision on whether or not to develop such a capability has not been made, what are the criteria for making this decision?

A1. On January 14, 2004, the President unveiled a new vision for space exploration. In this new vision, the Shuttle is planned to be retired in 2010, following the completion of its role in Space Station assembly. The Space Shuttle's unique capabilities (rendezvous, docking and EVA) are essential for the assembly of the remaining modules and components of the International Space Station. NASA will acquire cargo transportation as soon as practical and affordable to support missions to and from the International Space Station; and acquire crew transportation to and from the International Space Station, as required, after the Space Shuttle is retired from service.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Admiral Harold Gehman (retired), Chairman, Columbia *Accident Investigation Board*

Questions submitted by Chairman Sherwood Boehlert

Q1. What recommendations do you have to strengthen the effectiveness of the Aerospace Safety Advisory Panel (ASAP)? Are changes to the statute establishing the ASAP necessary? If so, please explain.

A1. The Board did not investigate the ASAP. However, it was clear that the yearly report of the ASAP was not being utilized by NASA in any great detail.

Q2. The Columbia *Accident Investigation Board recommended that NASA upgrade the ascent tracking cameras and that the operational status of these cameras should be a Launch Commit Criteria. NASA has announced the intent to launch during daylight hours. Was it the Board's intent to limit the Shuttle to daylight launches? What issues would need to be addressed prior to attempting a night launch?*

A2. The Board never directed NASA that the only launches could be accomplished during the daylight hours. We did make solid recommendations on making sure that proper photography was being recorded on launches to monitor debris hits on the Orbiter. The Board simply stated the requirement to have three useful views of the orbiter during every ascent. The Board did not address how to obtain these three useful views during a night launch and does not have the technical expertise in this area to make additional observations about the issues of imaging during a night launch.

Q3. In your testimony, you stated, "that when you build a crew transport capsule, that you are also going to have to get some kind of propulsion system to get it up there. Just sticking this thing on top of a Delta IV is not going to do it." On what basis is this conclusion based? Would a Delta IV or other similar vehicle satisfy the requirements for safety, if a crew escape system were made part of the crew transport capability? Would you have separate, more lenient, safety requirements for loss of mission than for loss of crew?

A3. The Board recommended that the Shuttle be replaced ASAP as the main means of getting manned space programs to orbit. Instead of just taking off the shelf propulsion systems to get something to orbit, NASA needs to look at its vision, move to the concept of operations, outline the requirements and capabilities (to include crew escape) and finally determine the platform that would meet the needs of manned space flight.

Question submitted by Representative Ralph M. Hall

Q1. One of the CAIB's return-to-flight requirements is the development of an emergency repair capability for the "widest possible range of damage to the Thermal Protection System, including both tile and Reinforced Carbon-Carbon." NASA officials now indicate that they might not be able to comply with that recommendation in the near-term for holes the size of the one that opened on Columbia*'s leading edge.*

Does the CRIB still stand by its recommendation that the Shuttle should not fly until such a repair capability is available?

A1. The Board was very clear on this issue—". . .develop a practicable capability to inspect and effect emergency repairs to the widest possible range of damage to the TPS, including tile and RCC.. . ." The Board stands by that recommendation. The Return-to-Flight group will need to determine if the intent of the recommendation has been met.

Question submitted by Representative Bart Gordon

Q1. The CAIB report discussed at length the pressure exerted by senior NASA management to meet the February 19, 2004 milestone for Space Station "Core Complete." Do you agree with the Administrator's explanation that there was no schedule pressure since no recent Shuttle mission launched on time, or do you think that the evidence shows that each Shuttle launch delay simply added to the schedule pressure perceived by the NASA workforce?

A1. Insidious scheduling pressure was evident to the Board during many interviews of NASA personnel by Board personnel. While this pressure may not have been evident at senior levels in NASA HQ, it was clear the SSP felt the pressure of making the Node 2 deadline from the Program Manager down to the shop worker at KSC. The Board found sufficient evidence that schedule pressure was felt at the working level.

Question submitted by Representative Nick Lampson

Q1. In a response to a question by Mr. Barton on the potential availability of a replacement vehicle for crew transport, you stated:

"Sir, don't forget to include in your estimates that when you build a crew transport capsule, that you also are going to have to get some kind of propulsion system to get up there. And just sticking this thing on the top of a Delta IV is not going to do it."

Please elaborate on what you meant by "just sticking this thing on the top of a Delta IV is not going to do it." What is your concern, and what do you think will need to be done to address that concern?

A1. This statement addresses a concern that the next launch vehicle is designed with specific set of requirements in mind for a manned space vehicle. While any number of solutions are possible to this problem, including the modification of unmanned systems for use in the manned space program, this can't be done without first considering the mission requirements of our next launch vehicle.

The Board recommended that the Shuttle be replaced ASAP as the main means of getting manned space programs to orbit. Instead of just taking off the shelf propulsion systems to get something to orbit, NASA needs to look at its vision, move to the concept of operations, outline the requirements and capabilities (to include crew escape) and finally determine the platform that would meet the needs of manned space flight.

Questions submitted by Representative Zoe Lofgren

Q1a. What budget documents did you receive from NASA or OMB that detailed upgrade requests from the Shuttle or Safety programs to the NASA Headquarters budget office, from NASA to OMB, pass-backs from OMB to NASA, or initial OMB guidance to NASA on the preparation of human space flight budget requests?

How hard did the CAIB push to get these documents?

A1a. Executive privilege protects pre-decisional, NASA-executive office communications. We could have requested such information from NASA, but we were advised by NASA general counsel's office that the request would have been denied on the basis of executive privilege.

Q1b. Did anyone advise you not to pursue the budget document requests? If so, who?

A1b. Executive privilege protects pre-decisional NASA-executive office communications. We could have requested such information from NASA, but we were advised by NASA general counsel's office that the request would have been denied on the basis of executive privilege.

Questions submitted by Representative Chris Bell

*Q1. Administrator O'Keefe has been quoted in the press [*Space News, *9/1/03, page 1] saying that "the demand—the clarion call" of your report is that NASA should accelerate its proposed Orbital Space Plane (OSP) program. However, your report states that the Board "does not suggest what the next vehicle should look like." A Committee hearing held earlier this year identified serious questions about NASA's approach to its OSP program, including the cost uncertainty surrounding the OSP, the relatively low level of improvement in crew safety being sought in the OSP program, and whether OSP is the most appropriate approach to moving beyond the Shuttle.*

Q1a. Is Administrator O'Keefe making an accurate characterization of your report as demanding that NASA accelerate the Orbital Space Plane program currently being proposed to Congress?

A1a. The Board recommended that the Shuttle be replaced as the main means of getting man to Low Earth Orbit as soon as possible. However, we did not state what the solution should be—we did not tell NASA how to do it but what to do. This was centered on a criticism that NASA has been too platform centric and needed to revise its thinking by developing a systematic process of starting with a vision, then developing a concept of operations, move to a listing of requirements and capabilities, and then and only then do you outline what platform will answer the question of what the next space platform should look like.

Q1b. Regarding the CAIB's finding that the U.S. should develop a replacement vehicle for the Shuttle's crew-carrying capability, if NASA develops a crew transfer vehicle to replace the crew-carrying capability of the Shuttle, how many flights will be required before it would cease being considered developmental and would become operational?

A1b. After 113 flights, the Board felt that the Shuttle Program was not operational. The Shuttle was still a research and development vehicle in an era of aging spacecraft, an era mankind has never experienced so there was still learning being gathered on every SSP flight. This question is well outside the technical ability of the Board to answer.

Q1c. The CRIB has recommended that NASA have an autonomous on-orbit TPS inspection and repair capability on the Shuttle. Should that also be a requirement for any follow-on crew transfer vehicle?

A1c. The Board recommended that the Shuttle be replaced as the main means of getting man to Low Earth Orbit as soon as possible. However, we did not state what the solution should be—we did not tell NASA how to do it but what to do. This was centered on a criticism that NASA has been too platform centric and needed to revise its thinking by developing a systematic process of starting with a vision, then developing a concept of operations, move to a listing of requirements and capabilities, and then and only then do you outline what platform will answer the question of what the next space platform should look like.

Appendix 2:

Additional Material for the Record