

**DEPARTMENT OF DEFENSE AUTHORIZATION FOR
APPROPRIATIONS FOR FISCAL YEAR 2004**

HEARINGS

BEFORE THE

COMMITTEE ON ARMED SERVICES

UNITED STATES SENATE

ONE HUNDRED EIGHTH CONGRESS

FIRST SESSION

ON

S. 1050

TO AUTHORIZE APPROPRIATIONS FOR FISCAL YEAR 2004 FOR MILITARY
ACTIVITIES OF THE DEPARTMENT OF DEFENSE, FOR MILITARY CON-
STRUCTION, AND FOR DEFENSE ACTIVITIES OF THE DEPARTMENT OF
ENERGY, TO PRESCRIBE PERSONNEL STRENGTHS FOR SUCH FISCAL
YEAR FOR THE ARMED FORCES, AND FOR OTHER PURPOSES

PART 5

EMERGING THREATS AND CAPABILITIES

MARCH 14, 31; APRIL 9, 2003



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AND CAPABILITIES**

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**DEPARTMENT OF DEFENSE AUTHORIZATION
FOR APPROPRIATIONS FOR FISCAL YEAR
2004**

FRIDAY, MARCH 14, 2003

U.S. SENATE,
SUBCOMMITTEE ON EMERGING THREATS
AND CAPABILITIES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

**THE POSTURE OF U.S. JOINT FORCES COMMAND AND
THE ROLE OF JOINT EXPERIMENTATION IN FORCE
TRANSFORMATION**

The subcommittee met, pursuant to notice, at 9:33 a.m. in room SR-222, Russell Senate Office Building, Senator Pat Roberts (chairman of the subcommittee) presiding.

Committee members present: Senators Roberts, Dole, Reed, and Akaka.

Majority staff members present: Charles W. Alsup, professional staff member; Carolyn M. Hanna, professional staff member; Gregory T. Kiley, professional staff member; and Joseph T. Sixeas, professional staff member.

Minority staff members present: Richard W. Fieldhouse, professional staff member; Maren R. Leed, professional staff member; and Arun A. Seraphin, professional staff member.

Staff assistants present: Leah C. Brewer and Andrew W. Florell.

Committee members' assistants present: James Beauchamp, assistant to Senator Roberts; Henry J. Steenstra, assistant to Senator Dole; Frederick M. Downey and Aaron Scholer, assistants to Senator Lieberman; Elizabeth King, assistant to Senator Reed; Davelyn Noelani Kalipi, assistant to Senator Akaka; and William K. Sutey, assistant to Senator Bill Nelson.

OPENING STATEMENT OF SENATOR PAT ROBERTS, CHAIRMAN

Senator ROBERTS. The Subcommittee on Emerging Threats and Capabilities will come to order. We meet this morning to receive testimony from the Commander of the U.S. Joint Forces Command (JFCOM), Admiral Edmund P. Giambastiani, Jr., United States Navy and Vice Admiral (Ret.) Arthur K. Cebrowski—who if he is not the godfather of transformation, certainly is the god-prince, or maybe Machiavelli, or maybe all three wrapped up in one individual. Admiral Cebrowski is the Director of the Office of Force Transformation, in the Office of the Secretary of Defense. We will discuss

the current and future role of joint experimentation on transforming our Armed Forces to meet the challenges of an increasingly complex, uncertain, and threatening future.

Welcome, Senator Reed.

Senator REED. Thank you, Mr. Chairman.

Senator ROBERTS. I want to welcome our two distinguished witnesses. We have before us two of America's most able and willing public servants. Admiral Giambastiani, we congratulate you on your confirmation to this important position in October. This is your first appearance before this subcommittee in your new capacity, but I am sure it will not be your last.

Your leadership role as the joint forces trainer, provider, integrator, and innovator is critical to the timely and coordinated transformation of our Armed Forces, and I am sure we will seek your counsel often, so we welcome you.

Admiral Cebrowski, you served our Nation well as a highly decorated sailor, and now you have selflessly taken on this very difficult and challenging chore of guiding the transformation of our Armed Forces, a concept around which many opinions abound. Some would say that they are unique and unprecedented ideas, and some would say brilliant and often controversial ideas that you have advocated while in the Navy, show you to be a man of vision and courage. We are fortunate to have you in this new role. I want to thank you for your past courtesy calls to me and suggestions to this subcommittee.

You both are aware of the interest of this subcommittee, for strengthening our joint warfighting ability and our interest in the timely and meaningful transformation of our Armed Forces to meet the very different threats of the future. The testimony in this subcommittee in years past makes it clear that we have focused on many areas of joint military operations and capabilities.

As Senator Reed knows, the passage of the Goldwater-Nichols Act in 1986 did initiate a process that has greatly changed the way our Armed Forces operate together. It puts into place processes to assess gaps in our joint capabilities and try to really identify the requirements to fix these gaps.

Members of this subcommittee have been instrumental in getting a joint experimentation process initiated. I remember well my first trip to the Atlantic Command, that is what it was called in years past, and that was under the command of Admiral Gehman, and the difficulty staff and all of us had in obtaining any funding for any joint exercise.

The events of September 11, however, changed a lot of things, including the urgency with which we need to review the capability of our Armed Forces to ensure that they are organized, trained, and equipped to be adaptable and capable of deterring and, if necessary, defeating known and emerging threats to our national security.

We have the processes in place that should work, but we seem to relearn the same lessons in conflict after conflict. We also hear defense experts in and out of government really lament the lack of urgency for transformation, and our inability to rapidly acquire the new capabilities that we need. We hear a lot about that, but in talking to Admiral Cebrowski, and I share his opinion, it is not so

much that we have the need for transformation. We are over that hill. It is actually what we are doing.

I for one, and many of my colleagues, find some of the criticism troubling. We hear over and over that we have a unique opportunity to transform our forces to successfully confront our current and future challenges, but we also must listen with concern as the observers who are objective, former defense officials and others, assert that little has really changed in the requirements, the acquisition, and the budgeting mechanisms in the Department of Defense.

Three years ago, this subcommittee initiated legislation that accelerated the joint experiment process and required the Department of Defense to conduct a major joint field experiment in 2002. That experiment, called the Millennium Challenge 2002, concluded in August.

Admiral Giambastiani, we are anxious to hear what was accomplished, how this was translated into tangible improvements for our operating forces, and how you view the future role of joint experimentation, including how you are leveraging actual military operations to identify the trends, the gaps, and the new requirements for our joint warfighting capabilities.

This subcommittee also expressed concern and required the Department to assess the need for some type of joint national training capability. I am pleased to learn that our U.S. Joint Forces Command is now formalizing this concept. We look forward to your testimony on this capability, and how you feel it will contribute to the transformation of our Armed Forces.

Admiral Cebrowski, we are especially interested in your understanding of the role you perceive for your office and how you feel you have influenced the pace and direction of transformation. In our conversation earlier, I asked you, are you pushing a rope, or do you have a lot of help in pulling it. I think you indicated to me you have a lot of help in pulling it. Clearly, there should be a close association between your two organizations. We look forward to your characterization of this relationship.

Finally, most veterans of the Pentagon would agree that the momentum for change revolves around resources. Both of you have rather modest budgets to achieve what seem to be rather daunting tasks. Some have even suggested that the U.S. Joint Forces Command should have some ability to rapidly acquire and field needed capabilities that are identified in the joint experimentation process. This subcommittee is anxious to hear both of your assessments about the adequacy of your resources and existing authorities to successfully accomplish your important missions for our men and women in uniform.

Gentlemen, we thank you again for being here and what you do every day for our great Nation. We look forward to your testimony. I want you to feel free to summarize your testimony as you deem fit. It is not necessary to read each and every golden word, which will be made part of the record for sure.

I welcome now the distinguished ranking member and my good friend Senator Reed, and we also thank Senator Dole for attending the subcommittee meeting, and thank you, Elizabeth, for taking time on a Friday morning to attend.

STATEMENT OF SENATOR JACK REED

Senator REED. Thank you very much, Mr. Chairman. Let me first say what a privilege it is to serve with you as the Ranking Member. You and Senator Landrieu have done an extraordinary job over the past several years. You are the first and only chairman of this subcommittee, so when we think of emerging threats, we think of Pat Roberts. [Laughter.]

In fact, even before you were on this subcommittee, I thought of emerging threats and Pat Roberts. [Laughter.]

Senator ROBERTS. I had thought I had reached the place in my life where I was not an emerging threat, I was just a threat. [Laughter.]

Senator REED. That will be upon us shortly, Mr. Chairman, but it is a pleasure to be with you and serve with you. Let me commend you, with this subcommittee, you did so much to get it going, not only as the first chairperson, but as the one who saw the need. I appreciate that and want to thank you for it.

Senator ROBERTS. Jack, let me just interrupt, and pardon me for interrupting—if you would yield, I guess that is the proper way to say it. A lot of credit has to go to the chairman of the full committee, John Warner, who set up this subcommittee, 4 years ago, and a lot of credit has to go to Senator Lieberman and Senator Coats, whose idea it was in the first place, and so all we had to do is pick up the plate.

Senator REED. Well, you deserve a little bit of credit, so you will get it today, they rightly deserve it also, and thank you for that point.

Let me also welcome Admiral Giambastiani and Admiral Cebrowski. I had the privilege of getting to know Admiral Giambastiani in his submarine days. Admiral Cebrowski was the distinguished president of the Naval War College at Newport, Rhode Island, and in that capacity was a visionary, thoughtful, and articulate, not only a naval theoretician, but also someone who saw the bigger picture with the whole Defense Department. I am glad you are in your present position, Admiral Cebrowski.

In fact, I recall last November you were at a conference and you were reported to have said that a lot of the discussion at the Pentagon and Congress today about defense is becoming irrelevant, that we should be talking more about sensors than about the kind of aircraft we are buying and how many. It is that provocative and innovative thinking I hope you will follow through on in your present position, and maybe even this morning you might amplify those remarks.

I am very concerned today, as we go forward, to look at the evolution of the roles and responsibilities of transformation within the Department. I know we have several different organizations that are involved. There is a forthcoming transformation planning guidance which I hope will be a road map for a lot of what we do institutionally in transformation. We have the Office of Force Transformation, the Joint Forces Command, the Joint Chiefs of Staff, the regional combatant commanders, the military services, all of these have to be not just integrated, but really energized to provide real transformation.

One of the issues that is throughout all of this discussion is just changing cultures, which might be the most difficult challenge that you gentlemen have. We are very much set in our ways both here in Congress and in the Pentagon, and to change the cultures might be the greatest challenge, and you might also discuss some of your thoughts about that this morning.

One of the key issues that we are going to be looking at is to ensure that you have adequate resources to do your jobs, and that there are adequate resources within the overall budget so that you can reach out and make the transformation not just in a rhetorical sense, but in a practical sense with new systems, methods, and approaches to persistent problems.

One of the things that I noted with some dismay was that the technology, the research and development (R&D) budget in this year's budget has been decreased. So much of what you are going to be doing is to identify those appropriate projects and hopefully accelerate their deployment with the field forces. R&D is a key part of what I think you are going to be doing and I would be much more enthusiastic if we could get some additional dollars into our R&D budgets across the Services.

Let me also just say to Admiral Giambastiani, you have been in command now for, not the longest period of time, and your thoughts would be very much appreciated about the roles you see for JFCOM and also the resources you think you need at JFCOM. I am extremely pleased to be here, and also delighted that we have such competent and dedicated patriots who are doing this important job, and I thank you for that.

Senator Akaka is here, and I thank you for joining us. Senator Clinton very much wanted to be here, but she is at Fort Drum, New York this morning. The 10th Mountain Division lost a helicopter with several soldiers, and I know General Hagenbeck, the commander, and I know she wanted to be up there with General Hagenbeck and the troops of the 10th Mountain. She is not here with us because of that reason.

Thank you, Mr. Chairman.

Senator ROBERTS. Gentlemen, please proceed, and I think Admiral Giambastiani will proceed first.

**STATEMENT OF ADM. EDMUND P. GIAMBASTIANI, JR., USN,
COMMANDER, UNITED STATES JOINT FORCES COMMAND**

Admiral GIAMBASTIANI. Thank you, Mr. Chairman. Before I start, I would like to follow on Senator Reed's brief comments on the Fort Drum incident. I would like to recognize the brave men and women of our Armed Forces who put their lives on the line every day at home and abroad to defend our Nation and our way of life.

Earlier this week, as Senator Reed mentioned, we lost 11 of our soldiers at Fort Drum, New York and 2 others were injured while training. This tragic accident serves as a reminder both of the challenge and the commitment that our service members willingly face every day to keep our Nation free. We are proud of their service, and pray for their families and loved ones.

Mr. Chairman, distinguished members of this subcommittee, I am honored to testify for the first time before you as the Commander of U.S. Joint Forces Command. Joining me today, and seat-

ed directly behind me, is the Command Sergeant Major of the United States Joint Forces Command, Sergeant Major Mark Ripka, United States Army. I am proud to have him with me today.

My message to the subcommittee today is that Joint Forces Command, following the leadership of President Bush, Secretary Rumsfeld, and General Myers is focused every day on executing the top three priorities of the Department of Defense: successfully pursuing the global war on terrorism, strengthening joint warfighting capabilities, and transforming the joint force. We do this, as the chairman mentioned, in our role as joint force provider, joint force trainer, joint force integrator, and joint concept development and experimenter.

Joint Forces Command is leaning forward on all of these areas so that our homeland can be defended, allies assured, potential adversaries dissuaded and deterred, and those who would challenge our freedom and peace swiftly and decisively defeated.

Exercising combatant command of 1.1 million soldiers, sailors, airmen, and marines based in the continental United States, Joint Forces Command is responsible for providing trained and ready forces to all of our regional combatant commanders, yet it is not enough merely to manage the deployment of our joint force, as large and complex a task as that proves to be. Those forces need training, and they need capabilities to do their jobs swiftly and effectively. That ties our contribution to the global war on terrorism directly to our drive to strengthen joint warfighting capabilities.

In our role as joint trainer, we deploy an average of 100 observer trainers from our command headquarters every day in support of other combatant commander training requirements. We have been able to flex significantly in the last 6 months to support critical mission rehearsals for commanders such as General Tommy Franks, Commander of the Central Command. In the same period, we have also helped stand up and train four joint task forces for employment in Afghanistan, Guantanamo Bay, Cuba, the Horn of Africa and, most recently, in Southwest Asia. This training constitutes one of the United States' most potent asymmetric advantages—highly trained forces with superb command and control organizations, equipment, and procedures.

As a final note on strengthening joint warfighting, we have been rapidly exploiting our joint experimentation results for use in the field. One example I will give, and I certainly can talk more about it later, is Combined Joint Task Force 180 in Afghanistan, which used the training, equipment, and procedures provided to them in preparation for Millennium Challenge 2002, to conduct their highly successful campaign in Afghanistan. We continue to look for opportunities to convert these experimental results into quick wins.

Having shed the operational burdens, as directed by the President in the Unified Command Plan, Joint Forces Command has been liberated to focus its effort on transforming the joint force. In effect, I have lost a geographic area of responsibility, but I have gained a more challenging and exciting area of responsibility: the future. To confront these transformation challenges posed by an uncertain future that this subcommittee looks at, populated by asymmetric threats, weapons of mass destruction, transnational actors, and regional powers, Joint Forces Command has embarked on

a wide-ranging and robust campaign of joint experimentation, building on the insights of Millennium Challenge 2002.

We are excited that we are able to provide much-needed common joint context in the concept and development efforts of all of our Services, in addition to our combatant commanders. This forms the basis for multinational cooperation and transformation with our close allies around the world and as we stand up NATO's Allied Command.

Finally, in addition to experimentation and concept development, which produces critical intellectual capital, Joint Forces Command is taking a larger material role in filling a critical void in identifying joint interoperability requirements, especially in the area of joint battle management command and control. This is an area, Mr. Chairman, that I will be happy to talk about. You asked about areas, and so did Senator Reed, we need to concentrate on. This is a very big one.

Building on our integration and interoperability functions, we will work with the Services to provide the command and control solutions, both near and long term, that our combatant commanders will require.

Mr. Chairman and members of the subcommittee, since taking command last October I have worked hard to learn as much as I can about Joint Forces Command. I have visited every subordinate command of Joint Forces Command. I have traveled with Command Sergeant Major Ripka to visit troops deployed around the world, including Bosnia, Afghanistan, and throughout the Persian Gulf. I have been impressed by the troops' service, devotion, and resolve. I have been uplifted by their morale, confidence, and good cheer, and I can report to you that your support, as well as that of Congress and the American people, has borne fruit in the best-trained, best-equipped, and best-led joint force that I have ever seen in my professional career. I consider it a privilege to serve with these young men and women at this critical time in our Nation's history.

Thank you for your patience and attention. I will be pleased to answer your questions, sir.

[The prepared statement of Admiral Giambastiani follows:]

PREPARED STATEMENT BY ADM. EDMUND P. GIAMBASTIANI, JR., USN

Mr. Chairman, distinguished members of the subcommittee, I am honored to testify for the first time as Commander of U.S. Joint Forces Command on our role in the global war on terrorism and the ongoing process of transforming our Armed Forces.

Let me open by assuring the subcommittee that U.S. Joint Forces Command is focused every day on winning the global war on terrorism (GWOT), including the successful defense of the homeland, and leading the transformation of the U.S. Armed Forces.

Joint Forces Command is a dynamic command that learns from and works with our partners throughout the Department of Defense to lead continuous evolutionary and revolutionary improvements in U.S. warfighting capabilities to enable continued success, including rapid, decisive military action. As such, I see U.S. Joint Forces Command maximizing the Nation's future and present military capabilities by advancing joint concept development and experimentation, identifying joint requirements, ensuring interoperability, conducting joint training, and providing ready forces and capabilities—all in support of the Combatant Commands.

This focus follows directly from the President's transformation agenda as outlined in his Unified Command Plan 2002, or "UCP 02" that took effect 1 October 2002, and the Secretary of Defense's top three priorities:

1. Successfully pursue the global war on terrorism
2. Strengthen Joint Warfare Capabilities
3. Transform the Joint Force

U.S. Joint Forces Command is the primary force provider to our country's other combatant commanders worldwide. With over 1.1 million soldiers, sailors, airmen, and marines—some 83 percent of the Nation's general-purpose forces—I allocate a significant part of each day managing the deployment of joint forces from our service components in support of the global war on terrorism. Forces assigned to Joint Forces Command comprise some 74 percent of the forces engaged in operations in Afghanistan, 52 percent of the forces building in the Persian Gulf Region, and 90 percent of the Nation's forces deployed worldwide in support of the war on terrorism, including here at home.

Joint Forces Command's role in joint training has been instrumental in honing the joint command and control architecture now prosecuting the war on terror. In the last 8 months alone, Joint Forces Command has trained and deployed four Joint Task Forces, now commanding joint and multinational forces in Afghanistan, the Horn of Africa, and Guantanamo Bay, Cuba, and Southwest Asia. On any given day, moreover, some 100-plus observer/trainers and senior mentors from this command are deployed to support the joint training programs of the combatant commanders in their areas of responsibility around the globe. Similarly, every Joint Special Operations Task Force has received training, and, in some cases, augmentation by the experts from Joint Forces Command's Special Operations Command.

Our training capabilities have a global reach and our processes focus on the needs of the joint warfighter. The world class Joint Warfighting Center in Suffolk, Virginia, for instance, has already organized and executed two major exercise rehearsals for U.S. Central Command and a force flow and logistics rehearsal for U.S. European Command in preparation for potential operations against Iraq. In the case of Central Command's event, known as Internal Look and conducted in December 2002, we actually were able to quickly develop a follow-on exercise only 2 months later at the request of General Franks and his ground Component Commander, called Lucky Warrior, to specifically refine operational concerns discovered by Internal Look.

Joint Forces Command's concept development and experimentation initiatives have had an immediate and positive impact on the global war on terrorism. Outcomes, systems, procedures, organization and experience during Millennium Challenge 02 (MC02), last summer's congressionally-mandated joint field experiment, are making a difference today. The Services and Regional Combatant Commands are applying the training, initiatives gained during MC02 and are exploiting their own, and selected joint concepts and capabilities validated by the experiment.

The Army's XVIII Airborne Corps is using MC02 lessons, software and processes today as part of Combined Joint Task Force (CJTTF) 180s operations in Afghanistan; the Air Force's use of software tools and procedures in Afghanistan and at Prince Sultan Air Base; and the Navy's use of MC02 concepts, software and processes to improve training for deploying naval forces.

Command authority over my Service Component Commands has been vital to understanding and responding quickly to the training and readiness needs of the warfighter. This command has trained or assisted in training every JTF deployed overseas, establishing joint standards across the force. We have also worked closely with the component commanders to review, update and streamline the force flow procedures for units deploying from the continental U.S.

U.S. Joint Forces Command has simultaneously launched a comprehensive concept development and experimentation campaign to deliver capable joint forces that can operate coherently in a Knowledge-centric environment, enabled by Network-centric systems and trained to conduct Effects-based operations. Our campaign plan specifically aims to achieve these goals through close partnerships with the Combatant Commands, Services and Defense agencies by conducting our collective experimentation activities using a "common joint context" that defines the challenges of the future warfight. Conducting our experiments within a common understanding of the future warfight allows the joint community to determine future joint requirements in a collective way—before the acquisition of service capabilities. This process produces a shared understanding of the future joint environment that produces coherently joint capabilities that we describe as "born joint."

This spring Joint Forces Command will achieve a significant milestone in our campaign to expand the experimental ground by co-sponsoring a U.S. Army/Joint Transformation Wargame called Unified Quest 2003. Our intention is to embed within the Transformation wargame a common set of scenarios and a joint context that defines the operational level of war to determine how well emergent Army capabilities might actually work within a future joint and multinational environment.

Plans are also underway to establish the similar partnerships for other upcoming Service wargames later this year and in follow-on years.

In this important area, Joint Forces Command has matured its processes and products to the point where the “joint horse” is getting in front of the “service cart.”

In the near term, we have already begun implementing new warfighting capabilities and operational methods gained from Millennium Challenge 2002. Foremost among these is the implementation into the Regional Combatant Commands (RCC) of the Standing Joint Forces Headquarters prototype, or “SJFHQ.” The SJFHQ is comprised of a small but powerfully enabled team of planners specifically trained to speed the operational employment of a larger joint task force headquarters with real-time, actionable and shared knowledge crucial to the conduct of rapid and decisive operations. This shared understanding produces what we call the Collaborative Information Environment, or “CIE,” that, in our judgment, may very well change the conduct of future warfare. This prototype was immediately adopted by Central Command and is being implemented today in Pacific Command, European Command, Southern Command, and Northern Command, with the target date of fiscal year 2005 for the SJFHQ to be fully operational.

Undergirding the implementation of these new operational concepts is a powerful training environment known as a Joint National Training Capability, or “JNTC.” The JNTC is being designed in part to train Service units to operate as integrated joint forces anywhere around the world. Our aim is to turn the existing training and exercise environment into an integrating environment for new warfighting capabilities and methods. This will allow the rapid fielding of prototypes so that operators can test and improve them. We believe that the JNTC will not only transform the way our armed forces will train in the future but also speed the implementation of new capabilities and methods springing from our collective Service Joint Forces Command experimentation programs. In my view, the Joint National Training Capability will drive “jointness” down to the lowest tactical level.

Here again, the command authority that I maintain over my Service Component Commands has proven critical to the alignment of our training and experimentation campaign with the operational requirements of the force. The command relationship to the Component Commands anchors our transformation efforts to the joint warfighter—our ultimate customer.

Just as important, this command has formed collaborative partnerships in the experimentation campaign with other Federal Departments and Agencies. The Departments of State, Treasury, Justice, and Transportation, for example, have participated in our experiments to determine new information sharing processes and techniques included in the “Joint Interagency Coordination Group” concept. The combatant commanders have all taken this concept aboard and are establishing similar organizations within their headquarters with the focus of supporting the global war on terrorism. Though more experimentation and training is required to standardize and expand the concept to incorporate processes for theater engagement planning, deliberate and crisis action planning, and transition (to peace) planning, the “JIACG” capability will prove instrumental in leveraging all aspects of our national power and influence in a more coherent, unified way.

Likewise, we are expanding the experimental agenda with key multinational partners to focus on concepts that allows for timely coalition information sharing. Just last month, we conducted a worldwide, distributed, multinational Limited Objective Experiment (LOE) that included senior representatives from Australia, Canada, the United Kingdom and Germany. While the results are still being assessed, initial insights have identified the policy challenges that must be overcome to build a coalition equivalent of a Collaborative Information Environment.

Joint Forces Command is also deeply engaged in the transition plans of Allied Command Atlantic (ACLANT) as it becomes a NATO functional command focused on transformation to be known as Allied Command Transformation (ACT). Our NATO partners are closely monitoring our transformation campaign. We will seek to learn together as the Alliance, as a whole, dedicates itself to military transformation.

In partnership with the combatant commanders, Service Chiefs and senior Defense officials, this command is helping to promote the beginnings of a new culture of joint transformation. This culture rewards intelligent risk taking and supports competition of joint ideas in open venues. Our culture must reward those who question in order to make things better; who seek differing perspectives and innovative approaches and who are not paralyzed by the fear of failure. This culture understands that combatant commanders do not really care where a particular capability comes from so long as it is relevant to their warfighting needs, is interoperable across the force and which works. In all of my troop visits with our young warriors, I found that they “get it.” Innovation and “jointness” are important and intuitive

for them. The dynamic of this new culture goes virtually unnoticed and receives no fanfare and yet is chiefly responsible for providing the momentum towards joint transformation. In short, the real transformation is taking root within the minds of those participating in the change process. This is the culture of transformation that Congress help put in motion 17 years ago with the watershed Goldwater-Nichols Defense Act.

Lastly, like the military as a whole, Joint Forces Command has transformed itself to serve as the Nation's agent for transformation even as we have been deeply involved in supporting operations around the world. The divestiture of our geographic area of responsibility has enabled this command to focus on our new area of responsibility: the future. With your help, we are receiving the resources and authority to carry out our new mission and are now helping to deliver:

- Trained and ready joint forces to the regional combatant commanders
- Coherently-joint capabilities and operational methods to the joint warfighter of today
- A common joint context to Service experimentation programs that will lead to new "born joint" capabilities of tomorrow
- The first steps in alignment of Joint Battle Management Command and Control programs across the Department of Defense
- Integration of Interagency and Multinational capabilities into the change process, and
- The beginnings of a new culture of joint transformation.

What follows is a detailed overview of our successes and additional requirements to complete our mission.

THE GLOBAL WAR ON TERRORISM

The attacks of 11 September 2001 put this command on a wartime footing. Since that day, all elements of this command, including active, Reserve, National Guard, Civil Service, and contract employees are involved in this two-front war—at home and abroad. There can be no more important mission than fighting terrorism overseas and simultaneously securing the homeland. This Command has directly supported our Nation's offensive operations overseas while our homeland security through four major endeavors:

1. Joint Force Provider
2. Joint Force Trainer
3. Joint Force Integrator
4. Joint Force Experimenter

Joint Provider and Trainer

In the last year, Joint Forces Command has supported the war on terror with an aggressive training program that both improved our joint readiness of the force while setting the conditions for joint transformation. Specifically, this command trained and deployed Joint Task Forces such as: JTF 160 to Guantanamo Bay, Cuba; JTF 180 to Afghanistan and JTF HOA to the Horn of Africa. Additionally we have recently stood up Task Force IV for U.S. Central Command (CENTCOM) and trained the Southern European Task Force for U.S. European Command (EUCOM). Our observer/trainers have helped train the Commander, III Marine Expeditionary (CDR III MEF) for U.S. Pacific Command (PACOM) and Commander, Joint Task Force-Civil Support (CDR JTF-CS) for U.S. Southern Command (SOUTHCOM). In total, some 3,018 individuals from the Combatant Commands were trained to joint operational standards in the last year and over 786 man-years were dedicated to the training events supported by Joint Forces Command.

Overseas, troops from all Joint Forces Command components are actively involved in support of operations in Afghanistan, preparing for possible conflict in the Persian Gulf region, and supporting operations worldwide. Forces from JFCOM comprise some 53 percent of the forces supporting U.S. Central Command in Southwest and Central Asia. This force commitment has doubled our normal overseas force rotation and does not include the substantial obligation of Active and Reserve Forces to homeland security, force protection and infrastructure protection.

Additionally, other key elements of Joint Forces Command, such as the Cruise Missile Support Activity, Joint Personnel Recovery Agency, the Joint Communication Support Element (JCSE), and the Joint Warfare Analysis Center are providing critical support to the global war on terrorism in general and Operation Enduring Freedom in particular.

Joint Integrator

To accelerate the Joint Interoperability and Integration of Service-provided warfighting capabilities, our Joint Interoperability and Integration (JI&I) office continues to deliver materiel and non-materiel solutions to interoperability challenges by working closely with all combatant commanders, Services, and Agencies to identify and resolve joint warfighting deficiencies.

Joint Forces Command's JI&I efforts support current military operations by fielding:

- Interoperable capabilities between U.S. Army and U.S. Marine Corps ground commander command and control elements
- Collaborative planning capabilities for the combatant commanders
- Improvements to Joint Task Force information assurance and information management
- Adaptive mission planning and rehearsal capabilities for the combatant commanders

Additional efforts that directly support the commanders of Northern, Central, Pacific and Special Operations Commands in the near future include fielding capabilities for:

- Capabilities for JTF situational awareness, a Common Operational Picture (COP), and enhanced integration of the Joint Deployment
- Capabilities for integrated joint targeting, and intelligence analysis
- Capabilities for integration of Distributed Common Ground System multi-intelligence sources
- Capabilities for integrated Joint Intelligence, Surveillance, and Reconnaissance (ISR)

Joint Experimenter

As noted earlier, MC02 concepts are making a difference in the global war on terrorism as demonstrated by CJTF180 operations in Afghanistan.

CJTF180's implementation of MC02 concepts and capabilities in Operation Enduring Freedom illustrates the power of joint experimentation and joint training in general and MC02 in particular. XVIII Airborne Corps' exploitation of MC02 concepts and training were important factors in their success in Afghanistan. USJFCOM-developed concepts that are being applied in the war on terror listed below provide a sense not only of their operational utility but also the impact Joint Experimentation is having on today's force:

- Effects-Based Operations (EBO). CJTF180 use of EBO processes affords operational benefit.
- Operational Net Assessment (ONA). To support its effects-based operations, CJTF180 used an ONA-like process to view the enemy as an interconnected system of systems.
- Collaborative Information Environment. CJTF180 utilizes a CIE based on MC02 processes, within the CJTF headquarters and their functional components.
- Standing Joint Force Headquarters (SJFHQ). CJTF180 is exploiting SJFHQ tools and procedures and is implementing cellular reorganization initiatives to improve coordination and effectiveness.

Joint experimentation is a proving ground for important technological capabilities to support combatant command interoperability needs. Joint initiatives demonstrated in MC02 generated the following Transformation Change Package (TCP) recommendations:

- Adoption of software to support the Joint Fires Initiative (JFI)
- Implementation of the Joint En route Mission Planning and Rehearsal System-Near Term (JEMPRS-NT)
- Fielding the Network Security Management Correlation and Display System (NSM C&D)
- Supporting the identification, certification and fielding of automated tools to facilitate information transfer among information systems operating at various levels of security, e.g. the Joint Automated Single Guard Solution (JASGS) and Inter-Domain Transfer System (ITS)
- Fielding the technologies identified in the Automated Network Information Flow (ANIF) project
- Continuing development of Unmanned Aerial Vehicle (UAV) Interoperability

Joint concept development and experimentation findings are also being integrated with Advanced Concept Technology Demonstrations (ACTD) programs to provide a

path to accelerate near-term joint warfighter solutions. For instance, promising solutions to pressing warfighter needs sponsored in fiscal year 2002 by the Under Secretary of Defense (Acquisition, Technology, and Logistics) included:

- Content Based Information Security (CBIS) ACTD—sharing information across multiple security domains using cryptographic separation and dynamic access control.
- Area Cruise Missile Defense (ACMD) ACTD—improved detection, identification, and engagement capability against low altitude targets that may go undetected by the existing Joint Surveillance System.

Lastly, fundamental to the success of the DOD transformation effort is collaboration and the partnership with the activities of the wider transformation communities from joint, interagency and multinational organizations. MC02 provided a highly successful platform to establish close partnerships with these communities as well as with industry and academe.

STRENGTHEN JOINT WARFARE CAPABILITIES

Joint Provider and Trainer

The establishment of a Joint National Training Capability (JNTC) is perhaps one of the most important transformation programs that the Department of Defense and Joint Forces Command are developing. The goal of establishing a JNTC is to improve the ability of U.S. forces to fight effectively as a joint and combined team. Such improvement requires new capabilities to augment our existing joint training capabilities. While Service training centers have excelled at training Service tactical competencies, joint training requires a more holistic endeavor at the operational level of war. In its simplest terms, the JNTC envisions a global system to bring the benefits of live, virtual, and constructive opportunities to the user. To this end, we must create a network that is easily accessible, readily available and capable of supporting the wide spectrum of joint tasks. This network must provide an integrated, common architecture for ranges, training centers, experimentation venues, test and evaluation events, simulation centers, as well as venues for participants located around the globe.

History has taught us that joint warfighting is the way of the future. The development of a JNTC will support the broader strategic goal of Department of Defense Training Transformation with the ultimate goal “to train like we will fight.”

Establishing an initial operating capability in 2004 will support four or five JNTC events per year. Near-term milestones will include the conduct of “bridging” events, which are stepping stones towards full execution of training events. The JNTC will expand over time to reach full operational capability in fiscal year 2009, when the JNTC goal will be to support up to 40 events per year. During this time, the JNTC will continue to move from interoperability training at the tactical to the operational level, allowing network-centric and mission rehearsal capabilities that increase the combat power of sensors, weapon and decision making systems. As directed in the Defense Planning Guidance 04–09, Joint Forces Command will establish a joint management office (JMO) to oversee the programs necessary to implement the JNTC.

In the global war on terrorism, our forces are training and fighting alongside allies and coalition partners in different parts of the world. In support of this effort, we continue to train and exercise with multinational partners through existing alliances and programs such as NATO, NATO/Partnership for Peace (PfP), the American-British-Canadian-Australian Armies Standardization Program (ABCA) and bilateral support agreements.

We participated in or supported nine NATO, NATO/PfP, and “In the Spirit of” PfP exercises since March 2002 and are currently planning 15 more such exercises to be executed in the 2003–2004 timeframe. These exercises included the full spectrum of operations from crisis response operations and humanitarian relief to Allied/Coalition combat.

As part of the Chairman of the Joint Chiefs of Staff Exercise Program, USJFCOM is sponsoring a Combined Joint Task Force training event in June 2004, which will have a significant multinational contingent. ABCA has focused on this event as its U.S. hosted major biennial exercise. Additional multinational naval units have requested to participate as well. This U.S. joint/coalition exercise will also be a major event in the ongoing establishment of the Joint National Training Capability.

We are working closely with NATO’s Allied Command Atlantic (ACLANT) in its rapid transition from a strategic operational command to a strategic functional command focused on Transformation, known tentatively as Allied Command Transformation (ACT). JFCOM is providing specific expertise in the NATO effort to revise its exercise program and establish a European based Joint Warfighting Center

using Joint Forces Command's Joint Warfighting Center as a model. The center's personnel could train NATO elements such as the NATO Reaction Forces, component headquarters, and PfP nations in joint operations.

Joint Forces Command also has the responsibility to develop the Regional Security Cooperation Network (RSCN) initiative. The objective of the program is to assure security cooperation among allies, friends and potential partners. It will also enhance the ability of United States and coalition forces to become more interoperable and more efficient in the conduct of multinational operations. The Swedish-U.S. Viking series exercise, the Eastern European Defence Ministerial series, and the South Eastern Europe Simulation Network—02 are examples of ongoing Regional Security Cooperation Network initiatives.

Critically important to the creation of a joint culture are the joint education endeavors of our armed forces. Currently, I am working with the Chairman of the Joint Chiefs of Staff and the President of the National Defense University (NDU) to establish closer links between NDU and Joint Forces Command. We continue to support NDU with our Joint Operations Module (JOM) as part of the overall CAPSTONE program for approximately 160 newly selected one star flag and general officers. We provide guest lecturers and adjunct professors to support portions of the curriculum at NDU's Joint Forces Staff College. We are also seeking opportunities for further cooperation and collaboration. A prime example of the ongoing collaboration is NDU's Military Education Research Library Network linked to JFCOM's Regional Security Cooperation Network. We also will be providing the opportunity for both Joint Forces Staff College student and faculty observation of JFCOM exercises and experiments.

Joint Integrator

This command continues to receive new authority to ensure interoperability today and in the future throughout the Joint Force. Recent DOD Management Initiative Decision 912 signed on 7 January 2003 direct expanded responsibilities for the U.S. Joint Forces Command in establishing Joint Battle Management Command and Control (JBMC²) requirements, identifying system-of-systems capability requirements and ensuring the integration and interoperability of JBMC² capabilities. In this expanded role, JFCOM will lead JBMC² mission and capability area requirements.

Additionally, we will assume immediate oversight responsibility for the Deployable Joint Command and Control program and the Single Integrated Air Picture, with expanded responsibilities in fiscal year 2004 for Family of Interoperable Operational Pictures. This responsibility will allow Joint Forces Command to synchronize programs and initiatives within Joint Battle Management Command and Control.

Our Joint National Training Capability will also facilitate the evolution of JFCOM's role as joint integrator by providing venues for integration in training.

Joint Experimentation

Joint Forces Command's influence on strengthening our joint warfare capabilities through experimentation is best understood by viewing how the services themselves are picking up on the "joint context" and incorporating new capabilities to their organizations.

From MC02 and other smaller experimentation events over the last year, the Army gained insight into their internal transformation initiatives with the Interim Force and is exploiting a number of initiatives and insights in current operations. In the case of XVIII Airborne Corps' experience as the first "experimental JTF," their experience in establishing a collaborative information environment using the suite of MC02 tools enabled that staff's rapid transition and deployment to the Afghan combat zone with less than 30 days notice. The Army has incorporated several organizational constructs and experimental methodologies into Army doctrine and training programs. This includes new fire control measures and effects-based methodologies, use of collaborative tools, and co-location of the Army Air and Missile Defense Command with the Joint Force Air Component Commander, operating as the Deputy Area Air Defense Commander. The incorporation of the common joint context in upcoming Army transformation wargames, like Unified Quest 2003, will help to ensure that future capabilities are "born joint."

The Air Force's Joint Expeditionary Force Experiment initiatives examined in MC02 are likewise being implemented into their organizations. Currently, Air Force personnel are using MC02 software tools that improve the tracking and tasking of intelligence aircraft, reduce air operations planning time, enable swifter tracking and targeting of mobile targets, reduce fratricide, and provide real time tracking of downed aircrews. Planners are using some of these capabilities at Central Com-

mand's Air Operations Center in Afghanistan and plans are underway for use in other theater Air Operations Centers.

The Marine Corps' Millennium Dragon experiment examined a number of expeditionary warfare and urban operations challenges. Marine initiatives under implementation include urban operations tactics, techniques and procedures, the Dragon Eye backpack UAV, cellular staff structure standard operating procedures for the Joint Force Land Component Commander, and Special Operations Mission Planning Environment-Maritime.

Execution of the Navy's Fleet Battle Experiment-Juliet inside of MC02 also resulted in the fielding of initiatives and had a positive impact on personnel and training. Core members from two carrier battle group staffs, with recent Operation Enduring Freedom experience, were teamed with Second and Third Fleet staff members to form the Joint Force Maritime Component Command staff. Each is using the lessons learned from MC02 to improve training for deploying carrier battle groups and amphibious ready groups.

Other top concepts coming out of MC02 that an operational Joint Task Force is applying in the war on terror include the Joint Interagency Coordination Group (JIACG) and the Standing Joint Force Headquarters (SJFHQ).

Standing Joint Force Headquarters is a key capability examined in MC02. CJTF180's exploitation of SJFHQ supporting tools and procedures established the effectiveness of a more cellular organizational structure such as provided by the SJFHQ concept. CJTF180's organization is a hybrid of a traditional military staff and cellular structure. They are exploring reorganization of their headquarters to a cellular staff to improve coordination and effectiveness. Continued work in developing a SJFHQ, joint interagency and multinational coordination, and information sharing and compatibility through joint concept development and experimentation will assist in Operation Enduring Freedom as well as prepare for future operations that face the Nation.

TRANSFORMING OUR ARMED FORCES

The most significant event in joint transformation for the Department last year was the conduct of MC02 in July and August 2002. Over 13,000 soldiers, sailors, airmen, and marines participated in the event from 8 live training locations across the American Southwest and Pacific Ocean as well as from 17 simulated locations. As mentioned above, the insights and lessons gained from MC02 have led to several new capabilities and operational methods that are being implemented today.

Joint Forces Command does not have all the "answers" to Defense transformation. In the transformation journey, each answer achieved raises new questions to answer. This command relies on the collective wisdom and shared understanding of a common purpose from the joint, interagency and multinational communities to effect true change over the entire force and for future coalitions. Our joint experimentation campaign plan collaboratively links the transformation plans of our customers, the Combatant Commands; our partners, the services and Defense agencies; and the interagency and multinational communities.

Additionally, Joint Forces Command has established a collaborative relationship with the DOD Office of Force Transformation. Joint Forces Command has included Vice Admiral Art Cebrowski's team in our ongoing efforts to implement the SJFHQ in the Combatant Commands. His office provides the necessary bridge between strategy and policy and the future operational concepts and capabilities of our Armed Forces as well as assisting with streamlining the acquisition process to capitalize on rapidly developing 21st century capabilities.

In serving as the Executive Agent for joint concept development and experimentation, a key aspect of our role in the change process is to integrate at the operational level the concept development and experimentation activities of the Services, combatant commands, and other agencies. Developing innovative joint operational and organizational concepts that integrate supporting concepts of the Services, combatant commands and others is the essential first step in this process.

Millennium Challenge 2002 focused on determining the extent that the Joint Force could conduct a rapid decisive operation in this decade without a major recapitalization of the force. Integrating concepts, such as SJFHQ, were refined to provide a level of detail that supported a robust concept of operations.

It is important to understand that joint concept development and experimentation (JCDE) is an iterative process that takes time to fully develop and implement a new concept. MC02 was a key step in this journey, but only one step. The JCDE Campaign Plan continues with activities in 2003 and 2004 that will define the capabilities and concept of operations for the future joint force. Through the competition of joint and service concepts, the best ideas will move to rapid implementation by em-

bedding them in the exercise programs of the Combatant Commands and the Joint National Training Capability, delivering the SJFHQ and supporting concepts to the combatant commanders in fiscal year 2005.

Key to our understanding of joint transformation was defining the characteristics of future joint operations. During our joint concept development work, four key characteristics for future joint operations were identified:

- Effects-based
- Knowledge-centric
- Coherently joint
- Fully networked.

These characteristics provide a simple descriptive framework for examining concepts and exploring capabilities.

The effects-based characteristic describes the application of the military instrument of national power across a continuum that ranges from cooperation through conflict. Effects-based thinking is a philosophical shift from traditional attrition and maneuver warfare. It involves the comprehensive, integrated assessment of the adversary and the application of relevant instruments of national power to achieve a defined political-military end-state in support of national goals. It views an adversary from a systems perspective and identifies key links and nodes to direct engagements.

In conflict, military actions will focus on the precise application of military capabilities to produce the desired effects needed to shatter the enemy's operational coherence, preempt his options, break his will, and destroy his capability to fight, while preserving long-term U.S. interests. The effects-based approach links to other supporting characteristics of future joint operations, but it is important to emphasize that developing a thorough capability to understand and execute effects-based operations is key to ensuring U.S. strategic advantage as the global war on terrorism unfolds over the coming years.

The Knowledge-centric characteristic is a simple yet powerful characteristic that complements EBO. The more that is known about the adversary, the operational environment and ourselves, the more precisely capabilities can be focused to produce the desired effects with less risk of unintended consequences, and more efficient expenditure of national resources.

Not surprisingly, knowledge becomes a hedge against risk, allowing rapid deployment of more precisely tailored capabilities with decisive effects. Knowledge-centric operations postulate a move beyond information superiority to decision superiority through a comprehensive, system-of-systems understanding of the enemy and the environment, as well as a shared integrated awareness of friends, allies and neutrals. Decision superiority is the ability of the commander, based upon information superiority and situational understanding to make effective decisions more rapidly than the adversary, thereby allowing a dramatic increase in the pace, coherence and effectiveness of operations. Advanced decision-support tools, knowledge-fusion, and horizontal and vertical integration of situational awareness will improve dissemination to decisionmakers in an understandable and actionable format.

Coherent jointness is the third characteristic of future joint operations, which facilitates coordinated, synergistic employment of the full range of joint capabilities to achieve the desired affects. The interoperability of joint and Service capabilities further enables, and amplifies this common joint ethos. To achieve this synergy of doctrinal, organizational, and human factors, future capabilities must be "born joint." Interoperability by design in the first instance will permit true integration. It will solve, by moving beyond, the current challenge of de-conflicting service systems that do not talk to each other. Born joint capabilities will require a greater depth of understanding of joint capabilities, an agreed Joint Operating Concept and a shared joint warfighting culture. It enables the execution of seamlessly joint actions at levels appropriate to the mission.

Finally, fully networked forces enable the creation and sharing of that knowledge needed to plan, decide, and act both collaboratively and quickly. It will allow the joint force to accomplish many tasks simultaneously from distributed locations in the battlespace. Networked forces (based upon systemic, organizational, and personal link) are necessary to compress and change today's sequential, echeloned way of planning and conducting operations. Networked forces use shared situational awareness among all elements of the joint force, to include interagency and multinational partners. This increases the speed and precision in planning and application of power. They allow streamlined joint dynamic processes for the integration of information operations, fires, and maneuver elements as well as for sustainment and joint intelligence, surveillance, and reconnaissance management. Fully

networked forces are necessary to employ a coherently joint force to achieve rapid decisive operations.

We clearly understand that trained and ready forces are the foundation of Joint Transformation. Transformation is more than just experimentation, the interoperability of current and future systems or some new technology.

As the Joint Force Provider, our Service components' forces, intellectual input and operational experience shape, enable, and assess transformation activities, particularly concepts and experimentation. Having direct access and command authority over component forces has been key and remains essential to establishing the proper foundation and framework necessary for conducting relevant joint force training and coordinating constructive joint experimentation and technological prototyping, which has proportionally increased and enhanced our total force capability and will continue to be the cornerstone to an unassailable, transformational joint force.

We are convinced that improved interoperability is crucial, to ensure near-term fusion of mission capabilities across the joint services, allied, and inter-agency partners. We have emphasized the need that operational lessons learned and experimentation must drive the development of new joint doctrine, concept development, and integrated architectures, which ensure and enforce the operational requirements, are properly defined and influence Service and Agency capabilities in the future.

In support of military operations, I am determining with my fellow combatant commanders priorities of materiel and non-materiel capabilities solutions, which provide near-term joint warfighting capabilities. In response to the Secretary of Defense and Chairman, Joint Chiefs of Staff concerns over legacy command and control interoperability and integration, my staff has worked closely with Services and Defense agencies to develop and implement numerous transformation change proposals towards improvements in Joint Task Force command and control, situation awareness, and integration of intelligence assets. Additionally, we have delivered four interim capabilities that directly support the global war on terrorism and ongoing military operations for Central Command, and six other initiatives that support U.S. Pacific Command and Northern Command for Homeland Security.

Joint Forces Command is addressing critical interoperability problems for the warfighter. To ensure new systems are born joint, the command reviews all requirements documents under development to ensure sufficiency of interoperability key performance parameters, information exchange requirements, and operational architecture views. The Joint Requirement Oversight Council (JROC) has approved four Joint Forces Command Capstone Requirements Documents—Global Information Grid, Information Dissemination Management, Combat Identification, and Theater Air Missile Defense.

Joint Force Integration clearly reaps insights from training and experimentation and feeds them back into the force. At the same time, our engagement in joint requirements helps us identify needs and focus our efforts. This is how we are working to transform the joint force.

CONCLUSION

We must transform even as we conduct worldwide operations across the range of military operations. We have to get through today to get to tomorrow. Prudent risk management is necessary. The counsel of prudence is to strike the right balance between operations, readiness, transformation and quality of life. This is both a management issue and a resource issue. Risk can be managed to a point, but resources must also be committed to secure our dominance for today and the future. Transformation, modernization, and selected recapitalization cannot occur without the resources identified in the President's budget.

While I have outlined a number of challenges and priorities for ensuring we sustain our worldwide military edge, I must note the criticality of congressional support. Within the constraints of competing national priorities, even in this time of conflict, the support of the members of this committee is both critical and reassuring. The challenge of transforming the joint force "in stride" is daunting but doable.

Transformation is underway. Our efforts will accelerate these trends. I look forward to working with you to provide our troops the joint capabilities they need today and the transformational capabilities our Joint Force will require in the future. I am enthusiastic about our plan for the future and extend to each of you an invitation to visit Joint Forces Command and our Service components to see transformation in action.

Senator ROBERTS. Admiral Cebrowski.

**STATEMENT OF VICE ADM. ARTHUR K. CEBROWSKI, USN
(RET.), DIRECTOR, OFFICE OF FORCE TRANSFORMATION,
OFFICE OF THE SECRETARY OF DEFENSE**

Admiral CEBROWSKI. Thank you very much, Mr. Chairman, it is a pleasure to be here, Senator Reed, members of the subcommittee.

We are in our first full year of operation in the Office of Force Transformation and I am pleased to report that I am happy with the results, but I am dissatisfied. I am happy because so much progress has been made, but dissatisfied because so much remains to be done in this important area.

Last Thursday evening, the Secretary of Defense approved the transformation planning guidance. It will be worked into an unclassified format for general distribution so that not only yourselves but, indeed, the American people can see what the main thrust is.

The transformation planning guidance is a precise strategy for transforming the Department. It clearly identifies the roles and responsibilities within the Department, and it does provide the Secretary with some additional levers, bureaucratic levers within the Department.

As for the role of my office with regard to the transformation planning guidance, I am tasked with evaluating the transformation road maps from the Service departments. The first road maps were produced last year. We have done an analysis of those and prepared a briefing for that, and I would be very happy to make those graphics available to the committee if you would like.

I am also tasked to provide an annual strategic transformation appraisal to the Secretary. This is meant to be an independent appraisal quite apart from the prerogatives and equities of other people in the Department and, of course, I am tasked with continuing to advise the Secretary and his staff.

One of the questions which I am frequently asked is, what was the view of our office of the large exercise conducted last year, Millennium Challenge 2002, and we did have people with Admiral Giambastiani's people during the experiment. We had five areas of concern at that time. I will not talk about all the positives. Admiral Giambastiani can talk about those, I am sure, at length, because there were many positives. Instead, I will just touch on the negatives briefly.

We thought that the after-action process, the evaluation process needed to be more quantitative.

We felt that the linkage between the high level experiment focused at the headquarters in Norfolk seemed to be somewhat separated from the lower-level experiments conducted by the various components out and about the country.

We thought that there needed to be more interaction with all of the component commanders.

We thought there needed to be better alignment between training and experimentation, and we thought that we needed acquisition agility that reflected the agility of the operating forces themselves. That was one of the things that was pointed out.

These findings were shared with Admiral Giambastiani's staff. Immediately, action was taken on every single one of those issues, and so we feel very confident that we are moving forward now.

Principal among the actions taken is an increase in the number of smaller, what we call limited objective experimentation, done collaboratively with the various combatant commanders. This is very important, because it converts the experimentation effort from a large step function to a continuing process with a greater degree of involvement, and that is very beneficial to us.

With regard to speed and acquisition, the transformation planning guidance provides for something called the transformation initiatives program, which is meant to provide on very short notice funding for combatant commanders to take advantage of emerging opportunities, either in actual operations and contingencies, or opportunities created by exercises, or the availability of new technology, to conduct an experiment, and this is new and we hope that it will be funded appropriately for us.

The office over the last several months has focused on five areas, we will continue that focus on into the future, and our business plan reflects this focus. The first is to make transformation an integral part of the DOD corporate strategy and national defense strategy supporting all four of the strategic pillars.

Next, to change the force from the bottom up through experimentation and the development of experimental articles, or what one might call operational prototypes, to create new knowledge.

Third is to implement networkcentric warfare as theory of war for the information age, and the organizing principles for joint concepts and capabilities.

Fourth is get the decision rules and metrics right, and cause them to be applied enterprisewide.

Fifth, and I think most exciting, is to discover and create, or cause to be created, new military capabilities to broaden the capabilities base and mitigate risk.

Moving specifically to the area in which we are focusing, and this is a rather fast-moving area, so what we might have said we would focus on last year has been broadened somewhat as we learn more, first, the strategic context. There are falling barriers to competition with which we are concerned, principally in the three major commons of the world for which or over which America has been a marvelous steward, space, cyberspace, and the sea, and there is potential for considerable competition in all three of these areas, and we need to find new ways to compete in these areas.

Next, we have the emergence of a phenomenon which we call the systems perturbation. By virtue of the movement to the information age, the density of interconnectivity is such that it creates a medium for propagation and, indeed, amplification of large system shocks, which then produce waves which cross all social, cultural, and economic sector boundaries. September 11 was exactly such a case.

We have been concerned for sometime with the appearance of the non-State, non-nodal, asymmetric actors who seem to have more perversity than ever, but now we are finding that we have to place those threats in the context of this new medium for propagation of disruption. In other words, they are more empowered now than we had thought they were, and this is causing us to step back, make a reassessment of exactly where we are and where we need to go. We are in the process of doing that now.

On the technical side of the house, energy weapons are looming large, not just laser weapons, but also particle beam weapons, radio frequency weapons, and we have to deal with both the offensive and defensive side of those, and discern what their emergence will mean for the character of war in the long term. That is becoming an area of focus and study for us as well.

We are concerned about the falling cost of weapons and how that may change the strategic laydown, and obviously we are concerned about weapons of mass destruction and the like.

What is emerging from this kind of work is the need for broadened approach to policy and strategy, one which takes into account the systems perturbations and which takes into account, indeed, a redrawn map pointing out the difference between those societies which are very well-connected, or what we call globalized, and those which are not, and how that indicates the kinds of force we will need.

We have identified four major geographic flows, or geostrategic flows, which will impact the National security environment, populations, energy, money, and security actions themselves, and how those four flows interact with each other, producing a new strategic context for us.

What seems to be indicated is that we need a force which is less retaliatory and punitive and more preventive. A force which in addition to being highly networked is more Special Operations-like, not that we need more Special Operations Forces, but we need to have more of those key features of the Special Operations Force, more broadly populating the rest of the force.

Senator ROBERTS. Somewhat like the United States Marine Corps. [Laughter.]

Admiral CEBROWSKI. I was going to say that it is no accident that the Marine Corps has a robust communications with the Special Operations Command for precisely that purpose, forces which are capable of applying new information techniques in an urban environment.

We need surveillance-centered forces, particularly counter-weapons of mass destruction. We need to extend joint concepts down to the tactical level of war. We are going to need to figure out how we are going to structure ourselves better for the back end of conflict, where we have to deal with constabulary actions, nation-building, civil affairs and general stability actions, and then we have to, of course, deal with what this new reality means for the total force, the relationship between the active component, the Reserve, and the Guard, which will be up for flex, or it needs to be reviewed.

There are three major movements that we can see are going to happen, the strategic laydown and the operational laydown, and what you might call a temporal laydown having to do with speed, and we are reviewing those, and there is considerable activity in the Department in all three of those areas already, and I will be pleased to discuss them with you.

Of course there are other things that we have not begun to talk about so far at this hearing is the implications for alliances, where our reliance on alliances seems to be increasing at the very time when alliances seem to be less reliable and less durable.

I would be delighted to take your questions and issues.
[The prepared statement of Admiral Cebrowski follows:]

PREPARED STATEMENT BY VICE ADM. ARTHUR K. CEBROWSKI, USN (RET.)

Chairman Roberts, Senator Reed, members of the subcommittee, I'm honored to have the opportunity to be back before you, and I am grateful for the opportunity to continue the dialogue begun last year.

In surveying the course of transformation over the past year, we see considerable progress throughout the Department. But, of course many of these are first steps. Our future efforts to transform must not just sustain the current effort, but must outpace the rate of change evident in the increasingly interconnected world around us.

When we last spoke, September 11, 2001, had focused considerable attention on the concept of transformation. Indeed, 1 year ago it was easy to view our future as a narrow consequence of those events. However, as we have come to more fully appreciate, transformation is not simply a response to global terrorism. While the events of September 11 triggered a "system perturbation"—a systemic shock to the stability of the international system—it is clear that profound change was already occurring in that system. Transforming defense, its role in national security, its management and the force itself, is a national, corporate, and risk management strategy that responds to that change.

While "change"—uncertainty—is an ever-present part of the strategic landscape, energy for current change seems to have emerged from three broadly defined events of the early 1990s. The first was demise of the bi-polar template that shaped U.S. security strategy; the second was the aftermath of a great military victory in the Persian Gulf, which had validated much of our previous military investment strategies; and the third was the ascendance of information age warfare. In isolation, each provided a host of relevant issues to consider as we framed the strategic context within which we would build a future military. However, taken together they suggested a deeper assessment of the strategic environment. The trends are there—escalating ethnic and religious strife, the reshaping of nation-states, shifting and emerging economic centers, the proliferation of information technologies in relatively undeveloped societies and nations, and the emergence of global, transnational terrorism. September 11 was a violent manifestation of these trends—trends that continue to reshape our Government, our economy, and even our society.

Understanding how transformation addresses uncertainty is incredibly important as we move forward. This is a very different way of thinking for us. For a very long time our focus was at the top—great power war in a global security environment where our security concerns were largely viewed through the prism of state-vs-state conflict. Even as the threat of great power war diminished, we remained focused largely on state-vs-state conflict—with the threat recast as the "rogue." Meanwhile, sources of power, conflict and violence continued to change and spread more broadly within the system. Today, we find that power is moving to the larger system level—an international system evolving as a consequence of globalization—while violence is migrating downward to the level of individuals or collections of individuals. New threats are emerging from societies and people who remain disconnected from the larger evolving global system. These threats have the potential to create severe perturbations to this system, and the resulting shockwaves cross all economic sectors and social boundaries as they propagate around the world. On September 11, we witnessed this phenomenon. We were not attacked by a nation or by an army; we were attacked by a group of individuals—non-deterables—keen to die for their cause. As the consequences of this systemic change become more apparent, we're discovering that our force capabilities are out of balance with emerging realities.

There is another way of understanding this. In the second half of the 20th century (prior to 1990), we balanced our global interests and homeland security on the fulcrum of mutually assured destruction and containment. It worked well versus the Soviet Union, but what it yielded was surrogate wars. We lived a useful fiction that depicted all surrogate wars as lesser-included cases of the larger strategic problem—which they were not. However, that strategic system "worked" given the types of forces we had, and given the era in which we lived—namely, industrialization. That construct dissolved with the fall of the Berlin Wall, and we are just now readjusting our security perspectives in light of this altered system; a strategy that emerges is transformation.

The need to transform the military as well as the organizations and processes that control, support and sustain it is compelling. This need is a by-product of the effects of globalization on the international security order, as well as the transition from the industrial age to the information age. While we might point to a beginning

of transformation, we shouldn't foresee the end—the President's mandate was “to challenge the status quo and envision a new architecture of American defense for decades to come.” Both he and Secretary Rumsfeld have rightly seen that transformation is a continuing process that not only anticipates the future, but also seeks to create that future. It does so, in part, by co-evolving technology, organizations, processes. However, it begins and ends with culture. Transformation is first and foremost about changing culture. Culture is about behavior—about people—their attitudes, their values and their beliefs. What we believe, what we value, and our attitudes about the future are ultimately reflected in our actions—in our strategies and processes, and the decisions that emerge from them. The Department's strategy for transformation understands this; its actions reflect that understanding. Consider these Departmental actions in light of the new security environment discussed above:

- Crafted a new defense strategy (with Transformation as a centerpiece)
- Rewrote the Unified Command Plan
- Completed a new Nuclear Posture Review
- Replaced the two-Major Theater of War force-sizing construct
- Moved from a threat-based to a capabilities based approach to defense planning focused not on the “who” but rather the “how” our national security might be threatened
- Reorganized the Department to better focus space activities
- Initiated work with the Allies to develop a new NATO command structure as well as a NATO Response Force
- Expanded the mission of Special Operations Command
- Made some tough program decisions

Of course, this last item, the cancellation of programs—or how many three- and four-star officers were fired—represents the yardstick by which many would have the Department measure its progress. That would be a wholly unconstructive approach, and one counter to Secretary Rumsfeld's stated intent—“we are working to promote a culture in the Defense Department that rewards unconventional thinking—a climate where people have the freedom and flexibility to take risks and try new things.” Consider these other “new things”:

- Created an Under Secretary position for Intelligence
- Created an Assistant Secretary for Homeland Defense
- Development of Joint Operations Concepts
- Reorganization of the JROC
- New service-based contributions to Joint Warfare
 - Army Objective Force
 - Air Force CONOPs
 - Navy Expeditionary Strike Groups, TACAIR Integration
- Created a Joint National Training Capability in order to better train as we intend to fight
- Process revisions
 - New DOD Acquisition Directive and Instruction
 - Legislative relief proposals
- Invested in capabilities to support the warfighter
 - Joint C⁴ISR
 - Precision Strike
 - Adaptive logistics
 - Mobility enhancements

In the aggregate, these activities represent the beginning of “the continuing process” of transformation as we “create/anticipate the future.” They represent the “co-evolution of concepts, processes, organizations, and technology.” They are consistent with the vision outlined in the President's remarks, and are representative of progress toward the goals outlined in the 2001 Quadrennial Defense Review.

As a consequence of this progress, we also see “new competitive areas,” and a “re-valuing of attributes” consistent with information age phenomena and the demands of the emerging security environment. One measure of this revaluing is what is called “information fraction.” In other words, what is the measure of a system's ability to access and contribute to a larger information network? Can it contribute to the “speed of command” and “shared situational awareness” so necessary for success in current and future battlefields? The concept of “information fraction” provides an important insight into a “revaluing of attributes” that characterizes transformation. When we talk with Sergeants at Ft. Lewis about their Strykers, they're not only happy about the ride and relative quiet it provides, they're excited about the situational awareness that can be brought into that vehicle through its information sys-

tems; the Stryker has a high information fraction. The Army's Land Warrior and Future Combat System (FCS) also have very high information fractions. Similarly, when Marine pilots talk about the Joint Strike Fighter, they not only talk about its low radar cross section and precision weapons—they talk about the aircraft's sensors and its ability to access and distribute information as part of a larger naval expeditionary sensor network. The Joint Strike Fighter has a very high information fraction.

Transformation is yielding new sources of power. Because the global pace of change is accelerating, new sources of power fuel our ability to maintain advantage in a competitive landscape where yesterday's winner is tomorrow's target. Our ability to capitalize on new sources of power will determine, in part, our success in the future. One such source is information sharing through robust network structures. We have a mountain of evidence—from simulation, from experimentation, and from real world experience—that substantiate the power of network behavior. Many think of network the noun—in other words, a “thing.” They forget that “network” is also a verb—a human behavior. So when we shift from being platform centric to network centric, we shift from focusing on “things,” to focusing on behavior or action. That is where we find the power. Each of the Department's efforts reflects an understanding of this phenomenon. Some examples include the Navy's ForceNet and its creation of the Network Warfare Command, the Army's Battle Command System for the Legacy and Interim Forces, the Warfighter Information Network for the Objective Force, and the Early Entry Command post concept. The Air Force is pursuing Network Centric Collaborative Targeting and “predictive battlespace awareness” under the Space C²ISR Task Force CONOPs, and the Marine Corps intends to exploit an Expeditionary Sensor Grid through CAC²S. These efforts reflect the ongoing shift from platform-centric to network-centric thinking that is a key to transformation.

When Secretary Rumsfeld signed the Quadrennial Defense Review in September 2001, he created the vision for transformation. The six operational goals and the four pillars of transformation get the most attention. However, one of the most powerful concepts in that document, and one that has received the least scrutiny, is “deter forward.” “Deter forward” is profoundly important because it forces us to change the way we think about force capabilities and disposition. Consider for a moment the implications of deterring and defeating an enemy with minimal reinforcements. In peacetime, we assure allies, we dissuade competition, and we deter hostile acts. If forced to compel resolution with military force, we bring forces to bear in the traditional fashion; the relationship between the capabilities we bring to bear and the forces and the timeline demanded by the circumstances is a measure of the risk we are willing to accept. This is normal industrial age thinking. In the Information Age, warfare is increasingly path dependent—small changes in the initial conditions result in enormous changes in outcome. Thus, speed becomes a more valuable characteristic of the entire force because we want to be able to define or alter the initial conditions on terms favorable to our interests. The goal is to develop high rates of change that an adversary cannot outpace, while sharply narrowing that adversary's strategic options. Only certain kinds of forces are going to be able to do that—forces oriented around speed. This is not so much speed of response, as it is speed within the response—speed of deployment, speed of organization, speed of employment, and speed of sustainment. In other words, we may choose our punches with great care (strategy), only to unleash them with blinding speed (operations, tactics). Networking is the key enabler of the battlespace transparency necessary for that speed.

The entry fee for the “deter forward” force is a network structure, network centric organizations and an understanding of the emerging theory of war for the information age—Network Centric Warfare (NCW). NCW is not about technology per se—it is about behavior. It is not about the network; rather, it is about how wars are fought, how power is developed. During the industrial age, power came from mass. Increasingly, power tends to come from information, access and speed. Network Centric Warfare will enable the merging of our warfighting capabilities into a seamless, joint warfighting force. It capitalizes on the trust we place in our junior and noncommissioned officers. As information moves down echelon, so does combat power, meaning smaller joint force packages wield greater combat power. We've seen this most recently in Afghanistan—very, very small units being very powerful. NCW enables and leverages new military capabilities while allowing the United States to use traditional capabilities more discretely and in new venues. This is allowing the U.S. military to downshift effectively over time from system-level wars (the Cold War and its World War III scenarios) to state-on-state wars (Iraq and Korea major theater wars/scenarios) to the emerging wars fought largely against groups of individuals (Taliban take-down, rolling up the al Qaeda network). Net-

work-centric operations capitalize on greater collaboration and coordination in real-time, the results of which are greater speed of command, greater self-synchronization, and greater precision of desired effects. During the past year, we've seen each of the Departments begin implementation of NCW, primarily at the operational level of war. However, what we're seeing is essentially "NCW for the JTF commander." The next step is NCW for the warfighter—reflecting increased jointness at the tactical level of war.

Pulling together the conceptual threads of transformation and the emerging international security environment, one is led to the conclusion that even when homeland security is the principle objective, the preferred U.S. military method is forward deterrence and the projection of power. As a matter of effectiveness, cost, and moral preference, operations will have to shift from being reactive i.e., retaliatory and punitive, to being largely preventative. The implications of "deter forward" necessitate a major force posture review—rebalancing from the current condition where 80 percent-plus of the force is U.S. based and everyone is competing for the same finite strategic lift. Accordingly, the emerging American Way of War features:

- Highly networked, special operations-like forces whose extensive local knowledge and easier insertion will give them greater power and utility than large formations deploying from remote locations
- Forces capable of applying information-age techniques and technologies to urban warfare, else we will not deny the enemy his sanctuary
- Surveillance-oriented forces to counter weapons of mass destruction, else unambiguous warning will come too late
- Concepts of "jointness" that extend down through the tactical level of war
- Interagency capabilities for nation building and constabulary operations, lest our forces get stuck in one place when needed in another
- Adjustments in force structure and posture in consideration of the growing homeland security roles of the Coast Guard, the National Guard, the Air National Guard, and the Reserves

Adding these new responsibilities to the U.S. military is not only a natural development but also a positive one. For it is the United States' continued success in deterring global war and obsolescing state-on-state war that will allow us to begin tackling the far thornier issues of transnational threats and sub-national conflicts—the battlegrounds on which the global war on terrorism will be won.

Senator ROBERTS. We thank you both, gentlemen. Senator Reed and I are here for the duration. Senator Dole has a time situation. Senator Akaka, what is your time situation?

Senator AKAKA. I am fine for half an hour.

Senator ROBERTS. You are fine for a half an hour. Senator Dole, would you like to start off on any questions you might have?

Senator DOLE. All right. One question I would like to ask, the Marines at Camp LeJeune provided a significant portion of the staff for a land component headquarters in Millennium Challenge 2002. Their participation obviously was valuable, successful, but it is my understanding that it also came at some sacrifice in terms of increased personnel tempo and funds that had to be expended. So I am interested in what level of participation in experimentation we can expect of the operating forces, considering that they have other obligations, obviously, with regard to deployments, training exercises, and is there a need for a dedicated experimentation force?

Admiral GIAMBASTIANI. Senator Dole, let me answer the last part of your question first, about a dedicated experimentation force.

This is my third time being associated with a command that does both, if you will, force-providing, organize-train and equip-type functions and participating in them with services. I did one of these back in 1991 and 1993, in the Navy. I also performed a similar function late in the 1990s similar to this, and now today at Joint Forces Command.

I am not an advocate of dedicated experimentation forces, and there is a very good reason for that. If you do not have your day-to-day business grounded in operations, in providing forces for regional combatant commanders who go out and use these forces, it does not make you relevant. You need to have that connection so that your forces remain relevant, otherwise they become very specialized, more insular, and they do not deal with the greater military community.

I could go into a long discussion on this, but I am very positive on having operational forces doing experimentation exercises and demonstrations.

To go to the first part, clearly, the Marines performed very well during the course of Millennium Challenge 2002. As a matter of fact, we took some of those folks in. They are currently on Joint Task Force (JTF) Horn of Africa. The Second Marine Division, as it turns out, has supplied the commander of that unit. We helped to stand-up and train JTF—Horn of Africa back in October and November, deployed them in late November on board the U.S.S. *Mount Whitney*.

Major General John Satler, Second Marine Division Commander, is the JTF Commander. We have a Navy one-star rear admiral named Don Bullard, who is the Deputy, but about two-thirds of that joint task force staff are, in fact, Marines. The rest of them, obviously, are Army, Navy, and Air Force, some coalition members and a few civilians.

What I would tell you is, is that where we see, if you will, some stress on the force is at the major, lieutenant commander, commander, lieutenant colonel, captain, and colonel level who are populating all of these joint task forces and combatant command staffs as what we call individual augmentees. The Services provide all of these. They are high quality, top quality officers. They have done a lot of this work, and we are looking for those skill sets to populate these major commands, so that is the place where I do see that we have a problem across the entire Armed Forces, is at the joint task force and combatant command staff augmentation level to form these joint forces.

Senator DOLE. Thank you very much, and let me just say that I am extremely grateful to both of you for your outstanding service to our country at this critical time. Mr. Chairman, my husband recently was being interviewed and the interviewer referred to him as a part of the greatest generation, and his response was something that I certainly back up and that is that the greatest generation is these young men and women today who are being deployed in the defense of our country and our freedom, so thank you very much for your testimony. I look forward to working closely with you in the months and years ahead.

Thank you, Mr. Chairman.

Senator ROBERTS. Thank you, Senator Dole. Senator Akaka, I know you are pressed for time. Why don't you proceed with any questions you have.

Senator AKAKA. Thank you very much, Mr. Chairman. I commend you for having this hearing and this discussion. I take this opportunity to express my appreciation to Admiral Giambastiani and Vice Admiral Cebrowski for joining us today. What you are

doing is very exciting, because what you two officers are representing is a whole new twist in what we are trying to do.

After looking at your statement, Admiral Cebrowski, somehow I came to the conclusion that maybe there might be a need for an academy of peace instead of training our young people only for battles. It seems as though we need to focus on culture, people, quality of life, and we certainly would want global peace one day, and why not have an academy that trains young people to bring that about.

But Admiral Giambastiani, I have a question for you. DOD senior leadership frequently talks about the challenges of balancing current readiness and transforming to better meet the future threats. You probably understand this problem better than almost anyone, as you have to both provide ready forces to other commands and spearhead DOD's transformation and experimentation efforts.

My question is about the particularly difficult situation we find ourselves in now. What impact has our extremely high tempo of operations (OPTEMPO), higher, I think, than any of us can remember for quite some time, what impact is this high OPTEMPO having on our efforts to advance transformation?

Admiral GIAMBASTIANI. Senator, two things. One, clearly we have probably the most ready force I have ever seen, as I said in my statement, to date. I am very impressed with the readiness of forces, but with the number of forces we have deployed right now, can we maintain that high level of readiness in the long term, with all of these forces forward? I do not think any military leader would tell you yes, we can maintain it, if everybody is forward, but what I would say to you is this. There is a very important balance that you have pointed out between readiness and the ability to do transformation.

Back when I was the transition director for Admiral Vern Clark, when he came in to relieve as the Chief of Naval Operations, our first two priorities, and I think in explaining this to you, you will see where I am going with it, we thought that our people clearly were our number 1 priority, and our second priority was current readiness. The reason for that is, we had lots of spare parts problems, and Congress has been incredibly supportive here over the last couple of years to increase our operations and maintenance account levels throughout all the services, but in the Navy I happened to be focusing on it at that time.

We took a lot of money out of platform programs, shipbuilding, aircraft, and a number of other things to pour that money into readiness accounts, because the most important thing was to keep our forces ready. I think those decisions have proved today to be very wise, and again the other Services have done similar things.

For example, we moved \$1 billion, as I recall, into precision weapons 2½ years ago. Now, we did not have any idea that we would be going through Afghanistan, Operation Enduring Freedom, and the rest of it, but one of the reasons why all this additional money that Congress has put into helping our readiness with regard to precision weapons is that we had ramped up the factory level so that they can, in fact, handle more production today, so these additional funds have been very useful.

So it is important to maintain readiness in these operations and maintenance accounts and the personnel accounts to pay our young men and women properly. At the same time, though, this is the best time to transform. Everybody is thinking about how they are warfighting today. Everyone is thinking about how to do things better, how to make them work more jointly, make them work in coalitions, and there is great impetus out there and interest in doing this well.

As a matter of fact, we have created a fairly sizeable lessons-learned team from Joint Forces Command that is forward-deployed now, sitting in Transportation Command (TRANSCOM) in Scott Air Force Base in Illinois, at my headquarters, for example, looking at the Joint Staff on how we are doing business, to capture these lessons, and to help us transform right now. We are working on improving the efficiency and effectiveness of the joint deployment process, so Congress' support, and the drive from the administration with the President, the Secretary, and the Chairman has been absolutely dead on the mark with regard to transforming.

So you all have put additional resources into the readiness piece, and you have put additional resources into the transformational side, and we applaud that, and I would be happy to talk in more details.

Senator AKAKA. Thank you, and that is what I meant when I said what you are doing is exciting. It is bringing about a whole new effort in what we are trying to accomplish in the world.

Admiral, Tom Christie, DOD's Director of Operational Test and Evaluation (OT&E), gave a speech in April last year about test and evaluation's role in experimentation. One of his basic points was that experimentation and testing are essentially the same thing. He also raised some concerns about changes from a requirements-driven to a capabilities-driven acquisition project. Specifically, he pointed out that a capabilities-based process is not likely to result in measurable requirements until late in the acquisition process, and that this may inhibit attempts to measure the operational effectiveness or suitability of specific systems.

In your mind, do you make a distinction between testing and experimentation? Do you share Dr. Christie's concerns about a capabilities-based acquisition process?

Admiral GIAMBASTIANI. Simply stated, I do not share his concern that he has expressed with regard to the connection between operational test and evaluation and experimentation, and also the piece about the capabilities force, and let me explain why very briefly.

When we bring forward a system, a platform, or anything else to be approved through our DOD system, we have a series of documents that describe the mission need, first of all, and then we put out one of two documents that we call an operational requirements document, or an overarching capstone requirements document under which are these other requirements.

Now, it is kind of an arcane language, but let me explain to you why the requirements piece still exists there. I think that Dr. Christie is changing his definition of requirements in describing a larger system of how we look for capabilities within the overall military, whereas we use these requirements documents to describe the specific systems and the performance parameters.

For example, we have something called a key performance parameter. We have very specific things called information exchange requirements. We also have another arcane term called an operational architectural view. All of these are very specific, so that when we produce something, we can measure against these key performance parameters and, in fact, the program managers can build the system to that. Now, I have not seen that changed with the advent of a capabilities-based force, because we are talking about capabilities at a much higher level.

With regard to experimentation and test, I find that generally test programs are, in fact, more set pieces and less freewheeling and free flow than experimentation is. The other piece is, when we do a test program, clearly the program manager that builds a system, a tank, a ship, an aircraft, a communications system works very hard to have that system be evaluated successfully so that it can be deployed. When we experiment, we expect to have failure. We expect things to go wrong.

That does not mean that in OT&E everything goes correctly, because it does not, but it is not as freewheeling as an experimentation event—OT&E is a less risk-averse environment than doing experimentation. We are supposed to take risks and push the envelope when we do experimentation.

Art, do you want to add anything to that?

Admiral CEBROWSKI. Yes. I think in general, when you test, you test against expectations, and you can do some experiments like that, but the more exciting experiments, the ones that we focus on more, are those which are seeking discovery, and that is a dramatic shift in emphasis.

Senator AKAKA. Mr. Chairman, what is happening is so exciting it will change what we will be doing in this subcommittee in the future. My time has expired. I have other questions that I will submit for the record.

Senator ROBERTS. I thank the Senator, and hopefully the subcommittee, with the Senator's help and advice and counsel will be part of that change. We would like to be a leader of that change posse. That is what we will call it.

Senator Reed.

Senator REED. Thank you very much, Mr. Chairman, and thank you, gentlemen, for your testimony. This is a daunting challenge, to try to change the operations of the Pentagon and the Department of Defense. It seems to me that everyone is looking for the approach, how do you do that, and I do not have an exhaustive list, but typically you reorganize, or you reallocate budgets, or you do a combination of both, so let me take the organizational question first.

The new transformation planning guidance is about to become public. Admiral Giambastiani and then Admiral Cebrowski, can you give us a preview of what this new organization will look like under the guidance? Is it just collaborative between these agencies? Is there an agency that is responsible for initiating projects? Is there a hierarchy of approval? Anything along those lines will help us understand what this new organization, or at least new arrangement will look like.

Admiral GIAMBASTIANI. Let me describe it first from my perspective. I thought that Admiral Cebrowski very nicely laid out a couple of the underpinnings of this transformation planning guidance. Frankly, both he and I had wished we had signed this out months ago.

As a matter of fact, when both of us were attending what we call within the Pentagon a senior level review group with the Secretary, the Deputy, the Chairman, the Vice Chairman, the Service Secretaries, the Service Chiefs, and the rest—we were both invited, of course, because of its importance to our organizations and commands. At the end of the meeting, the Secretary had asked me a question, and I said the only thing I wish is that we had gotten this document out sooner, and we have been working to the tenets of it, but let me describe it from my perspective.

First of all, my staff at Joint Forces Command has worked very heavily with those who are crafting this document. I know that clearly Admiral Cebrowski's staff and he personally have done the same thing.

Second, I cannot overemphasize a couple of things. This document codifies in many ways the role of the Office of Force Transformation and Admiral Cebrowski will speak to that. It also brings additional responsibilities to Joint Forces Command in the area of transformation. This all flows from the most recent unified command plan changes, a series of them.

What I would say to you is Joint Forces Command, through this document and a number of others, will play much more heavily in joint battle management command and control, as I said in my opening statement. We will share milestone decision authority, for example, with regard to a system that the Navy is procuring, but it will be called the deployable joint command and control system. We will share that with the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (C³I). This is unprecedented, for a combatant command to do this.

In addition, along with the transformation planning guidance, there is a significant emphasis on our ability to field things quickly. Admiral Cebrowski mentioned this TIP fund, this transformational initiatives program, and the fact that we want money in there.

Now, there is good news and bad news in this. Frankly, there are some within Congress who do not like to have initiative funds like this, and there are others who understand the importance of being able to quickly put capability into the force. We have tried this in a number of ways. I have gone through this within the Navy and the R&D community. I am a very strong supporter of this, very strong supporter of it. It is important, and there will be money in there.

In addition, there is another fund, for example, that is talked about in the transformation planning guidance, but it is supported strongly. We have this within Joint Forces Command. It is a transition fund for joint integration and interoperability and, in fact, I request the Senate's support on this budget submittal, because you will see the transition funds will jump from about \$13 million this year up to about \$43 million in 2004 and on, because we want to be able to get solutions out into the field.

Now, many of the things the Joint Forces Command is directed to look at are somewhat more near term. I will tell you they are in some cases today's problems, some of them are over the next 5 or 6 years, and of course, Admiral Cebrowski is looking further out to trends and the rest, but the importance of this I cannot overestimate, in that your support is important for these types of funds to allow us to quickly respond in an area that is important.

Art, why don't you—

Senator REED. Before you go on, Admiral, let me just put another set of issues on the table, and you might want to wait until Admiral Cebrowski comments, or make a comment now.

You have opened up the issue of budget authority, or at least funding issues, and there is an issue we talked about previously, whether JFCOM should, in fact, have its own line with respect to some of these budget issues, an R&D budget of your own, other types of funds. Do you want to comment now about that, or do you want to wait?

Admiral GIAMBASTIANI. Yes, sir, I would be happy to comment right now. I would also like to say that, one last part on the transformation planning guidance, Joint Forces Command is required to submit a transformation road map annually now as a result of this, and we will be putting that together, along with an annual joint experimentation campaign plan, so those are very important to support this overall view so that it gets reviewed.

Senator REED. That will be a product of collaboration with the uniformed services?

Admiral GIAMBASTIANI. It is a product of collaboration with the Services, combatant commanders, and defense agencies who play in this, so it is a pretty broad collaboration.

With regard to funding, Joint Forces Command today, if you looked at all of their combatant commanders, both regional and functional, the most significant amount of funding for a combatant command goes to Special Operations Command (SOCOM). Because of SOCOM's major force program 11 budget, and some of us describe them as the fifth service, they receive the most funding and personally I think it was a very smart move to do this.

Now, when I went to Joint Forces Command, I received questions along these lines and I was asked, do I need budget authority at Joint Forces Command? I went down and studied Special Forces Operations Command with Charlie Holland, looked through how he did business. One of the things I learned from that was that General Holland has an acquisition force of about 750 people who are essentially working for Special Operations Command, and I looked at my mission and charter with regard to transformation and asked myself how much time we could expend, if you will, bringing acquisition within Joint Forces Command.

I concluded after a period of time that I did not think I should sap my energy towards transformation so that I could have this, if you will, acquisition agency, and thought that a hybrid between how Special Operations Command does it and how we currently work today would be the best way to go about business. So we have asked for and gotten significant resource changes to come to Joint Forces Command, but we want to work through agencies that typically do acquisition out there, Army, Navy, Marines, DISA, Defense

Information Services Agency, et cetera, et cetera, so that we could work through them, fund them, and also play a kind of cochair role in milestone decision authority, so that is the approach we have taken.

Just to give you an idea, my staff tells me the budget from 2003 to 2004–2005 time frame goes up by 76 percent, is what the administration has submitted in the 2004 budget to date, so we are looking forward to your strong support of the budget initiatives that Defense has brought forward in the President's budget, and with those and many of these other authorities talked about in the transformation planning guidance and others, I think you will see that our role will change and it will be stronger without trying to become a separate major force program like SOCOM.

Senator REED. Thank you, Admiral Giambastiani.

Admiral Cebrowski, your comments.

Admiral CEBROWSKI. The transformational planning guidance creates no new organizations. Rather, it sharpens the roles of existing organizations. It is really quite American. It is focused on the concept of checks and balances and seeks to ensure that, while a particular office is designated for responsibility, that at least one other office must comment on it before it goes to the Secretary to ensure that he gets at least two opinions.

The general offices that fill these roles are the immediate Office of the Secretary, Under Secretary of Defense for Policy, Office of Force Transformation, the Chairman, Joint Forces Command, and my office, and that is generally the way it works.

You expressed also concern about R&D.

Senator REED. Let me correct that. That should have been more directed to science and technology programs and I think you were going to make that correction, so thank you for that. That is an important part of your role, the science and technology business. That is the R&D, 15 years from now, when the basic research and science comes up with new developments. You are in the R&D business, and the concern I have, and I think you would agree with me, is that right now we might be able to afford it, but if we continually deny science and technology funding, it is going to in the longer run, in your world, have an impact.

Admiral CEBROWSKI. One of the things that was really debated in the transformation planning guidance was the creation of the transformation initiatives program and the joint rapid acceleration or rapid acquisition program, because those are R&D items, but they occur late in the program, and we had considerable discussions with Director, Defense Research and Engineering (DDR&E), Dr. Ron Sega, about ensuring that we have an appropriate balance between S&T and R&D, and so I know he is quite sensitized to the issue.

Senator REED. Let me ask you, Admiral, you indicated, and I think your description is a very helpful one, about what is the underlying premise, at least two agencies get to discuss it before it gets to the Secretary. Who decides which two of those entities on a given issue get to play?

Admiral CEBROWSKI. That is in the document. Those issues were resolved before the document went forward to the Secretary, and so for example, program appraisal and evaluation will support my

strategic assessment as it goes forward. The Chairman will produce guidance concerning the experimentation program broadly, which Admiral Giambastiani and I will comment on that.

Senator REED. I think, and I suspect you will be sensitive, many times who gets to look at the program determines whether the program survives or fails. If you are sensitive to that going forward it will be very helpful.

Admiral GIAMBASTIANI. I think one of the things I would add, Senator Reed, and it is important, is the fact that we can bring up criticism, if you will, critique comments, recommendations, or voices of dissent during this process, which is important.

Senator REED. Absolutely. Sometimes the dissent is more important than the concurrence.

Mr. Chairman, I am happy to go for a second round if you would like to take questions, start questioning now, or whatever.

Senator ROBERTS. I have quite a show planned. Why don't you go ahead. [Laughter.]

Senator REED. All right. Let us turn our attention now to the Joint Requirements Oversight Council (JROC) process. Where does that fit in terms of this new approach towards joint requirements, joint doctrine?

I know, Admiral Giambastiani, in a slightly different context you responded to Senator Akaka about the requirements, et cetera, et cetera. My understanding is a lot of that is going to be changed as we move to the capability-based approach, but just, let's do the question, how do you see JROC working within now, the context of this new transformational guidance?

Admiral GIAMBASTIANI. Simply stated, I will tell you in my view the JROC process needs reform, number 1. Number 2, I would tell you that General Pace is, in fact, working with the Service vice chiefs and has spent quite a bit of time talking with the Chairman and the Secretary about reforming the JROC process as it currently exists to reflect, as you have already said, the capabilities-based approach.

The JROC cannot play in every requirements issue because there is not enough time for all of the committees and the Vice Chairman and the vice chiefs to do that. I think they fully understand that, which is why they are bringing forward and have been frankly iterating here over a number of months a different approach to how the JROC actually operates. In fact, what studies, what architectures they looked at across the Defense Department, so in very broad terms, do I think it needs some reform, answer, yes, and General Pace I think agrees with that and is, in fact, working with the vice chiefs to bring about a reform.

Senator REED. Admiral Cebrowski, your comments.

Admiral CEBROWSKI. The thrust right now is that the requirements process and the acquisition process are both in flux. The guiding documents for both requirements and acquisitions, the 5,000 series acquisitions have been suspended and are being rewritten. Of course, I am not your best witness on those two documents, but the objective is to harmonize those and streamline them, and one of the critical features is to try to force management attention to earlier in the process, when it is easier to make changes and less expensive, rather than having to fix things after

they have been broken for years, so that is the general thrust of that.

Senator REED. Let me change the subject just briefly to Millennium Challenge. There was some criticism, Admiral Giambastiani, about it being overly scripted. The criticism raises a more general issue, I think we all would agree theoretically that you learn more from your mistakes than sometimes you learn from your successes, but in the real world we are loath to make mistakes, or at least public mistakes. Can you comment about the nature of Millennium Challenge, and also to what extent are you going to design experiments that have a significant probability of failure to learn from that?

Admiral GIAMBASTIANI. First of all, on being able to accept failure, we have a specific mechanism that we have introduced into our experimentation plan that actually evaluates whether we are taking sufficient risk in a certain type of experiment. In this case red is good. If you use the stop light, red, yellow, and green, generally green is good and red is bad, but in the case of experimentation we flip this around and, in fact, we look at each of our experimental objectives to see if it is red or if it is orange, if you will, or if it is yellow, as opposed to being on the lower-risk side. This is important for us to internally look at it and then ask some external organizations to look at it, so what I would tell you is, it is important for us to move in that direction.

Now, with regard to Millennium Challenge, Admiral Cebrowski early on talked about one of the criticisms is that we had this huge experiment, exercise and demonstration that it took 2 years to run, and Congress supported this very strongly, and frankly it was a defining event for Joint Forces Command, and I think DOD with regard to joint experimentation. Despite any criticism one way or another, it was, in fact, a defining event, and an important one.

What we learned out of that is that if you give the military anything to plan for for 2 years, it is going to work. [Laughter.]

I mean, if you give us money, you give us time, you give us resources, we will go make it work. In experimentation you are looking for the failure, as you have already pointed out, so we have changed and shifted our program to what we call limited objective experiments, where we run them more frequently. We try not to on the scale of preparation go too deeply into them because once again we will get into this mind set of if I work long enough on it we are going to make it work, no matter what the procedure, doctrine, training technology is. We do not want to do that.

Plus, in these more freewheeling experiments in many cases you learn insights that you had no clue that you were going to get in the first place. That is why you experiment. They are very important insights.

So that is how I would answer your question, sir.

Senator REED. Thank you.

Senator ROBERTS. Could I ask an add-on?

Senator REED. Absolutely.

Senator ROBERTS. I remember talking at length with General Paul Van Riper, who was the head of the opposing force, and he indicated in rather meaningful dialogue that every time that the opposing force won, or was one or two steps ahead of the operation,

that you stopped the exercise. That might be a little harsh. I am just trying to sum that up. I think his name was Sun Tzu, as I recall, in the exercise.

Would you comment on that, because one of the questions I have is, how do you keep the opposing force up to speed with the rapidly changing environment that we are facing, and it does not do much good to have an exercise and have the opposing force really figure out what the answer is and “win,” if that is the proper term, only to stop the exercise, although I do not know if we are into a credit game where you get a star by your name in regards to what happens here. Would you care to comment on that?

Admiral GIAMBASTIANI. Yes, sir. First of all I would like to go back in history for just a moment and talk about opposing forces. When we were in the early days of developing carrier aviation in the Navy, in general in our fleet battle experiments the opposing forces generally won all the time and we developed a very robust naval aviation capability in this country as a result of this very extensive fleet battle experimentation program that occurred during the interwar years. Almost invariably the opposing forces won, and that is one lesson I learned out of that.

My own view on this is that the reason why you run a war game and experiment and exercise is to train and test, to experiment, and you learn a lot, and part of the failure in this learning process is the fact that an opposing force would win.

Now, let me talk about the mechanics of an exercise for just a second. I did not plan or execute Millennium Challenge. I am a little bit more of an unbiased observer than I would be if I had been directly in the middle of it. What I would say to you is this. When we run one of these experiments and exercises, you have certain constraints on when airlift is available, you have certain constraints on when you can use real forces and when they are available.

Even though the forces provided by the Services are under Joint Forces Command combatant command, they are also simultaneously on service training time lines. These are made available for certain periods of time to help leverage the experiment—but keep to service timelines so they can do the rest of their organize, train, and equip functions. We do not have the luxury of suddenly changing the clock, or allowing free play to continue in a certain point in the exercise, so some of this is an exercise constraint. It’s just part of the challenge, it is in existence. Does that mean it is right? No, but it is a fact of life.

It is easier to do it when you are doing a command post type of experiment or exercise, where you are moving virtual forces around. It is much easier to let the free play continue and the rest of it, but if you have 13,000 Active Forces out there operating, airlift is available at a certain time, battalions are available, the range time is available. You have to allow for those.

I know Paul Van Riper very well. I have dealt with him over the years, and he is a good man, and he would not have brought these criticisms up if he did not feel strongly in his gut that they were important criticisms. I take some of them as very important criticisms. Some of them, in looking at the situation, I do not, so I am kind of one of these guys who is about 50–50 on what he said, and

I have been to a couple of forums with him and discussed this with him.

My own view is that some of his criticisms are valid, some are not. We learned a lot in this experiment, in this exercise, in this demonstration. I keep using all those terms because I hate to call it an experiment if you took 2 years to get it moving.

So, sir, that may not be the perfect answer, but that is where I come from.

Senator ROBERTS. So bottom line, you took the criticism seriously and on a 50–50 deal, we did come up with some lessons learned.

Admiral GIAMBASTIANI. Absolutely.

Senator ROBERTS. Jack, go ahead.

Senator REED. Mr. Chairman, why don't I just forego. I might have another question, but why don't you go ahead. Thank you. Thank you, gentlemen.

Senator ROBERTS. Gentlemen, I am going to do something a little unique. I am not too sure you have ever been in a hearing where you have had the chairman repeat your statement back to you, but I am going to do that. I think it is important to emphasize this for the record.

Admiral Giambastiani, you said, "We must transform even as we conduct worldwide operations. Everybody knows that the attention on the world scene today is on the war against terrorism, Iraq, and North Korea, but we must transform while we are doing this," and you said, "we have to get through today to get to tomorrow." I think that is a pretty good quote. If there is any press here today, or if C-SPAN wants to take notice, I think that would be a good one to take notice of.

Then you said, "transformation and modernization and selected recapitalization cannot occur without the resources identified in the President's budget." That is up to Senator Reed, myself, and our friendly appropriators to follow suit, and you note the criticality of congressional support. You have our support.

You also mentioned the challenge of transforming the joint force in stride. It was daunting before, to get people's attention. Now, there is nothing like an exercise called Iraq to really get people's attention, but it is a daunting task to continue the mission that you are responsible for.

I would like to move now to the statement of Admiral Cebrowski and just highlight some things that he said and which I think are terribly important. On page 10 of his testimony, and he did not read it, he summarized it like I asked him to do, but I think this is very important.

"The preferred U.S. military method is forward deterrence and the projection of power. As a matter of effectiveness, cost, and moral preference, operations will have to shift from being reactive, retaliatory, and punitive to largely being preventative." We have heard a lot about preemption, but we have not heard too much about being preventative. There is a difference.

The implications of deter forward necessitate a major force posture review. Rebalancing from the current condition where 80 percent plus of the force is U.S.-based, and everyone is competing for the same finite strategic lift—which, by the way, if we do not get

the 767 leasing program done, we may not have any strategic lift. I thought I would toss that in, Jack.

Accordingly, the emerging American way of war features highly network special operation-like forces, information age technologies and techniques to urban warfare, deny the enemy his sanctuary, surveillance-oriented forces to counter weapons of mass destruction. That is surveillance-oriented forces to counter the weapons of mass destruction, which is a different kind of concept, a concept of jointness that extends down through the tactical level of war. I just came back from Qatar, Kuwait, Pakistan, Afghanistan, Jordan, Turkey, and London, on what was called the Chairman Warner Death March I think, or forced march, at least, by the time we were through. I was tremendously impressed by the fact that everything is joint. From the uniforms, to the tactics, to the communications, everything is joint, not that we are there in terms of being seamless. I was looking at the intelligence side, but I think it is a good suggestion.

Then you said, "interagency capabilities for Nation-building and constabulary operations." We all know that if in Afghanistan we are doing X, we are going to have to do 100 X in regards to Iraq.

The adjustments in force structure and posture in consideration of the growing homeland security roles of the Coast Guard, National Guard, Air National Guard, and the Reserves. Senator Akaka brought this up. We have people in the Reserves who have been in Bosnia, Kosovo, and now Iraq, and in some cases in the Balkans two or three times. How on earth they can continue to do that is beyond me, and it is about half our force over there.

Every time I meet with people, like Jack does, and we ask to meet with our own people, and I am talking about enlisted, non-commissioned officers (NCO), all the way up the command structure, and we pay more attention to the troops in the field, or at least we both do, and I ask how many are active duty, and I am always surprised at the number of hands, and then the number of hands who are Reserve and Guard. I do not know how we can continue this. The operations tempo is very severe, especially in the Reserves. You are going to have to give tax breaks to businesses or something of that nature.

Now, I wanted to thank you for those statements. I wanted to thank you for the leadership in this. We both have a working draft of the document that hopefully will be popping out here real quick. When did you say this might happen in terms of timing, Admiral?

Admiral CEBROWSKI. I expect within 2 weeks. It was approved on Thursday night.

Senator ROBERTS. Well, here it was Thursday night, and here we have Friday, and we have a working draft. We can help you write it right here, if you would like. There is the Secretary's comment that is not really done yet. Maybe we could work on that.

But on page 15, and I hope I am not violating any confidentiality here, you get to pillar 2 in regards to transformation strategy, and it rests on transformed intelligence capabilities. I am going to put on my intelligence cap as Chairman of the Intelligence Committee. You have some bullets here saying, allow us to warn of emerging crises and continuously monitor and thwart our adversaries' intentions, second, to identify critical targets for, measure and monitor

the progress of, and provide the indicators of effectiveness of U.S. base campaigns.

I asked Secretary Rumsfeld in his confirmation hearing what kept him up at night. He said, we need better intelligence. Let me ask you, in exploiting the intelligence advantages, in your view, what transformation is required of our defense intelligence capabilities to support the transformation program, and is investment in intelligence experimentation keeping pace with the overall experimentation campaign plan? Are we putting enough money into intelligence experimentation?

Admiral CEBROWSKI. Yes, considerable work does need to be done with regard to intelligence, and the problem is characterized by two things. First, the intelligence officer is at the center of the intelligence universe instead of the customer, and second, the provision of intelligence is a stovepiped operation.

The indication that there is a future for this which corrects both of those things is to be found at Fort Belvoir, in Army Intelligence and Security Command (INSCOM), under the command of Major General Keith Alexander.

Senator ROBERTS. Is that the LIWA Center?

Admiral GIAMBASTIANI. It used to be, sir. Now it is the Army's Intelligence Command.

Senator ROBERTS. So we have a different acronym. What is the new acronym?

Admiral GIAMBASTIANI. Army Intelligence Command.

Senator ROBERTS. I sort of liked LIWA. That sort of had a ring to it.

Admiral CEBROWSKI. In any case, sir, you might want to visit that.

Senator ROBERTS. I have been there twice.

Admiral CEBROWSKI. Okay, good.

Senator ROBERTS. And got funding for it, by the way.

Admiral CEBROWSKI. Great. The key feature of that is the establishment of what we call a data mediation layer which allows an analyst to look across all of the various intel stovepipes to perform his function. The next feature is to move the customer to the center, that is, the customer's question to the center of the process.

A possible third step is to take a look at the implications for the existence of those stovepipes to begin with, and we are looking at that together with them and the Commander of U.S. Forces Korea, and that takes me to the second part. We are hoping to conduct an experiment with him much later, a little later this year, I think late this summer.

Senator ROBERTS. Yes. He just testified before the committee yesterday, as a matter of fact.

Well, knowledge management is the key. When our congressional delegation (CODEL) was in Pakistan I was tremendously impressed with the coordination of the military and our intelligence agencies and the Pakistanis, resulting in some pretty good news on the war on terrorism. I think we are being much more robust, much more aggressive, and we are really collaborating much better.

The Intelligence Committee will be holding a hearing next week inviting the Director of the FBI to come up and to strongly assert

his position that he would prefer not to have a Director of National Intelligence to take the place of the FBI.

You mentioned stovepipes. Have you seen real progress, or some progress, or give it a grade in regards to much better collaboration and information-sharing, as opposed to the cultures that existed before September 11.

Admiral CEBROWSKI. I do not feel qualified to answer the question, sir.

Admiral GIAMBASTIANI. If I could, Mr. Chairman, I would like to just tail on Admiral Cebrowski's answer here. In specifically moving the customer toward the center of this operation, in our experimental work in prototyping at Joint Forces Command with regard to our standing Joint Force Headquarters, we have moved the customer to the center of this operation to perform four functions, knowledge management, operations, plans, and information superiority for just the reasons that you have pointed out. We are working very hard on this to break down what we consider to be the old J or G code structures to organize ourselves in this way.

In fact, Lieutenant General McNeil, the Commander of Joint Task Force 180—

Senator ROBERTS. We have met with him.

Admiral GIAMBASTIANI. Yes, sir, and you saw some of his products out there. He has organized and is organizing himself in this way. These are part of the products out of Millennium Challenge 2002, and this is what we are currently prototyping right now to embed within all of the regional combatant commanders over the next 2 years.

Senator ROBERTS. Admiral, you are going to take on the additional responsibilities as the Supreme Allied Commander for NATO Transformation? Now, I am not in a position to give you a Roberts Plan, or the Reed-Roberts Plan, or the Roberts-Reed Plan for NATO/Jones, or Jones-Roberts-Reed Plan, but at any rate, it is obvious to me that NATO could come up with a NATO response force, as opposed to European Security and Defense Identity (ESDI), that the Europeans keep talking about but will never fund and do not have the capability to operate, but a NATO response force is already bought and paid for.

It could be more flexible. We could move east. You could BRAC (base realignment and closure) certain bases in NATO. We are going to have to look south to Africa, be more flexible, a lighter footprint. Tell me what you think about transformation of NATO, just off the top of your head here. I do not want to get too far down the road, because these are just my personal views, and I would just like to have your feeling about it.

Admiral GIAMBASTIANI. Yes, sir. Just to let you know how important this subject is, General Jones, myself, and the interim Supreme Allied Commander Atlantic met in Norfolk yesterday for two-thirds of the day on this very subject.

Senator ROBERTS. We could call it the Jones Plan, except I do not think he is quite ready to call it the Jones Plan, but there is a ministerial in NATO in June, and there would be an opportunity—with all the talk about the coalition of the unwilling, this would surely be an opportunity to get a positive message out that made a lot of sense.

Admiral GIAMBASTIANI. Yes, sir, and I think we are striving collectively for a positive message here, and frankly, in January we, along with Supreme Allied Commander Atlantic, my old NATO staff before I was relieved, hosted a seminar for 2½ days called Open Road. Day 1 centered on U.S. transformation. We had the largest group of NATO officers to come to Norfolk in anyone's memory, and I am talking about senior people, coming to listen on how the United States does transformation. Day 2 included NATO speakers and discussion seminar topics.

That was a very important event, and a tremendous amount of interest as a result of last November's ministerials that the President attended, and the other NATO members said we want to create allied command transformation, so my staff, frankly, is doing more with NATO today than in the history of Joint Forces Command, U.S. Atlantic Command (USACOM), whatever it was in the past over this last 10 years, with regard to working on transformation. We are currently working on documents inside the military committee to help them on how we structure ourselves.

The important points are as follows: 1) we want to make the organization leaner, if possible; 2) we want to create, as you have already mentioned, a second Supreme Commander for Transformation; and 3) to stand up this allied command transformation, and make that staff joint. Currently, it is a naval staff, and here I am a Navy officer talking to you, and, in fact, we are moving joint officers from the allied nations into it as we speak. The current Chief of Staff, who is a vice admiral in the Canadian Navy, is leaving. He will be replaced by an Army lieutenant general. We have a number of other officers who have reported in already.

We are trying to do, in a space of about 8 months, what took 4½ years the last time to make any command structure changes, and so in itself we are trying to transform the organization.

The NATO response force in my view and in General Jones' view, and he and I have talked extensively on this, we think, as you do, can be the centerpiece for how we transform the way we do business with NATO, how we get to use it, how we get to operate it.

I would like to see NATO stand up a joint warfighting center similar to what we have in Suffolk, Virginia in the U.S. Joint Warfighting Center so that we can train a combined Joint Task Force staff. I think you will see that become a reality, and I think the nations will support this significantly.

So in summary, I would tell you it is an important thing for us to transform this coalition, make it more useful, usable, and more easily used.

Senator ROBERTS. Admiral, if we do not, NATO becomes irrelevant.

Admiral GIAMBASTIANI. Yes, sir.

Senator ROBERTS. We are on the cusp of that, and I cannot emphasize enough the importance of your keeping us posted on your advice and counsel on this. I will not go any further with it. I think it is in the developing stage. Obviously, each nation cannot develop the capability we have, that is impossible, but we can pool it. That is the key word. They call it pooling, and I think the faster we can get this done post the conflict in regards to Iraq, the more things may settle down in regards to the alliances that we must keep, and

the most important thing of all is the transatlantic partnership that we have had in the past.

Let me ask you how the Services are responding to all of your efforts, and this could be to both of our witnesses. How would you characterize the level of cooperation of the military Services and the joint training, joint concepts development, and joint experimentation process, more particularly the Army?

Senator REED. Then the Marine Corps after that. [Laughter.]

Senator ROBERTS. We have to be joint. We just have baling wire. [Laughter.]

Admiral CEBROWSKI. The principal finding of our review of the service department road maps was that the Secretary is being well-served by energetic and committed leadership that is committed to transformation. That is really not the issue. They are moving forward quite well.

Senator ROBERTS. So you are optimistic about that?

Admiral CEBROWSKI. Sir, I am optimistic. I am somewhat less optimistic, however, about the ability of the institution to correct some of the fundamentals, such as improvement in capability cycle time, which is an increasing concern. There is a lot of talk about it and a lot of energy is being poured into it. It remains to be seen whether or not it will deliver.

It is not just that we want to have forces and new things in the field sooner. When you have a capability cycle time of 16 years or 20 years, your learning curve is flat, and in an age when power accrues to those who can create new knowledge and innovation, we put ourselves at a considerable disadvantage.

Senator ROBERTS. How do you fix that? Other than putting you in charge, how do you fix that? [Laughter.]

Admiral CEBROWSKI. Well, Senator Reed talked earlier about culture change. We have a culture which is based on stability, the notion that you know what the threat is and the environment is generally stable, and you can plan things out for a long time. We also focus on risk management through the lens of technology, that is, suppressing technical risk.

We also are very efficiency-oriented, which means we spend the taxpayers' money, we are good stewards of the taxpayers' money but in the most expensive way possible, because we feel compelled to study it to death. There are probably things out there that would be less expensive to do than it would be to study, and the important thing is to get on with it.

I think about the run-up to World War II, when we did not know what kind of cruisers to buy, and so we started a chain of three classes of cruisers. We did not know what kind of destroyer to buy, so we started to build four of them. That turned out, those two decisions were margins of victory in the Solomons, and that is the approach we need to take now, and that is a completely different culture. It says, we do not have to have the first ship of the class, for example, be perfect. It says the important thing is to get the ship in the water where the forces can experiment with it, learn about it.

Senator ROBERTS. Do you want to give the catamaran example?

Admiral CEBROWSKI. Oh, I think that is a great example.

Senator ROBERTS. You were talking about it 2 years ago in my office, and you have how many in the theater?

Admiral CEBROWSKI. We have two, I think, in the theater right now, and we have another that is going to be delivered, I believe within a matter of weeks to the Atlantic Command.

Senator ROBERTS. The value of that particular craft is?

Admiral CEBROWSKI. The cost?

Senator ROBERTS. No, the value of it in terms of the mission in regards to the littoral threat.

Admiral CEBROWSKI. Oh, the value is difficult to measure because the metrics we have are all based on older capabilities. It introduces a new, broadened capability that we did not have before in terms of speed, numbers of port facilities which can be accessed, not just speed of the craft, but also speed with which you offload. These things were built on ferry technology.

I used to command an amphibious ship and it would take all day to load it and just as long to unload it. Now we are talking about craft where we can offload the equipment of a battalion, the whole battalion landing team plus its command element in probably 20 minutes or less. This is a degree of flexibility that we simply have not had before, and we buy it at about one-tenth the cost of the conventional ships.

My point is not that we should give up the conventional ships, but that we need to introduce the mix, because it is in the mix that we have the broadened capabilities.

Senator ROBERTS. Are you cracking that nut that you are talking about in terms of the culture, all these points that you have just made? I mean, do you feel confident that you are making progress in that regard?

Admiral CEBROWSKI. Yes, I do feel as though we are making progress, but you talked about rope-pushing, and that is rope-pushing, there is no doubt about it.

Senator ROBERTS. We have already touched on the Millennium Challenge. I will not go into that, and Jack, don't worry, I really do not have too many cards left.

Senator REED. I have just two questions, then.

Senator ROBERTS. We will let you do that in just a moment.

Admiral GIAMBASTIANI. Mr. Chairman, while you are looking at your next card, I wonder if I might add on cooperation.

Senator ROBERTS. I have memorized them all, of course.

Admiral GIAMBASTIANI. Yes, sir.

Senator ROBERTS. But go ahead. [Laughter.]

Admiral GIAMBASTIANI. I would just like to add, on working with the Services I think the key thing to look at from the Service perspective is a 17 September 2002 one-page document that Secretary Rumsfeld signed that was a result of 2½ months of senior-level review group. This is the Service Chiefs, the Chairman, the Secretaries of the Services, the Under Secretaries, where they came out and gave the top 10 priority list.

It is an unclassified document. I know your people have it, because it talks about legislative priorities on page 1, and on the back of it is what is called the draft top 10 priorities for the Defense Department for the next 6 to 12 months.

In the top three priorities I mentioned in my testimony, global war on terror, in fact, transforming joint warfighting capabilities and transforming the joint force, the Service Chiefs and the Service Secretaries were forward-leading there in pushing that.

I am optimistic, like Admiral Cebrowski is, that the Services want to play in this. However, I will put a caveat on it, as he did, but a different one, and that is, I find on a routine basis, though, because the Services, like any other large bureaucracy, are a large bureaucracy, it is tough to get down sometimes in the middle of this. For example, I will have staff people who will come back and say, the Navy is not in agreement with this, the Army does not want to experiment here, and what we find is, I say to them, okay, well, who is speaking for the Navy, who is speaking for the Army.

So number 1 is, I will tell you that there is a tremendous drive at the senior levels to push this. Number 2, one or two quick examples. The Service Chiefs and the Service Secretaries all ask for joint concepts of operations on which to base the building, organize, train, and equip of their programs. That is really quite remarkable, the fact that they would ask for a joint context to be able to do their work.

Each of the Service Chiefs is very committed. Just yesterday I had General Hagee in my office, having a very good discussion with him. Frankly, he used to make me do pushups, because he was my squad leader at the Naval Academy many years ago, but he and I are old friends and we work well together. Every one of the Service Chiefs has been forward-leaning.

In the case of the Army, I will tell you they are sending me just the best officers they can give me, general and below, on my staff. We are, in fact, going to, for the first time ever, have Joint Forces Command and the United States Army combine in a joint war game. It used to be the Army's transformation war game, and we are both equal partners in this. We have called it Unified Quest, and it is going to start on 28 April, and it is going to go for about 4 days, right into early May.

Senator ROBERTS. Where?

Admiral GIAMBASTIANI. It is going to happen, I believe at Carlisle Barracks, and we are going to participate and, in fact, not only participate, we are working together with them to do this, and we are going to take this same common joint context and bring it to the other Services.

The Navy will probably be next. We are working with the Air Force and the Marine Corps. The only reason why we did not do them first is because of the timing of their currently scheduled games and how we could integrate with them. I think these are all good messages, and that is what I would leave you with.

Senator ROBERTS. I want to bring up one other thing, and then I am going to yield to Senator Reed and we will close the hearing.

We have talked a lot about transformation, but I want to see how this fits into the concept of homeland security and the role of the Department of Defense in homeland security. What transformational capabilities and concepts are required to meet the Defense Department's responsibilities in the area of homeland security and homeland defense?

Now, I am going to mention something here that perhaps I should not, but in homeland security we just got a new coalition support team, by the way, in Topeka, Kansas, which gives our National Guard units—I cannot remember the number we are up to now, but I think DOD lagged a little behind in homeland defense and said, no, we really do not want that authority, and then the National Guard took a look at it and said, well, but wait a minute, we are to augment the active duty folks, but now I think they are welcoming it with open arms.

But if you get into homeland security and the threats that could happen, one of the things that fell into my lap when they could not find anybody else to do it is that I played the President under an exercise called Crimson Sky with the Department of Agriculture.

Now, Crimson Sky was the misnomer label of what would happen if Iraq had launched a hoof and mouth disease infection in the United States in seven States. That does not sound like much on the surface of it, but you have an infestation period of 6 days, and on the 7th day you have to make some decisions, and we did not do very well. We ended up with 50 million head of livestock that had to be terminated. How do you do that, just on the surface of it?

How on earth do you do that, and what do you do with the carcasses? Obviously, you call the National Guard, and then the National Guard could not handle it all, so you call in active duty personnel. Then we found out we did not have enough ammunition. Then we found out, you do not burn the carcasses because, as we learned in Great Britain that is not what you do, so you had to bury them. There was a ditch 25 miles long and a half a football field wide in Kansas alone, just to handle the herds there.

Then we had to put a stop order on all shipments, because you were having States and National Guards being activated by the Governors to stop other States in transportation of livestock. All exports stopped, the markets went nuts, and the people in the cities finally figured out that their food did come from farms and not supermarkets. [Laughter.]

They rioted in the streets, and it was a mess, and not only for 1 year, but for several years. Then add in the problem of food security, that if you put a little anthrax in the milk, you really have a problem on your hands.

I know at that particular time when different events happen that DOD will be there. They are going to have to be there, because they are the only outfit that can do it. I prefer the National Guard, because people know them, trust them. They are the home forces, and they are working toward it.

In terms of transformation, I am not sure I see much progress in that arena. Each State is doing different kinds of things, each Governor is doing different kinds of things. It is sort of a hodgepodge kind of arrangement. We are better, but I do not even think we are close in regards to the progress that we have made in the intelligence community with the 13 agencies that comprise that outfit.

Any comments?

Admiral GIAMBASTIANI. I would be happy to make a couple of quick ones. You know previously that Joint Forces Command was

working in this area, homeland security and homeland defense, and now we are the force provider, if you will, for Northern Command.

One very important and key indicator that I think General Eberhardt has brought about in Northern Command is, his chief of staff is a National Guard officer, so of the top three within the command, the number 3 guy is a National Guard officer. That, in my view, is very significant. In fact, the fine gentleman he just had has been promoted to lieutenant general and is now becoming the head, as you well know, of the National Guard Bureau.

Number 2, one of the best ways for us to explore in some of these areas is to run exercises and experiments and, in fact, we have a series called Unified Defense that started under Joint Forces Command and has now been exported to Northern Command, and we support them in the running of this exercise. In fact, we wound up having to do a simulated one due to a run-up here recently because of the high levels.

What I will just tell you is that these Unified Defense—and we do two of these a year for Ed Eberhardt—are very important exercises, and our imagination has to run to allow us to explore the types of things you are talking about in these exercises.

Senator ROBERTS. Senator Reed.

Senator REED. Thank you very much, Mr. Chairman. First, Admiral Giambastiani, you made reference to a two-page memo. Could you make sure we get a copy of that?

Admiral GIAMBASTIANI. Yes, sir. I will leave it with you when I leave.

Senator REED. Thank you very much.

Let me follow up on the issue of rapid acquisition funding. Admiral Giambastiani, you talked about funding within this year's JFCOM budget. Admiral Cebrowski, you mentioned both the TIP and the JRAP programs. There are already, as I understand it, other programs to achieve similar objectives like advanced concept technology demonstrations (ACTD), the technology transition initiative, and the Services' rapid acquisition programs.

Can you clarify for me how these different funds interact, and who oversees and coordinates these funds?

Admiral CEBROWSKI. I am meant to oversee the TIP, and the Under Secretary of Defense for Acquisition is meant to oversee the JRAP.

Senator REED. What about these other funds, the ACTDs, the technology transition? Is there a coordination or collaboration?

Admiral CEBROWSKI. Those are all under the Under Secretary of Defense for Acquisition. There is, of course, a profound difference between the JRAP and TIP and the ACTD. The ACTD process is well-defined, and even though it is rapid compared to some of the other—

Senator REED. The normal acquisition.

Admiral CEBROWSKI. Yes. It is still quite ponderous, and we need things that can work on the near side of that, and these other programs are meant to help with that.

Furthermore, they are also meant to focus specifically on joint constituency, as opposed to service.

Senator REED. Thank you, sir.

Admiral Giambastiani, I understand that JFCOM is one of the potential operational users of the Doppler total information awareness suite of data collection and analysis technology. How do you propose making use of this total information awareness (TIA) program at JFCOM, or do you?

Admiral GIAMBASTIANI. What we are interested in is the technology with regard to how it relates to external sources, if you will, foreign intelligence and the ability to collate, fuse, network, and use this in that organization I talked to you before about where we look at knowledge management and also the information piece, how that is fused for a standing joint force headquarters, so we are talking about foreign intelligence external to the United States, but we are very interested in those technologies, because they have some very powerful capabilities that we would like to leverage off of.

Senator REED. Could you give me a hypothetical example?

Admiral GIAMBASTIANI. Well, let me give you an example. If, for example, we have a variety of communications intelligence sources, electronic intelligence sources, in other words, all of these different INTS, and how we fuse and put that together is a very key component in allowing our people to have situational awareness so that the customer is the guy who is getting that.

That is why, when Admiral Cebrowski said before, if you, Senator Reed, have not been down to the Army's Intelligence Command, for example, and visited General Alexander, I commend you to do that. He has done a lot of this very well, and he is interested in it, too.

Admiral CEBROWSKI. I think a good example is the one that Senator Roberts pointed out, the hoof and mouth disease scenario, and what his explanation or his recounting of that, which was very dramatic, pointed out was the difficulty when you have zero depth of battle space, and what we need is intelligence efforts which will create for us depth of battle space, moving unambiguous warning to the left so that it happens earlier, so that we can work earlier. We want to start acting when the problem is on the other side of the globe, and then start working it in.

Senator REED. The kinds of intelligence capabilities that you two gentlemen have been talking about are going to help us considerably with that.

Admiral GIAMBASTIANI. This movement of unambiguous warning to the left, today you can see as we try to grope with the variety of little hints and scraps of information that we get with regard to what is happening and how it applies to homeland defense, systems like these are very important to try to bring this information and fuse it in a way that is useful so that you can tie threads together, if you will, connect the dots and give you information, because those smoking guns that everybody is looking for out there are so tough today because people know how good our systems are and will do everything to try to combat them.

Senator REED. You have indicated in your response that you are only going to use external sources, so that is a very clear, broad line in your mind about what information you are going for.

Admiral GIAMBASTIANI. Absolutely.

Senator REED. I know Senator Wyden had an amendment that put some constraints on the TIA development. Does that impact your use of this at all?

Admiral GIAMBASTIANI. Sir, I will take that for the record. I just have not looked at what he has written and how it would apply. [The information referred to follows:]

We are aware of the Wyden amendment (Public Law 108-7) and its requirement that the Secretary of Defense, acting jointly with the Attorney General and the Director of Central Intelligence, submit a report to Congress regarding proposed research and development activities of the Total Information Awareness (TIA) program. We understand that the Department of Defense intends that that report be submitted as required. If so, then there should be no impact on U.S. Joint Forces Command's current participation with the Defense Advanced Research Projects Agency (DARPA) in research and development efforts on the TIA program. U.S. Joint Forces Command's interest in the TIA R&D program is to explore the possibility of using TIA technologies to establish a collaborative environment for collection and fusion of foreign intelligence to enhance situational awareness for the warfighter. Any TIA activities conducted by U.S. Joint Forces Command will comply with all applicable laws and regulations, including the Wyden amendment and long-established intelligence oversight guidance.

Senator ROBERTS. Would you yield?

Senator REED. I would yield to the Senator.

Senator ROBERTS. I talked with Senator Wyden at length about it and he has done his homework. I think we can, I do not want to say work around, but work through his concerns, which we all share in terms of civil liberties. I would point out that yesterday in the Intelligence Committee we were going over the budget of the National Security Agency (NSA) and the National Reconnaissance Office (NRO), and I am not going to get into that, with the exception that we have had to plus-up and have plussed up a great many analysts, but our collection assets just knock your socks off, and the amount of information that comes in is just incredible.

We have to get some kind of an analytical product that makes sense, and you get into knowledge management again. I know all these are sort of gobbledy-gook words, but the young man who quit the Defense Intelligence Agency (DIA) the day after the U.S.S. *Cole* incident thought he saw storm clouds here, lightning going to strike here, and it was transformational. They paid attention, but they did not think that was enough to issue a threat warning.

I am not sure it would have saved the U.S.S. *Cole*, but now we have a situation, more especially in the Navy where we insist, no more U.S.S. *Coles*, and it is that kind of thing, that if you had had enough advance information, and I think we finally tumbled to the fact that terrorism was really transnational.

Only 6 percent of the information that comes in can be handled now by the analysts, and so you have to have different platforms like, what is it, TIA? I think I would have named it something else, but maybe we can come up with a new acronym that will not be quite so threatening, I guess, but total information awareness, but I think it is an excellent question.

We have to do this, or we will not be able to do the job in the intelligence community that we have to do.

I have one final question. The Joint Personnel Recovery Agency is an element that means a lot to every service person and a lot to everybody on this subcommittee and to me personally, and I am

using the case of Michael Scott Speicher, the Navy pilot who was left behind, and there are other cases.

I hope we will ultimately go to a system where all of our service men and women get the same advanced training regarding how to act if captured, and uniform gear that they have on their persons so that that would aid and abet them should that happen. I can tell you that on this CODEL that we went on, in every command that we talked to, when I said no more Speichers, everybody agreed, because it goes to the heart of what we stand for and the difference in the cultures where we now have a conflict, or an impending conflict.

You do not have to respond. That is just an observation on my part, if we can insist that everybody that could be put in harm's way get that same kind of training and same kind of gear, that would prevent another Speicher.

With that, I conclude the hearing. I thank you, gentlemen. Persevere. We are with you.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JACK REED

TRANSITION FUNDING

1. Senator REED. Admiral Giambastiani, in coordination with other parts of the Department of Defense, please provide a comprehensive list and description of current and planned programs whose objective is to more rapidly transition transformational capabilities to the warfighting force. Please include in each description the year the program began, the office or individual responsible for allocating the funding, a funding profile for fiscal years 2002–2009 (including new starts in the out years), and specific information about the phase or phases of the development and acquisition process the program is intended to affect. Please also provide an overarching description of how these programs will be coordinated to ensure maximum benefit from the proposed resources. Service-specific initiatives should be included.

Admiral GIAMBASTIANI. I can do no better than cite Secretary Rumsfeld's analysis of the transformational aspects of the President's budget for fiscal year 2004. In particular, he cites the programs that support the Department's six transformation goals:

For programs to help defend the U.S. homeland and bases of operation overseas—such as missile defense—we are requesting \$7.9 billion in the 2004 budget, and \$55 billion over the Future Years Defense Program (FYDP).

For programs to project and sustain forces in distant theaters—such as new unmanned underwater vehicle program and the Future Combat Systems—we are requesting \$8 billion in 2004, and \$96 billion over the FYDP.

For programs to deny enemies sanctuary—such as unmanned combat aerial vehicles, and the conversion of SSBN to SSGN submarines—we are requesting \$5.2 billion in 2004 and \$49 billion over the FYDP.

For programs to enhance U.S. space capabilities—such as Space Control Systems—we are requesting \$300 million in 2004 and \$5 billion over the FYDP.

For programs to harness our advantages in information technology—such as laser satellite communications, Joint Tactical Radio, and the Deployable Joint Command and Control System—we are requesting \$2.7 billion in 2004 and \$2 billion over the FYDP.

For programs to protect U.S. information networks and attack those of our adversaries—such as the Air and Space Operations Center—we are requesting \$200 million in 2004 and \$6 billion over the FYDP.

Over the next 6 years, we have proposed a 30 percent increase in procurement funding and a 65 percent increase in funding for research, development, testing, and evaluation (RDT&E) above the 2002 baseline budget—a total investment of around \$150 billion annually.

In addition to these increases, RDT&E spending will rise from 36 percent to 42 percent of the overall investment budget. This shift reflects a decision to accelerate the development of needed next generation systems and accept some near-term risk.

Among the more important transformational investments we propose is our request for funds to establish a new Joint National Training Capability. In the 21st century, we will fight wars jointly. Yet, our forces still too often train and prepare for war as individual Services. That needs to change. To ensure that U.S. forces train like they fight and fight like they train, we have budgeted \$1.8 billion over the next 6 years to fund range improvements and permit more of both live and virtual joint training—an annual investment of \$300 million.

The total investment in transforming military capabilities in the 2004 request is \$24.3 billion, and about \$240 billion over the FYDP.

JROC PROCESSES

2. Senator REED. Admiral Giambastiani, last year General Pace testified that the Joint Requirements Oversight Council (JROC) was still in the position of “grading somebody else’s homework” when it came to requirements development, and that the JROC was still not being as proactive as it should be in ensuring capabilities are “born joint.” Can you give an update on your evaluation of the status of the JROC in this regard—as you put it in your testimony, are we getting better at putting the “joint horse” before the “service cart” in the JROC as well?

Admiral GIAMBASTIANI. I believe General Myers gave a good update on how the JROC is evolving to help all of us produce “born joint” requirements. In his posture statement, he noted that “—the JROC will implement methodologies to assess both legacy and proposed systems in the aggregate. As a result, the JROC will define and validate desired joint capabilities and derive mission area requirements. The JROC shall consider the full range of doctrine, organizations, training, materiel, leadership and education, personnel, and facilities solutions to advance joint warfighting. In this manner, the JROC will further reorient our force planning to a capabilities-based framework. The Joint Operations Concept will allow the JROC to adopt a synchronized, collaborative and integrated systems engineering approach to sizing and shaping our forces.” In this case, the “joint horse” driving the “service cart” is the Joint Operations Concept, derived from our Joint Vision and the Defense Strategy. That will ensure all the Services have the proper “joint context” with which to develop their concepts and programs. The JROC is working to adapt its processes to contribute meaningfully to our collaborative efforts to produce the best possible capabilities for the joint warfighter. Much work lies ahead.

3. Senator REED. Admiral Giambastiani, are you satisfied with your role in JROC deliberations?

Admiral GIAMBASTIANI. To date I am satisfied with my role in JROC deliberations. In our role as the Joint Integrator, Joint Forces Command has had good results working with the JROC to ensure that requirements for new defense systems include key interoperability performance parameters. We are also working closely with General Pace and the Service Chiefs on a variety of Transformation Change Packages that capture the results of our experimentation and integration work. The proof of the process, however, will be product—the adoption of joint warfighting programs with adequate resources. Much work remains to be done, though we have made a good start.

4. Senator REED. Admiral Giambastiani, you also mentioned in your testimony that the JROC’s requirements process sets out clear criteria which serve as benchmarks for testing. How will the proposed shift to a capabilities-based assessment process (and the movement away from clear requirements definition) affect DOD’s ability to evaluate its weapon systems with tests and experiments?

Admiral GIAMBASTIANI. I believe the shift from a requirements based to capabilities based assessment process is not going to affect Department of Defense’s ability to evaluate its weapons systems with test and experiments. The difference in the approaches is in the “up front” conceptual work to drive capability development—not in the detailed elaboration of key performance parameters that form the foundation of our test and evaluation efforts. The Quadrennial Defense Review, Defense Planning Guidance, and other strategic documents will provide guidance for transformation strategy, implementation, and joint experimentation. The Chairman, using the results of experimentation, will approve joint operating concepts, supported by born-joint and Service-led concepts that define how the transformed joint force will operate. These concepts, assessed against integrated architectures, will be used to develop or define capabilities based requirements.

With a capabilities based approach, especially within the joint arena, we can now be more assured that systems are born joint and can perform their missions within

a joint context. U.S. Joint Forces Command's current involvement in the development of Capstone Requirements Documents and Key Performance Parameters and future role in developing integrated architectures helps to ensure the jointness of Service systems before we ever get to the assessment phase. The rigor and integrity of that phase will remain intact and indeed essential.

EXAMPLES OF EXPERIMENTATION FAILURES

5. Senator REED. Admiral Giambastiani, witnesses before this committee have repeatedly stressed the importance of being able to fail during experimentation as a critical enabler of the creative process. With that in mind, can you cite some of our most revealing or significant failures over the past year or so, including examples from Millennium Challenge 02, and what you learned from them?

Admiral GIAMBASTIANI. Our experimentation efforts are designed to take risks and accept failure in our concept development process. Learning from our previous experiments, we have made risk an important factor that is encouraged in future experiments. It is the only way we can drive new warfighting concepts to achieve new and improved operational approaches and capabilities.

For example, during our May 2001 Unified Vision 01 (UV01) precursor experiment to Millennium Challenge 2002 (MC02), we tested effects-based warfighting concepts without the benefit of a robust Operational Net Assessment (ONA) of the enemy or a functional collaborative information environment (CIE). We found that without a robust ONA, a dynamic and comprehensive system-of-systems analysis of the enemy, and a functional CIE, little was different in our approach to warfare. Learning from these shortcomings, we matured the ONA concept and designed tools and capabilities to rapidly integrate intelligence and create actionable knowledge. These improvements better enabled our MC02 experimental audience to approach warfare differently by leveraging information technologies and a more comprehensive and robust understanding of the enemy. However, even after 2 years of experimentation, only CIE was recommended for immediate implementation. The effects-based operations and ONA concepts and associated capabilities remain in development.

6. Senator REED. Admiral Cebrowski, what do you consider to be the most significant failures in your work and what have you learned from them?

Admiral CEBROWSKI. One aspect of force transformation that we have yet to achieve is to embed a culture of experimentation throughout the defense establishment. Experimentation is essential for defense transformation. Only through experimentation will we learn and gain enough experience to understand what approaches comprise the best paths for U.S. Armed Forces to extend and broaden their competitive advantage, and to rapidly adapt to the uncertainties inherent in information age warfare.

Experimentation should be widespread—planned and executed in a decentralized manner, guided by principles of competition and cooperation in the information age. Every organization should adopt a culture of examining and reexamining its practices and experimenting with new approaches to extend its capabilities at every opportunity. Operators, technologists, and systems integrators should work in teams, rapidly prototyping technology and coevolving organizational and procedural change to achieve desired capabilities. Spiral transformation that significantly improves operational capabilities is possible in months, rather than decades, by transforming current acquisition approaches and the development of joint mission capabilities.

STANDING JOINT FORCE HEADQUARTERS

7. Senator REED. Admiral Giambastiani, I am encouraged by the potential for Standing Joint Force Headquarters (SJFHQ) to greatly improve the process of standing up and operating joint command and control elements much more efficiently. I am still unclear, however, on how these organizations relate to more traditional staffs. Can you clarify how an SJFHQ would interact with the permanent staffs of the regional combatant commands, with the component commanders in a joint task force, and with the Joint Staff?

Admiral GIAMBASTIANI. We are in the process of maturing and validating the SJFHQ concept through cooperative efforts with several combatant commanders. These collaborative efforts will clarify how a fielded SHFHQ will interact with other elements of a regional combatant command, the Joint Staff and others. In concept, informed by the Millennium Challenge 2002 Experiment and preliminary work with combatant commands, the SJFHQ will be an integral part of the combatant commander's staff and have routine interaction with the rest of the staff, component

commands, and the Joint Staff. One key difference is the envisioned method of interaction, which will exploit innovative information technologies and collaboration tools. Finally, the SJFHQ is designed to be the full time nucleus of a Joint Task Force (JTF) headquarters.

8. 9. Senator REED. Admiral Cebrowski, in response to questions at our hearing last year, General Pace suggested that we should move away from dividing the battle area into air, land, and sea sections and instead conceive of it as joint battle space. I agree with his idea but wonder if our organizational structures support such a concept. That is, we continue to have air, land, and maritime force component commanders. I wonder if it might be fruitful, however, to think about alternative ways to organize, perhaps around missions or capabilities. In your view, is the current joint task force organizational framework still relevant? Does the current joint task force organizational framework support the kind of integrated view of the battle space we are trying to encourage? If not, what alternatives have you looked at or are you considering.

Admiral CEBROWSKI. A key feature of the JTF framework is that the commander can change it to suit mission requirements. There are many models for the division of activities and responsibilities across a notional battle space. The primary inhibitors in each of these models are “interoperability based.” I am less concerned about how we divide the battle space than I am about the interoperability that we can demonstrate across that battle space—both at the operational and tactical levels of warfare. To the degree that we address interoperability only at the operational level of war, we inhibit interoperability at the tactical level of war. Also, we must address interoperability by eliminating the divisions between the traditional functional stovepipes—intelligence, operations, and logistics. These stovepipes exist as a consequence of traditional industrial age warfare organizational models. It is apparent that the increasing complexity of the information age battlefield is rendering these organizational models not just inadequate, but obsolete. In short, our technologies are outpacing the ability of our organizations to act on the information those technologies provide. The task now is to put in the hands of commanders viable alternatives—from experimentation, from war games, from field exercises, and most importantly, from our most recent real-world examples. In OFT, we are currently developing a collaborative demonstration/experimentation program for “Sense and Respond” logistics that addresses new network-centric organizational models for the information age battlefield.

JFCOM TOUR LENGTH

10. Senator REED. Admiral Cebrowski, do you know if the Office of the Secretary of Defense is considering extending the tour length of key transformational positions such as Commander, Joint Forces Command?

Admiral CEBROWSKI. The recently submitted “Defense Transformation for the 21st Century” contains the Department’s position on extended tour lengths for some officers/positions.

11. Senator REED. Admiral Giambastiani, in your mind what would be the main pros and cons of such an extended tour?

Admiral GIAMBASTIANI. In general, I favor longer tours, however, transformation depends as much on the power of the idea as the stability of a single person. Powerful ideas take on a life of their own as they gain credibility, maturity, and supporting constituencies.

Joint Forces Command’s role in transformation is effectively supported by a work force with the right blend of continuity with fresh perspectives and operational experience. Joint Forces Command’s mix of stable, professional civilian and rotational military personnel is about right. Continuity ensures long-term focus and efficiency, providing the ability to see things through to closure and avoiding frequent changes of direction. Conversely, fresh ideas and personal energy are important to the business of transformation. Periodic leadership changes and infusions of recent operational experience revitalizes an organization, prevents stagnation, and brings new perspectives to the mission—vitally important in an organization charged with being open-minded and inquisitive. Additionally, transitions expose more officers to transformation and allow them to carry their new knowledge and enthusiasm back into the force.

IMPLEMENTING CHANGES

12. Senator REED. Admiral Giambastiani, you have talked in the past about allowing enough time for experimentation to mature and bear fruit. On the other hand, you have described some of the transformation packages that you have prepared for the JROC. As I understand it, some of those packages were presented within months of the conclusion of Millennium Challenge, the first major experiment to test them. When you develop your transformation packages for the JROC, do they represent all of the anticipated changes across each of the Doctrine, Organization, Training, Materiel, Leadership, Personnel, and Facilities (DOTMLPF) areas, or are they sometimes incomplete (e.g., only include personnel and materiel implications)? If they are not complete, are JROC members being asked to support initiatives prematurely?

Admiral GIAMBASTIANI. U.S. Joint Forces Command is working across a wide spectrum of concepts and issues to identify immediate combatant commander needs as well as looking to joint experimentation for new operational methods and capabilities to support the joint warfighter. Some joint experimental initiatives like Standing Joint Force Headquarters and its supporting concepts will take time to mature, yet have some developed aspects of DOTMLPF that are of immediate value to joint warfighting, these should be fielded as soon as possible. Not every capability will require that each part of the DOTMLPF spectrum be addressed concurrently; this does not mean that capability recommendation is incomplete or premature, but that portions of each capability mature at different intervals. Each capability is unique and some rapidly accelerated near-term capabilities will need follow-on refinement.

JFCOM EXPERIMENTATION PLAN

13. Senator REED. Admiral Giambastiani, in your confirmation hearing last summer, you stated that your priority would be to “conduct a complete review” of U.S. Joint Forces Command’s experimentation plan. What is the status of that review? What changes have you made or do you intend to make, and why?

Admiral GIAMBASTIANI. In the wake of Millennium Challenge 02 (MC02), we have evolved our Joint Concept Development and Experimentation Campaign Plan to build on MC02 results and to support updated guidance from the Secretary of Defense and the Chairman, Joint Chiefs of Staff. To help refine our plan, we have held a NATO Concept Development and Experimentation conference, two-star level conferences with the combatant commanders and Services, in addition to briefing commanders, Service Chiefs and the Chairman of the Joint Chiefs of Staff.

Our near-term objectives for experimentation now include four elements: 1) field the Standing Joint Force Headquarters (SJFHQ) to provide the structure and the enabling concepts for developing transformational joint command and control, 2) pursue rapid prototyping of capabilities to improve joint warfighting now, 3) provide actionable recommendations from experimentation results to senior leaders concerning options for future force investment, and 4) include our Combatant Commands, Services, defense agencies and multinational partners and leverage their experimentation activities. A coordination draft Joint Concept Development and Experimentation Campaign Plan will be reviewed and endorsed by the JROC, and final draft forwarded to the Secretary of Defense via the Chairman, Joint Chiefs of Staff by 01 August 2003.

As a result of this review and technical analysis, we are embarking on a two-path plan of action. The first, which we call the Concept Path, will focus on developing concepts for the far-term and develop recommendations for future investment. The immediate objective of our efforts along the Concept Path is to refine a Joint Operations Concept for the Armed Forces of the United States. The second, or prototype path, focuses on the near-term fielding of prototype capabilities to our warfighters, giving them potentially transformational capabilities and giving us operational data to help us refine those prototypes.

Through our review, we determined that no one experiment would answer all the questions—that it requires a body of knowledge linked by a series of experiments. We have therefore begun a series of experiments and other events to refine the overarching concept for joint operations through a series of events known as Pinnacle Impact 2003.

VULNERABILITIES OF NETWORKED FORCE

14. Senator REED. Admiral Cebrowski, what new vulnerabilities would a truly networked force need to deal with? For example, would dependence on commercial communications infrastructure, satellite communications, and a sensorized battle-field reduce our ability to deal with asymmetric threats (such as cyber attack) or operate in areas of the world with very limited infrastructure?

Admiral CEBROWSKI. The creation of any new capability also creates new vulnerabilities. Everything of value will potentially be targeted and its vulnerabilities exploited both before and during hostilities. Because information processes and technologies are such a great source of combat power, measures will be taken to provide for defense of that power.

The capabilities of our sensors and networks, and the information sharing they enable make us less vulnerable than we would be without them. A “truly networked” force is less vulnerable by virtue of the very nature of the network—“robustness” being a key feature. We most often see problems when we simply overlay new information technologies on outdated organizational constructs and information architectures and consider ourselves “networked.” When our networks are also expeditionary, consistent with the character of the entire force, they are by definition capable of operations without pre-existing infrastructure.

DISTRIBUTED LEARNING

15. Senator REED. Admiral Cebrowski, you indicated to the committee last year that DOD intends to pursue an architecture to allow for distributed training and education. However, some work the General Accounting Office (GAO) has conducted for the Readiness and Management Support Subcommittee indicates that the Services’ initial efforts to take advantage of distributed learning techniques have only been minimally successful. GAO cited cultural, technological, policy, and funding challenges to DOD’s ability to fully exploit the benefits of distributed learning. What is the current status of the Department’s efforts to develop a distributed learning architecture?

Admiral CEBROWSKI. The approach outlined in the Strategic Plan for Transforming DOD Training (March 1, 2002) emphasizes the mission requirements of the combatant commanders focused in terms of the training needed to support the CINCs’ requirements, missions, and capabilities, while preserving the ability of Services to train on their core competencies. The focus of training transformation is to better enable joint operations in the future. Joint has a broader context than the traditional military definition of the term. Joint training includes training, education, and job-performance.

Strategic goals for training transformation include: comprehensive and systematic joint training focused on the operational requirements of the CINCs and linked to readiness assessment robust, networked, live, virtual, and constructive training and mission rehearsal environment that enables DOD to build unparalleled military capabilities; and acquisition and other supporting processes that identify interfaces and integrates between training systems and acquisition, logistics, personnel, military education, and command and control processes.

The Advanced Distributed Learning initiative is a Defense Department-wide strategy to modernize education and training by developing standardized e-learning techniques. The goal is to provide access to the highest quality education and training, tailored to individual needs, delivered cost-effectively, anywhere and anytime. At the heart of the program is the sharable content objective reference model (SCORM), which provides a series of comprehensive guidelines for developing e-learning systems so Web-based learning content will be interoperable, accessible, and reusable. SCORM represents one of the initiative’s key accomplishments. ADL work takes place at three co-laboratories and includes partnerships with the Office of Naval Research, the Labor Department, and the National Guard Bureau, as well as work with NATO allies.

16. Senator REED. Admiral Cebrowski, what steps is your office taking to help DOD overcome some of the challenges that GAO has identified?

Admiral CEBROWSKI. We have participated extensively in the development of the Department’s Training Transformation initiatives. This plan addresses many of these challenges. Specifically, we have examined the Army’s Broadband Intelligence Training System (BITS) and believe this methodology may have potential for a much broader application for the Department’s distance learning initiative. We have collaborated with Dr. Chu’s staff on this particular issue and they are examining

its potential. We are continuing a modest research effort on broadly related education issues.

INTEGRATION OF LEGACY SYSTEMS

17. Senator REED. Admiral Giambastiani, in the near-term perhaps one of the biggest challenges to enhancing joint warfighting capabilities is integrating legacy weapon systems through improved command and control. However, one of the “bill payers” for an increased emphasis on longer-range transformational programs in this year’s budget request was service modernization programs. In your view, have any of the reductions in improvements or upgrades to our legacy forces put near-term joint interoperability at greater risk?

Admiral GIAMBASTIANI. I cannot speak with detailed knowledge of all of the decisions the Services made when putting together their programs. However, I do know from my experience as the Navy’s programmer, that each Service carefully measures and balances risk across its entire program. In doing so, they have followed the risk balancing approach outlined by Secretary Rumsfeld to produce a more coherent total program. Insofar as resources have flowed to Joint Forces Command, which has primary responsibility for joint interoperability, I feel confident that both near-term and long-term joint interoperability will be enhanced, not jeopardized, by the President’s budget. In fact, the President’s budget for fiscal year 2004 triples the dollars coming to U.S. Joint Forces Command for interoperability.

MILLENNIUM CHALLENGE 2002

18. Senator REED. Admiral Giambastiani, please provide a chronology of events during Millennium Challenge that specifies what was planned during the activity, and what ultimately occurred. Please also provide a list of programs that resulted from Millennium Challenge that are included in the fiscal year 2004 budget request.

Admiral GIAMBASTIANI. As covered in detail in the 2002 Joint Experimentation Annual Report to Congress, Joint Forces Command and its Combatant Command, Service, and Agency partners conducted Millennium Challenge 2002 (MC02) from 24 July to 14 August. This joint experiment was the culmination of over 2 years of concept development, experimentation, and the integration of operational lessons learned from the global war on terrorism. At its core, MC02 is about thinking differently with respect to the complex challenges and opportunities of the 21st century. The joint experiment focused on the value of Effects-Based Operations (EBO), as employed by a JTF headquarters, built around the U.S. Army’s III Corps staff (with critical Service augmentation), enabled by a permanently manned Standing Joint Force Headquarters, informed by an Operational Net Assessment, and executed through functional components using a robust Collaborative Information Environment.

MC02 was the largest joint field experiment ever conducted. Over 13,500 soldiers, sailors, airmen, marines, and members of the interagency community participated in the joint integrated experiment that employed simulated and live forces nationwide. MC02 was the result of a deliberate and comprehensive process that comprised numerous concept development workshops, wargames, and limited objective experiments involving combatant command, service, defense agency, and interagency partners. The integration of live and simulated forces, the incorporation of an adaptive and aggressive “red team”, the use of a new federation of 42 simulations, and the use of Service-training ranges created both a rich experiment and challenging control issues. Reflecting Combatant Command, Service, defense agency, and interagency requirements, MC02 facilitated the exploration of 11 concepts, 27 joint initiatives as well as 46 Service sponsored initiatives, and assessed 22 warfighting challenges.

MC02 execution included several spiral events that developed and integrated the necessary technical architecture, trained the experimental audience in the required concepts, tactics, techniques, procedures, and tools, and enhanced planning for the execution of military operations against a complex scenario that the U.S. could realistically confront in the future. MC02 also incorporated Service experimentation with tactical level, live events. This proved challenging especially when essential platforms were only available for very restricted periods due to operational support requirements for “Enduring Freedom”. Another change occurred when the Army’s XVIII Airborne Corps headquarters was deployed to Afghanistan. However, one of the experimental organizations, the Standing Joint Force Headquarters (SJFHQ), enabled III Corps to take mission handoff in stride and do in days what in our experience tells us normally takes weeks, providing valuable insight into the utility of the SJFHQ.

Programs initiatives and concepts resulting from Millennium Challenge 2002 supported by the fiscal year 2004 budget include:

- Collaborative Information Environment
- Standing Joint Force Headquarters
- Joint Interagency Coordination Group
- Effects Based Operations
- Operational Net Assessment
- Force Projection
- Information Operations
- Joint National Training Center
- Joint Fires Initiative

JFCOM'S ROLE IN C2 PROGRAMS

19. Senator REED. Admiral Giambastiani, a December 2002 article in *Inside the Army* reported that the Joint Staff had recommended to the Chairman that JFCOM should become the head of a new federation to oversee joint battle management command and control. A key feature of the proposal would be that JFCOM would control a separate budget line. What is the status of a Joint Battle Management Command and Control (JBMC2) federation, headed by JFCOM?

Admiral GIAMBASTIANI. JBMC2 is essentially a new management structure to ensure the joint interoperability of key Service programs, not a new program element itself. To use a sporting metaphor, I don't want Joint Forces Command to become an expansion team in the acquisition league—I want Joint Forces Command to help write the rules of the game. In January 2003, Management Initiative Decision (MID) 912 assigned U.S. Joint Forces Command to lead the development of joint doctrine, concepts, requirements, and integrated architectures for JBMC2 interoperability and connectivity. These efforts will be coordinated through a JBMC2 board of directors composed of combatant commander and Service representatives.

In addition, MID 912 directed U.S. Joint Forces Command to take oversight and directive authority for Single Integrated Air Picture (SIAP) and Deployable Joint Command and Control (DJC2) in fiscal year 2003 and Family of Interoperable Operational Pictures (FIOP) in fiscal year 2004. Joint Forces Command is currently negotiating Memorandums of Understanding with the Army for SIAP, the Navy for DJC2 and the Air Force for FIOP for execution of the oversight and directive authority.

Finally, MID 912 directed U.S. Joint Forces Command to recommend a plan to the Deputy Secretary of Defense by July 2003 to take oversight and directive authority for additional programs. U.S. Joint Forces Command is currently conducting thorough studies to identify service programs to manage under the JBMC2 construct.

20. Senator REED. Admiral Giambastiani, has a new program element line been created for JBMC2 in fiscal year 2003? If so, what was the amount and source of the funding?

Admiral GIAMBASTIANI. No. JBMC2 is essentially a management structure to ensure the joint interoperability of key Service programs, not a new program element itself.

21. Senator REED. Admiral Giambastiani, what is the JBMC2 funding profile in the fiscal year 2004 budget request and across the FYDP?

Admiral GIAMBASTIANI. Currently one does not exist. JBMC2 is essentially a management structure to ensure the joint interoperability of key Service programs, not a new program element itself.

22. Senator REED. Admiral Giambastiani, in your view, are these resources sufficient to support JBMC2 requirements?

Admiral GIAMBASTIANI. There were no fiscal year 2003 resources identified in MID 912 to support the JBMC2 management structure. However, MID 912 did ask U.S. Joint Forces Command to report back to the Deputy Secretary of Defense on the resources required to administer and execute JBMC2 oversight as defined within that document. These resource requirements have been forwarded to the Office of the Secretary of Defense.

JOINT NATIONAL TRAINING CAPABILITY

23. Senator REED. Admiral Giambastiani, JFCOM's March 2002 report on the Joint National Training Capability (JNTC) includes a table that describes funding requirements for fiscal years 2004–2009. Please provide a description of the current funding programmed for the JNTC, as compared to the estimates in your report, and explain any differences.

Admiral GIAMBASTIANI. U.S. Joint Forces Command received \$10 million in fiscal year 2002. The fiscal year 2003 program of \$35.6 million adequately funds the actions necessary to establish an initial operating capability in October 2004.

NETWORK CENTRIC WARFARE

24. Senator REED. Admiral Cebrowski, how would you assess the Department's progress to achieve visions of a truly network-centric force?

Admiral CEBROWSKI. We are making significant strides but much remains to be accomplished. As Operation Iraqi Freedom has highlighted, some parts of the force are more networked than others. For example, the 4th Infantry Division is the most digitized and networked of all the Army Divisions, yet it was late to the fight. The 3rd Infantry Division is not as digitized and networked as the 4th ID, never the less its commanders were able to operate with higher shared situational awareness than ground commanders have experienced in the history of warfare. Similar benefits accrued to the commanders of the 101st Air Mobile Division, and as well as British Army commanders. Where there is room for further progress is in our ability to share information at the tactical level of war across the battle space, and in blue force tracking and identification.

The benefits of real-time information sharing between air and ground units have been demonstrated during exercises. Phase I of the Army's Division Capstone Exercise highlighted the benefits of real-time information sharing between F-16s, A/OA-10s, and the 4th Infantry Divisions Brigade Combat Teams. The F-16s and A/OA-10s had unprecedented situational awareness of the position of the 4th Infantry Division's ground units, which exceeded that of any combat aircraft participating in Operation Iraqi Freedom. This awareness enabled the F-16s and A/OA-10s to engage the OPFOR at night and render them combat ineffective.

We are pursuing an initiative with John Stenbit's team, to develop metrics that will help us measure progress in the implementation of network-centric capabilities in our forces. We call this a conceptual framework for network-centric operations, and it has already helped develop some key insights into the power of network-centric warfare.

25. Senator REED. Admiral Cebrowski, what are the biggest organizational roadblocks to achieving that vision?

Admiral CEBROWSKI. I believe that one key measurement of progress will be in the area of incentives for organizational behavior. For example, right now, the incentives for interoperability are insufficient to get us to the vision of a truly network-centric force. Going back to the answer to the previous question, who owns the air-ground seam? How should the bill for interoperability required to close the air-to-ground seam be divided so that we can get to the future faster rather than we are today? I believe the organizations and processes that we have inherited from the Industrial Age need to be reexamined in light of the challenges that we face during this Information Age transformation. Constructs such as Joint Force Packages and Agile Mission Groups (A UK Construct) will force these issues and bring them to the forefront.

Similarly, we need to focus on rewarding organizations in terms of output measures not input measures. This is particularly important for disruptive innovations. If constructs such as the Air Force's Network Centric Collaborative Targeting can enable networked distributed sensors to outperform a legacy, platform-centric approach, and do so with significantly reduced resources, then we need to ensure that organizations are provided with the right kind of incentives to pursue these kinds of solutions.

NETWORK CENTRIC TECHNOLOGIES

26. Senator REED. Admiral Cebrowski, what new technologies should be developed that are critical to achieving the vision of a networked force?

Admiral CEBROWSKI. An important area for focus for new technologies is interoperability. An example of a technology that is currently under development that

will help facilitate interoperability and accelerate network-centric warfare is the Joint Tactical Radio Program. When all the JTRS clusters are eventually developed and installed in platforms across the force, we will observe a dramatic improvement in the ability of the force to share information at the tactical level.

27. Senator REED. Admiral Cebrowski, how are you working with the Services and the defense agencies to ensure that proper investments are made in research and development to meet those needs?

Admiral CEBROWSKI. The products of our research and deliberations are made available to appropriate decision makers through numerous channels and media. But the principle means is to invite potential users into the concept development or experimentation from the beginning.

JOINT ACQUISITION

28. Senator REED. Admiral Giambastiani, currently the military departments have the primary responsibility for acquisition of equipment. There are, however, a few exceptions. For example, the Chemical and Biological Defense Program is a joint program which has a joint acquisition program. If we are to improve our joint capabilities and increase our focus on acquisition of equipment that is intended to serve joint forces, should we be moving toward more joint acquisition programs? If so, how would you propose doing so?

Admiral GIAMBASTIANI. Acquisition is a complex process requiring talented people and a disciplined management infrastructure. The Services have a mature capability here. I believe we can, and should, leverage that Service capability to acquire joint systems. From my perspective at Joint Forces Command, the key is to get the joint requirements right up front and then provide oversight and guidance for the acquisition community as it produces "born joint" systems. To use a sporting metaphor, I don't want Joint Forces Command to become an expansion team in the acquisition league—I want Joint Forces Command to help write the rules of the game.

Presently, we are moving in the right direction to ensure that all equipment we procure is "born joint." U.S. Joint Forces Command's role in the development and monitoring of Capstone Requirements Documents and Key Performance Parameters helps to ensure that the requirements we provide to the Service acquisition communities will result in capabilities that can be effectively employed within a joint context. Beyond that, the Joint Battle Management Command and Control MID 912 captures a new management structure that allows Joint Forces Command to help direct funding decisions, prioritize acquisition actions and participate in milestone decisions for major acquisition programs. In both of these endeavors, we will be writing the rules of the "born joint" acquisition game.

JOINT ASPECT OF WARGAMES AND EXERCISES

29. Senator REED. Admiral Giambastiani, Joint Forces Command will soon co-sponsor an Army wargame, and you are planning to work with the other Services on their wargames in the future. If we want to maximize our joint warfighting capabilities, should we have a joint component, if not Joint Forces Command participation, in all major wargames and exercises? What are you doing to ensure that we are getting the most "joint value" out of Service wargames and exercises?

Admiral GIAMBASTIANI. U.S. Joint Forces Command has begun working with all the Services to develop a common "Joint Context" for all their major war games. Our purpose is to improve joint warfighting capabilities from the birth of each Service's concepts and thereby ensure their compatibility and complementary nature. We started this development with the Army's 2003 Title 10 war game, Unified Quest 03.

Our Director of Experimentation has initiated a recurring dialog with his Two Star Service counterparts in order to improve coordination among the Service and Joint Forces Command concept development and experimentation efforts. We will both co-sponsor a major Service game each year, beginning with the upcoming Unified Quest, as well as conduct a more moderate level of participation in other games to ensure continued engagement. Through this approach, we aim to constantly improve the "born joint" development of Service concepts and improve joint warfighting capability.

COMMON JOINT CONTEXT

30. Senator REED. Admiral Giambastiani, your prepared statement included a discussion of the joint experimentation campaign plan that would achieve its goals by “conducting our collective experimentation activities using a ‘common joint context’ that defines the challenges of the future warfight.” Please explain the common understanding of the future challenges of warfare, and whether and how it will be modified as circumstances change over time.

Admiral GIAMBASTIANI. Based on the past 18 months of experimentation, what we have learned through years of joint operations, and via coordination with the combatant commanders, the Armed Services, and the Joint Staff, Joint Forces Command has developed a draft list of 18 common “Joint Military Challenges.” This list of challenges is the focus of the study and analysis effort behind application of the “Joint Context” in Service and our own wargames. By addressing these enduring challenges early in the Concept Development process, we intend to dramatically improve joint warfighting capabilities and efficiency. Addressing these challenges will enable our forces to achieve decision superiority, create coherent effects, and conduct and support distributed operations. This year’s experiments will address these nine challenges:

- Achieving info superiority (anticipatory understanding)
- Coalition and interagency information sharing
- Joint ISR
- Joint maneuver and strike
- Interagency operations
- Multinational operations
- Urban operations
- Force projection: Deployment, Employment and Sustainability
- Counter anti-access and area-denial (includes Forcible Entry Operations)

CRUISE MISSILE SUPPORT ACTIVITY

31. Senator REED. Admiral Giambastiani, please describe the Cruise Missile Support Activity mentioned in your prepared statement. What are its functions and how is it organized? Is it fully staffed and operational?

Admiral GIAMBASTIANI. The Cruise Missile Support Activities’ (CMSA) mission is to support combatant commander operations by planning conventional and nuclear Tomahawk Land Attack Missile (TLAM) missions, distributing mission and support data to command and control nodes, planning activities and TLAM firing platforms, integrating TLAM expertise into the supported commander’s force assignment and effects assessment deliberations, training TLAM planners and evaluating TLAM mission planning activities. There are two U.S. CMSAs (one each in Hawaii and Norfolk), and one United Kingdom CMSA located in Northwood. In Operation Iraqi Freedom, as in Operation Enduring Freedom operations in Afghanistan, U.S. Joint Forces Command’s CMSA is leading the other two CMSAs, all afloat TLAM Planning detachments, and the TLAM planning cell at U.S. Naval Forces Central Command in a collaborative effort in support of U.S. Central Command. U.S. Joint Forces Command CMSA manning consists of 32 government service civilians, 33 military personnel and 11 contractors (essentially the same as U.S. Pacific Command’s CMSA). This manning level is not sufficient to execute all mission essential tasks. Additionally, the CMSAs are not fully staffed to meet sustained round the clock support requirements during crisis or combat operations and are forced to rely on significant ad-hoc manning augmentation.

AREA CRUISE MISSILE DEFENSE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION

32. Senator REED. Admiral Giambastiani, your prepared statement mentioned the Area Cruise Missile Defense (ACMD) Advanced Concept Technology Demonstration (ACTD). What role is Joint Forces Command playing with respect to this ACTD, particularly in joint concept development and joint experimentation?

Admiral GIAMBASTIANI. U.S. Joint Forces Command has been the Operational Sponsor for this ACTD since its inception in fiscal year 2001. The ACMD ACTD has participated in several joint exercises including NORAD’s Exercise Amalgam Virgo 2001 and Amalgam Virgo 2002–2033, as well as the All Service Combat Identification Evaluation Team 2000, and Joint Combat Identification Evaluation Team evaluation 2002 exercises. These exercises evaluated ACMD concepts of operation and developed ongoing tactics, techniques and procedures for effective employment. Currently, this ACTD is supporting real-world operations in Operation Noble Eagle.

Joint Forces Command is responsible for, and will conduct the formal ACMD Military Utility Assessment at, the Amalgam Virgo exercise in August 2003 to determine the operational utility of this potential capability.

Lastly, the ACMD ACTD has had no direct involvement in joint concept development and experimentation. After the tragedy of September 11, 2001, the system went operational in its force protection capability in CONUS. The ACTD will have a Transformation Change Package prepared and submitted to the JROC before it closes out next year.

THEATER AIR MISSILE DEFENSE CAPSTONE REQUIREMENTS DOCUMENT

33. Senator REED. Admiral Giambastiani, your prepared statement mentioned that the JROC has approved four JFCOM Capstone Requirements Documents, including one for "Theater Air Missile Defense" (TAMD). Please describe JFCOM's role in preparing this Capstone Requirements Document (CRD), and the participation, if any, from: the Missile Defense Agency; the Joint Staff; and the Joint Theater Air and Missile Defense Organization. Please provide a copy of this TAMD CRD to the committee.

Admiral GIAMBASTIANI. On 1 March 2001, the JROC approved the Theater Air and Missile Defense Capstone Requirements Document (TAMD CRD). The CRD, which is focused on the 2010 timeframe, provides over arching requirements that apply to the collective TAMD Family of Systems (TAMD FoS). CRD approval came about as a result of an 18-month effort by the combatant commanders, the Joint Staff, the Services, and TAMD related agencies such as the Missile Defense Agency (MDA). The U.S. Joint Forces Command in coordination with the Joint Theater Air and Missile Defense Organization (JTAMDO) led development of the CRD.

The TAMD CRD is a key document in U.S. Joint Forces Command's transformation effort. Since the CRD approval in March 2001, U.S. Joint Forces Command has conducted approximately 200 TAMD-related requirements documents reviews in order to evaluate compliance with applicable CRD Key Performance Parameters (KPPs), requirements, and information exchange requirements (IERs) to ensure TAMD systems are designed to be interoperable at the joint and multinational level. Additionally, the CRD authors have briefed/coordinated with over 40 Service Program Offices to make sure the materiel developers fully understand the KPPs and requirements contained in the CRD. Document reviews and the close coordination with the Services have resulted in a much improved process that will contribute significantly to successfully achieving full spectrum dominance as described in Joint Vision 2020.

The TAMD CRD is currently undergoing a periodic update and is in formal Flag-level staffing with the combatant commanders, the Joint Staff, the Services, and other missile defense related organizations.

Per your request, a copy of the current TAMD CRD will be forwarded to the committee under a separate document.

[Due to the classification of this document, it will be retained in the committee's executive files and will not be available for public review.]

TOTAL INFORMATION AWARENESS

34. Senator REED. Admiral Giambastiani, in testimony before the House Armed Services Committee on March 13, the Assistant Secretary of Defense for Homeland Security Paul McHale indicated that the Department of Defense does not intend to operate the technologies developed by the Total Information Awareness (TIA) program. This seems to contradict your testimony on JFCOM's current and future plans for TIA. In light of Secretary McHale's statements, please clarify JFCOM's plans for testing and operating the technologies developed by the TIA program.

Admiral GIAMBASTIANI. U.S. Joint Forces Command seeks to exploit appropriate Total Information Awareness software tools and methodologies to enhance U.S. Joint Forces Command initiatives aimed at creating advanced warfighting capabilities. The command is interested in the capabilities offered by the Total Information Awareness technologies and collaborative environment to gather and fuse foreign intelligence information in such a way to improve situational awareness for the warfighter. Any implemented capabilities will be employed in accordance with existing intelligence oversight policies.

QUESTION SUBMITTED BY SENATOR DANIEL K. AKAKA

WEAPON SYSTEM COSTS

35. Senator AKAKA. Admiral Giambastiani, I also serve as the ranking member on the Subcommittee on Readiness and Management Support, which means I must address the rising costs of maintaining our weapon systems. We are also seeing costs increase as we attempt to boost training capabilities by more closely tying individual weapon systems together and increasing instrumentation. At the same time, the General Accounting Office has done some work that indicates that DOD's acquisition process does not give sufficient attention to total life cycle costs particularly the future operation and support (O&S) costs, early on in weapon development. I suspect the same is also true for future training costs—that program managers are more interested in maximizing certain performance parameters that they are in investing scarce program dollars into future training enablers. Do you agree that these two problems exist, that both long-term O&S and training costs are not taken enough into consideration in weapon system development and if so, do you see a role for yourself in trying to increase attention toward these issues, especially in the training arena?

Admiral GIAMBASTIANI. The Department of Defense has made steady improvements in capturing life cycle system operating and support costs. This is particularly true with new systems in final development or early production such as the Joint Strike Fighter, the Virginia Class attack submarines, the C-17 transport, et cetera. The Joint National Training Capability will help us focus on training and support costs.

QUESTIONS SUBMITTED BY SENATOR BILL NELSON

JOINT EXPERIMENTATION AND JOINT TASK FORCE HEADQUARTERS

36. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, the Bush administration articulated concrete transformation goals in the 2001 Quadrennial Defense Review (QDR), the specifics of which you are both very familiar. In addition, the President's 2004 budget and FYDP calls for the acquisition of billions of dollars worth of programs dubbed "transformational" by the Department of Defense, including F/A-22 fighters, unmanned aerial vehicles, the Army's Objective Force, and other programs. However, the Department, or more specifically Joint Forces Command, has yet to produce an overarching joint warfighting concept into which all of the QDR's goals and the procurement and research efforts in the FYDP are supposed to fit. The lack of a joint warfighting concept would seem to make real joint experimentation difficult. Please discuss this apparent disconnect between the QDR, the new FYDP, and the lack of an overall joint warfighting concept.

Admiral GIAMBASTIANI. I agree that an overarching joint warfighting concept is important to transformation and experimentation. Based on the Secretary's guidance we have been working cooperatively with the Chairman Joint Chiefs of Staff, the Services and the defense agencies to produce a concept. The QDR and other strategic guidance such as the National Security Strategy, and the National Military Strategy form the underpinning and shape the strategic environment for this concept. Connecting this concept and the derived subordinate concepts to future years defense planning is what we will achieve through subsequent concept development, experimentation, prototyping and creation of actionable investment recommendations.

Admiral CEBROWSKI. The QDR, the National Security Strategy, and the National Military Strategy form the hierarchy of strategic documents that currently undergird development of the Joint Operations Concept. As you've rightly observed, the Joint Operations Concept is a key document. Thus, it is important that it reflects the altered strategic context and emerging requirements of warfare in the information age. With guidance provided by the Secretary, the CJCS, through the Joint Staff, and in concert with the Services, JFCOM is working at providing such a document.

37. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, I am aware that there is an ongoing effort to produce such a concept of operation. Please update me on the status of this effort and when we may see some concrete results.

Admiral GIAMBASTIANI. Since I relieved as Commander, U.S. Joint Forces Command, we have been working collaboratively within the Department of Defense to help draft, coordinate and rewrite this concept. The draft document, currently titled "Joint Operations Concept", has been reviewed by senior members of the Depart-

ment of Defense. U.S. Joint Forces Command, in partnership with other elements of Department of Defense, will examine this concept through two experiments in April and May 2003. These experiments will use alternate perspectives, and multiple scenarios to provide a rigorous review of the current draft version of the concept. After analysis, U.S. Joint Forces Command will propose improvements to the draft concept.

The approval authority for the concept is the Secretary of Defense and Chairman of the Joint Chiefs.

Admiral CEBROWSKI. The original target date for approval of such a document was 1 May 2003. However, in light of Joint experimentation scheduled for April and May of 2003, as well the emerging lessons of Operation Iraqi Freedom, that due date has been suspended indefinitely.

38. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, please explain how the emerging concepts are prepared to deal with a serious threat to U.S. forces, specifically mobile ballistic and cruise missile launchers.

Admiral GIAMBASTIANI. Based on detailed input from all the combatant commanders and a review of strategic guidance to U.S. Joint Forces Command, we have identified force protection and countering adversary anti-access and area denial capabilities as the broader operational challenges posed by mobile ballistic and cruise missiles. Current experimentation is being conducted using scenarios that stress operating in and overcoming such threats. These scenarios are shared with our Service experimentation partners, so that we can understand these issues from multiple perspectives. Additionally, force and base protection will continue to be a focus in next year's experimentation events. This experimentation will allow formulation of actionable investment recommendations to address the operational challenges these capabilities pose.

Admiral CEBROWSKI. Experimentation is ongoing and planned using scenarios that stress operations in the face of such threats. JFCOM expects that this experimentation will provide actionable investment recommendations that address the operational challenges posed by these capabilities. The items mentioned are but two of an array of potential threats with which the force must deal. Our responses must be similarly broad.

39. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, Joint Forces Command is making significant progress toward creating a true joint training capability and improving joint command and control. Millennium Challenge was a step in the right direction. What is the next step in joint experimentation?

Admiral GIAMBASTIANI. Our near-term objectives for experimentation now include four elements: 1) field the Standing Joint Force Headquarters (SJFHQ) to provide the structure and the enabling concepts for developing transformational joint command and control, 2) pursue rapid prototyping of capabilities to improve joint warfighting now, 3) provide actionable recommendations from experimentation results to senior leaders concerning options for future force investment, and 4) include our Combatant Commands, Services, defense agencies and multinational partners in leveraging their experimentation activities. A coordination draft Joint Concept Development and Experimentation Campaign Plan will be reviewed and endorsed by the JROC, and final draft forwarded to the Secretary of Defense via the Chairman, Joint Chiefs of Staff by 01 August 2003.

As a result of this review and technical analysis, we are embarking on a two-path plan of action. The first, which we call the Concept Path, will focus on developing concepts for the far term and develop recommendations for future investment. The immediate objective of our efforts along the Concept Path is to refine a Joint Operations Concept for the armed forces of the United States. The second, or prototype path, focuses on the near-term fielding of prototype capabilities to our warfighters, giving them potentially transformational capabilities and giving us operational data to help us refine those prototypes.

Through our review, we determined that no one experiment would answer all the questions—that it requires a body of knowledge linked by a series of experiments. We have therefore begun a series of experiments and other events to refine the overarching concept for joint operations through a series of events known as Pinnacle Impact 2003.

Admiral CEBROWSKI. JFCOM's near-term objectives for experimentation include four elements: 1) fielding the Standing Joint Task Force Headquarters, 2) rapid prototyping of capabilities to improve joint warfighting immediately, 3) transition the results of experimentation to actionable recommendations for investment, and 4) leverage far ranging experimentation activities throughout the DOD as well as multinational partners. They are also coordinating for review a draft Joint Concept

Development and Experimentation Campaign Plan for signature by the Secretary of Defense no later than 1 August 2003. They have also begun a series of experiments and other events called Pinnacle Impact 2003, which are intended to refine an overarching Joint Operations Concept.

40. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, what are the emerging requirements for a Joint Task Force headquarters?

Admiral GIAMBASTIANI. Joint Task Force (JTF) headquarters are increasingly in demand. These headquarters must be joint, responsive, coherent, and as well trained just as we train our combat forces. We have seen more Joint Task Force Headquarters established since 11 September 2001 than we saw over the past decade. Given the variety of missions, we have formed Joint Task Force Headquarters with one-, two-, and three-star commanders, and in most cases, these commanders and their headquarters were first trained by Joint Forces Command as a Joint Task Force Headquarters just before deployment. In fact, Joint Forces Command has trained all Joint Task Force and Joint Special Operations Task Force Headquarters pursuing the war on terrorism.

The utility of joint training is clear. In the case of Afghanistan, the Army's XVIII Airborne Corps formation of combined Joint Task Force 180 was aided by several years of JFCOM JTF training in Unified Endeavor exercises, participation in Millennium Challenge 02 (MC02), and exploitation of MC02 concepts and capabilities. During my visit to Afghanistan, XVIII Airborne Corps cited MC02 concepts and joint training as important to their success in Afghanistan.

In the near term, we must institutionalize this model for all JTF capable one-, two-, and three-star Service headquarters. This training coupled with the fiscal year 2005 fielding of the Standing Joint Force Headquarters within the regional combatant commands will further improve JTF formation and responsiveness. As demonstrated in last summer's Millennium Challenge 02 experiment, the Standing Joint Force Headquarters enables the rapid establishment of an operationally and regionally focused JTF headquarters. In that experiment, III Corps was able to take mission handoff from XVIII Airborne Corps and do in days what in our experience tells us normally takes weeks.

Admiral CEBROWSKI. The most compelling requirements for the Joint Task Force Headquarters are those that emerge from experimentation and operational prototyping. To the degree that these requirements rapidly transition from concept or lesson to capability we will be successful at making transformation an inherent part of Joint Task Forces wherever they're formed.

SPACE IN NETWORK-CENTRIC WARFARE

41. Senator BILL NELSON. Admiral Cebrowski, as the developer of many of the theories of network-centric operations for our military, what is the role of space in a networked military force?

Admiral CEBROWSKI. We envision the potential for our future forces to increasingly operate in denied areas. We must develop operationally responsive space capabilities that provide persistent surveillance over these areas. Space also has the potential to resolve some of our current communications bandwidth limitations.

42. Senator BILL NELSON. How would you assess the current DOD level of investment and progress in space systems, training, and concepts of operation?

Admiral CEBROWSKI. Space is a critical capability that must be protected now and in the future. While all areas of space would benefit from increased funding lines, the areas of greatest concern in the space program are capability cycle time, work force aging, a narrowing capabilities base and a misplaced aversion to risk.

MODELING AND SIMULATION IN MILLENNIUM CHALLENGE

43. Senator BILL NELSON. Admiral Giambastiani, what role did modeling and simulation play in Millennium Challenge?

Admiral GIAMBASTIANI. Modeling and Simulation (M&S) was the only way we could provide a problem set robust enough to challenge an experimental audience that included all the Services, several Combatant Commands and agencies like the Departments of State, Justice, and Transportation. Costs to establish a similar live capability were prohibitive. Additionally, M&S allowed us to reset conditions in a comprehensive way that cannot be done with live troops. Over 13,000 soldiers, sailors, airmen, and marines operating from eight different "live" locations throughout the Southwest United States and Pacific Ocean were linked virtually to 17 other

simulated locations to create a coherent, integrated battlespace at the operational level of war. Ultimately, M&S allowed us to experiment with platforms, munitions, and C4I devices unavailable due to operations, funding and range constraints, still under development, or merely conceptual and apply those capabilities using new warfighting approaches in a cost effective and analytically valid environment.

SPACE ASSETS IN MILLENNIUM CHALLENGE

44. Senator BILL NELSON. Admiral Giambastiani, how were space assets (which are so critical to current operations) involved in the exercises and wargames of Millennium Challenge?

Admiral GIAMBASTIANI. U.S. Joint Forces Command used current space assets in the actual planning and conduct of the spirals leading up to and during Millennium Challenge 02. Space force enhancements such as satellite communications, space-based ISR, missile warning, and navigation, were integrated into the event. Space and information operations organization and C2 was exercised by Strategic Command (formerly Space Command). The Space and IO element (SIOE) commanded and managed all space and Information Operations (IO) capabilities in the area of operations. Much more experimentation is needed in space and IO.

The second part of the answer appears to support Admiral Cebrowski's observation during his testimony that the high level experiment focused on the SJFHQ in Norfolk was . . . "somewhat separated from the lower-level experiments conducted by the various components." With six notable exceptions, space issues and experimentation occurred within only the scope of component and Service events. These exceptions were the Joint Forces Command-sponsored Joint En-Route Mission Planning and Rehearsal System (JEMPRS) and five small separate initiatives sponsored by the National Reconnaissance Office (NRO) which focused on data fusion and product manipulation for the Standing Joint Forces Headquarters (SJFHQ). In order to coordinate space issues and experiments conducted by the Services, U.S. Space Command, and other agencies, we have created the U.S. Joint Forces Command Space Applications Experimentation Cell as a space conduit and clearinghouse for future experimentation events.

JOINT SPACE OPERATIONS AND EXPERIMENTATION

45. Senator BILL NELSON. Admiral Giambastiani, in my opinion, our space assets are critical enablers of any joint operation. They provide us the ability to access and distribute information to all parts of the globe and even down to the individual warfighter in the field. How is Joint Forces Command working to understand the role of critical space systems such as GPS satellites, space launch vehicles, and even manned space missions in future joint operations?

Admiral GIAMBASTIANI. In November 2002, U.S. Joint Forces Command, in partnership with U.S. Space Command (now STRATCOM) established a Space Applications Experimentation Cell with the mission of identifying, developing, refining, and experimenting with concepts for exploiting the medium of space in support of global joint operations. Until establishment of this cell, concept development and experimentation in the space arena had been largely left to the individual Services and agencies responsible for the particular functions of space. While we have always included current and projected capabilities in our models and simulations, we had not examined space as a "variable" in the context of future joint warfighting. The small initial cell is currently focused on conducting a baseline assessment of the National Security Space Community, identifying potential space experimentation issues, and beginning to create a strategy for space experimentation. The scope of that strategy will include examination and experimentation with the space community's current and future architectures and systems.

JOINT SIMULATION SYSTEM

46. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, the Joint Simulation System (JSIMS) was a high profile, critical program designed to use advanced computer modeling and simulation to provide computer-simulated environments that would be used to train warfighters and commanders, develop doctrine and tactics, formulate plans and operational requirements, and even assist in the evaluation of technologies during the acquisition process. This program was considered DOD's "flagship" modeling and simulation program for warfighters. It was joint, with participation of all the branches of the Armed Services, as well as a number of defense agencies, including the National Reconnaissance Office (NRO) and the

Defense Intelligence Agency (DIA). It has developed a number of fantastic technologies B including synthetic environments in which soldiers, sailors, marines, and airmen could all jointly train in real time. I understand that Joint Forces Command has taken delivery of some of the first software delivered by the program and is using it to support joint training activities (fiscal year 2004 investment: \$13.6 million). The JSIMS program had been scheduled to require an investment of over a \$1 billion over the course of the decade to accomplish its ambitious mission of developing these new joint simulation capabilities and deliver multiple versions of simulation software for use by the Services and joint activities. However, the funding for this program has been severely curtailed—in fact, the core program has been zeroed out in the fiscal year 2004 budget request. What is the role that modeling and simulation should play in transforming the military?

Admiral GIAMBASTIANI. Modeling and simulation will continue to play an important role in transforming the U.S. military. Joint Forces Command seeks a modeling and simulation capability that provides a single improved replacement for a wide variety of antiquated joint, Service and Agency legacy simulation systems. The federation of simulations central to the execution of last summer's Millennium Challenge experiment demonstrated the utility of such a system, but also the challenge of creating such a capability from those legacy simulation systems. The JSIMS was intended to provide next generation joint and Service training simulation tools; reduce relative development and life-cycle cost; and substantially improve performance. However, due to program difficulties the Department of Defense has discontinued JSIMS development beyond Block I pending an analysis of alternatives. In the interim, Joint Forces Command received version 1 of JSIMS in December 2002 and began testing, is taking steps to establish a Software Support Facility (SSF) to maintain JSIMS Block I software, and will support the analysis of alternatives. The JSIMS version 1 testing and validation process will take the remainder of the calendar year and if successful Joint Forces Command intends to use JSIMS in Unified Endeavor 04-2 (Aug-Sep 04) to support joint training. If testing is unsuccessful, Joint Forces Command will recommend program termination and will pursue alternatives to meet Joint training requirements into the future.

Admiral CEBROWSKI. Modeling and simulation aids risk reduction in operational and organizational concept development, as well as systems development and management decisions concerning cost. However, until modeling and simulation can divorce itself from dependency on variations of Lanchestrian equations, it is clear that it cannot support decision makers in the Information Age any better than was done in the Industrial Age.

47. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, do you feel that we are investing enough in developing these capabilities to meet our needs?

Admiral GIAMBASTIANI. There is significant investment in modeling and simulation. Funding has been adequate to meet the original requirements of JSIMS, but programmatic and developmental difficulties have denied U.S. Joint Forces Command the benefits of that system. Joint Forces Command seeks a modeling and simulation capability that provides an improved replacement for a wide variety of antiquated Joint, Service and Agency legacy simulation systems. With Joint National Training Capability (JNTC) requirements established and as funding comes on line, there is a potential that funds will be available to support emerging modeling and simulation capability requirements.

Admiral CEBROWSKI. The circumstance we find ourselves in today (described above), calls out modeling and simulation as an important area for research and development investment. The potential benefits are significant and far reaching. Some areas worthy of interest are physics-based modeling, warfare modeling, training simulations, and value/performance decisions.

48. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, what is your position on the cancellation of this program?

Admiral GIAMBASTIANI. The Program Decision Memorandum (PDM) did not cancel the JSIMS program. Program continuation is dependent upon the outcome of Joint Forces Command's testing and the Defense Department's Analysis of Alternatives. If testing is successful, Joint Forces Command intends to use JSIMS in Unified Endeavor 04-2 (August–September 2004) to support training for a combatant commander, JTF Commander, Component Commanders, and their staffs. If testing is unsuccessful, Joint Forces Command will recommend program termination as an input to the Defense Department's Analysis of Alternatives. U.S. Joint Forces Command requires JSIMS or JSIMS like capabilities to successfully perform its mission in the future.

Admiral CEBROWSKI. Personally, I am delighted that suspension of this program has occurred since it provides a real opportunity to skip a generation in our approach to modeling and simulation. Continuation of the program is contingent upon the outcome of JFCOM testing and a DOD analysis of alternatives.

49. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, are you satisfied that DOD directed the cancellation with a clear understanding of the risks and costs associated with closing the existing program, delaying establishment of a replacement program, and the potential loss of time and skilled modeling and simulation development personnel?

Admiral GIAMBASTIANI. The PDM did not cancel the program, as implied in the question. Program continuation or cancellation is dependent upon the outcomes of the U.S. Joint Forces Command Joint Warfighting Center-conducted Systems Verification and Validation Test (SVVT) and the OSD-conducted analysis of alternatives (AoA). Although a JSIMS-like capability is an essential component of JNTC, current plans provide for using JSIMS in the JNTC only if the system is judged usable and available.

The Joint Forces Command participated in the review of JSIMS that led to the PDM decision. U.S. Joint Forces Command made its schedule and cost concerns known during the review as well as its concerns about the validity of the joint training requirement that JSIMS was designed to fulfill. I understand the reasons for the PDM action, support the decision, and strongly support the SVVT event and AoA that will determine the best means of meeting joint training requirements in a timely manner, whether or not those means include JSIMS.

Admiral CEBROWSKI. It is not my role to evaluate program decisions in these terms. However, the PDM did not cancel the program—development was suspended beyond Block I, pending JFCOM testing and an OSD Analysis of Alternatives.

50. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, are you satisfied that cancellation of the JSIMS program is necessary to accelerate establishment of a Joint National Training Capability or does it complicate achieving such an objective?

Admiral GIAMBASTIANI. The PDM did not cancel the JSIMS program. Program continuation is dependent upon the outcome of Joint Forces Command testing and the Defense Department's Analysis of Alternatives. The Analysis of Alternatives will account for testing outcomes and impacts the establishment of a Joint National Training Capability.

Admiral CEBROWSKI. The PDM did not cancel the program. Program continuation is contingent upon JFCOM testing and an OSD Analysis of Alternatives. The Analysis of Alternatives will account for testing outcomes and impacts on establishment of a Joint National Training Capability.

51. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, what are your views on the importance of quality modeling and simulation to joint experimentation, joint training, joint doctrine, joint requirements development, and joint acquisition?

Admiral GIAMBASTIANI. Quality modeling and simulation make important contributions to joint experimentation, joint training, joint doctrine, joint requirements development, and joint acquisition, and will become increasingly important as simulation capabilities improve. Modeling and simulation plays an important role in training and transforming the U.S. military. Joint Forces Command seeks a modeling and simulation capability that provides an improved replacement for a wide variety of antiquated Joint, Service and Agency legacy simulation systems. The federation of simulations central in the execution of last summer's Millennium Challenge experiment demonstrated the utility of such a system, but also the challenge of creating such a capability from those legacy simulation systems. Modeling and simulation capability provides large savings in support costs for joint training and experimentation right now as compared to field exercises and experiments. With necessary improvements in simulation flexibility, interoperability, and fidelity, these savings can be applied to joint doctrine development, joint acquisition analysis, and joint requirements development. To maintain the quality simulation environment required, simulations will have to undergo constant improvement and expansion of capabilities over time, including accounting for new approaches to warfare by moving beyond the attrition based models currently in use.

Admiral CEBROWSKI. Modeling and simulation provides large savings in support costs for joint training and experimentation as compared to live field exercises and experiments. To achieve the quality simulation environment required, modeling and

simulation will have to undergo a major change that eliminates its current reliance on variations of the Lanchestrian equations developed during the Industrial Age.

52. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, in your view, what DOD agency should be responsible for the definition of requirements, research, development, testing, evaluation, and procurement of a joint simulation system?

Admiral GIAMBASTIANI. Unified Command Plan (UCP) 2002 guidance designates Joint Forces Command as the Joint Force Trainer and Joint Force Integrator, and as such, Joint Forces Command has an important role in the development of joint training and experimentation simulation requirements. Fully unified development, funding, and procurement of an extremely complex and ambitious simulation system is a necessity, as has been borne out by past Joint Simulation System development history. As with Joint Battle Management Command and Control, Joint Forces Command can take the lead with other joint users in the evaluation process.

Admiral CEBROWSKI. I don't believe there should be a single executive agent for joint simulation.

DECISION RULES AND METRICS

53. Senator BILL NELSON. Admiral Cebrowski, you mentioned the importance of decision rules and metrics during the hearing. I understood you to mean those rules and metrics associated with force structuring, wargaming and experimentation. What exactly did you mean by "decision rules and metrics?" What makes them so important?

Admiral CEBROWSKI. "Decision rules and metrics" are part of the incentives and rewards system that compel individual and institutional behavior. They underwrite our culture by reinforcing or changing our attitudes and beliefs. Over time they help define the characteristics and capabilities of our future forces.

54. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, is there a problem with our current system of "decision rules and metrics," how they are derived or used?

Admiral GIAMBASTIANI. The National Security environment is changing radically and so must our methods for enhancing and measuring military performance in that environment. Decision rules and metrics that are applicable to our transformation needs are evolving with our growing understanding of: first, the role of military power in the future security environment; second, radical changes in warfighting facilitated by dramatic technological advances; and, third, the required changes in doctrine, organization, training, leadership, and culture necessary to take full advantage of those technological advances in executing our military's role. Historically, decision rules and metrics have been derived by the Services to maximize Service warfighting performance in their respective areas of core competence. Recently, U.S. Joint Forces Command has begun partnering with the Services to assist them in ensuring their concepts capabilities and the decision rules from which they emanate, and the metrics by which they are assessed, are "born joint."

Admiral CEBROWSKI. The issue is value structure. To the extent our value structure flows from conventional threats and concepts of Industrial Age warfare while ignoring the effects of globalization and the transition to the Information Age, our decision rules metrics are detrimental.

55. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, the implication is that there will be new "decision rules and metrics." How will they be decided?

Admiral GIAMBASTIANI. U.S. Joint Forces Command's transformation responsibilities extend across a temporal continuum from developing and providing to the regional combatant commanders enhanced capabilities for today's joint forces to developing the capabilities of the future coherent force, which will be completely networked with total knowledge of all elements of the battlespace. The latter is unachievable with current technology, thus remains a vision toward which we are working. The former responsibility is being executed today. While some decision rules can be consistent across the continuum irrespective of the "art of the possible," many rules and most metrics governing these responsibilities cannot. Those that govern our near term responsibilities can be the most specific, and derive from policy documents such as the National Security Strategy, the National Military Strategy, and the Defense Planning Guidance. Rules and metrics that govern the mid-term are less specific and derive from the Transformation Planning Guidance and

the Joint Operations Concept. Least specific are those rules and metrics that govern the far-term, and are more akin to the scientific process of discovery, which we are employing in the concept development pathway of our joint concept development and experimentation process, addressed below. Key to ensuring that transformation initiatives permeate all aspects of this continuum is inculcating a culture of transformation throughout the armed forces. This is partially a function of the Joint Professional Military Education process, which we are addressing via a new partnership with National Defense University.

Admiral CEBROWSKI. New rules and metrics emerge in response to an understanding of a new strategic context and the domains of competition in the information age. They should be decided based on output measures and risk assessment.

56. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, what is the process (over what timeline and cost) and who will control this process and its ultimate decisions?

Admiral GIAMBASTIANI. The Office of Force Transformation is the agency within the Office of the Secretary of Defense responsible for establishing policies for DOD-wide transformation efforts. United States Joint Forces Command is responsible for executing transformation policy and leading transformation efforts in the Armed Forces. Therefore, Admiral Cebrowski and I are partners in this effort. We are working together to derive approaches, rules and metrics across the temporal continuum of transformation efforts. Within the area of joint concept development and experimentation, we have been working on a campaign plan for two experimental pathways, one looking as far ahead as 20 years into the future, and the other looking at near-term prototyping of transformational capabilities. This campaign plan is concept- and capability-driven with rules and metrics derived in accordance with the specifics of the concept or capability under examination. The concept pathway is focused on refining our Joint Concepts of Operations for the mid- and far-terms, and thereby rationalizing all the individual Services' visions for future warfighting. The principal focus of our prototyping pathway is on the enabling concepts for fielding a Standing Joint Force Headquarters (SJFHQ) capability in each of the regional combatant commanders' headquarters. These enabling concepts include Operational Net Assessment and the Collaborative Information Environment, both of which we are prototyping with U.S. Forces Korea. In Korea, rules and metrics will be developed specific to evaluating those concepts/capabilities within that environment. The ultimate assessment will derive from that of our customer, Commander, U.S. Forces Korea.

Admiral CEBROWSKI. This process should not be controlled—it is emergent behavior. As the new strategic context is articulated, new rules will flow from our understanding of the trends that emerge.

57. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, what role will the Services play in this determination process?

Admiral GIAMBASTIANI. The Services are U.S. Joint Forces Command's partners in joint concept development and experimentation. We work both through our component commands—Air Combat Command, the Army's Forces Command, Atlantic Fleet, and Marine Forces Atlantic—and directly with Service experimentation agencies for input into our planning and processes. As part of the planning for every Joint Forces Command-sponsored event, component and Service representatives contribute their agencies' perspective and positions, including inputs to definitions of rules and establishment of metrics. In the training realm, our components identify the specific joint mission essential tasks to be performed, which in turn define the metrics for our training exercises. As we evolve our Joint National Training Capability to address joint tactical actions, Joint Forces Command collaboration with our components and their Services will expand even more, especially in the derivation of joint tactical decision rules and metrics.

Admiral CEBROWSKI. The Services respond since they are providers. It's up to them to appropriately sense market dynamics and needs, and respond accordingly.

58. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, within what research or acquisition program(s) will this research and development take place?

Admiral GIAMBASTIANI. Our current transformation efforts are funded under three program elements: joint concept development and experimentation is under PE 0603727N; our Joint C⁴ISR Battle Center and Joint Integration and Interoperability transformation efforts are under PE 0305188N; and our joint combat identification efforts are under 0603857N. Future efforts under our Joint National Training Capability will be under proposed (not yet validated) PE 0804758N.

Admiral CEBROWSKI. This is done in many places—the Office of Force Transformation, the War Colleges, as well as governmental and commercial think tanks, to name a few.

59. Senator BILL NELSON. Admiral Giambastiani and Admiral Cebrowski, how will new “decision rules and metrics” be used for training, experimentation, operational rehearsals, requirements determination and validation, or acquisition?

Admiral GIAMBASTIANI. New decision rules and metrics will reflect an evolving joint culture across the continuum of our assigned responsibilities. The general policy established by the Office of Force Transformation will be translated into the specific rules and metrics needed to measure performance under the conditions and standards established for each Joint Forces Command event, whether it’s a training event for joint tactical actions within our Joint National Training Capability, an experimentation event within our prototyping pathway, or validation of interoperability within our Joint Integration and Interoperability cell. For example, a policy-level decision rule that values increased collaborative planning across all components and echelons of command impacts the metrics used in all the areas highlighted in your question: training, experimentation, rehearsals, requirements determination, and acquisition. It is also reflected in all our Command’s efforts from refining the Collaborative Information Environment for our Standing Joint Force Headquarters, through training we provide for all deploying Joint Task Forces; and establishment of multi-level security capability for collaborative planning with coalition partners to specific software packages fielded through our Joint C⁴ISR Battle Center as interim solutions for today’s operational problems.

Admiral CEBROWSKI. With the dramatic change in warfare being unleashed by the transition to the information age, future military capabilities must be judged using new criteria. Pentagon leaders require a different decision logic to understand which attributes of future systems are rising in importance, which are falling, and what overall mix of capabilities to pursue. Yet, the deeper, more profound debate about changing military “rule sets” is about new sources of power and how they are brought to bear.

In moving to the information age, the Nation is entering an era where advantages are conferred on the small, the fast and the many. These capabilities in turn will be paid for by the ponderous and the massive. Size shrinks because of the “demassification” of warfare that come about by substituting information for tonnage. The Air Force says that a target once requiring 1,000 bombs to destroy now requires only one. That magnitude of change is owed almost entirely to information technology and processes. A second key metric is increased speed, resulting not just from the decreased mass to be moved, but also from organizations streamlined to benefit from their superior information position. The result is a highly responsive, dispersed force with lower costs per unit of combat power. That is, increased combat power is vested in yet smaller units. One result of this is the need for new joint organizations and processes in small units, which were once considered the exclusive domain of the military services.

The military force must be rebalanced for future operations. The information component of the force must increase. Our sensor and networking capabilities must increase at the expense of more industrial age measures of combat power. Even before Operation Enduring Freedom, we were finding that we fight first for an information advantage and maneuver for a superior sensor position. So, an early question that must be posed regarding any weapon system is whether it is on the “net.” If not, then it is not contributing, not benefiting and not part of the information age. Program managers across all of the Services must understand that if they fail to achieve joint force interoperability, they are nominating their programs for cancellation.

In this age of strategic uncertainty, *risk is managed by increasing the breadth of capabilities*, no matter the imperfections, even at the expense of highly effective capabilities bought in quantity. The real issue is not how much is enough, but do we have the breadth of capabilities necessary to address strategic gaps. New concepts and capabilities must be favored over quantitative increases in the old. Of course, even these new capabilities must be prioritized, according to the new strategic and technical context, and the broadening threat base.

We must ask if a system is performing at increasing or decreasing rates of return on investment. That is, is the increased capability worth the cost? As a result of otherwise laudable Cold War efforts, we now have programs to produce the “ultimate” fighter aircraft, the “ultimate” artillery piece, the “ultimate” surface combatant and the “ultimate” of everything. Such systems must be candidates for review because they invariably perform at decreasing returns, not because these systems are not more efficient than their predecessors, but because the altered strategic environ-

ment has devalued their very existence. Potential enemies have also had time to prepare asymmetric counters, and the cost and complexity of the increased capability frequently outpaces its marginal value. The general rule is that “the new” should perform better, at lower cost, than “the old.”

Over time the validity or power of a particular type of capability changes. For example, the reasons normally given for artillery organic to the maneuver forces are low cost, high volume of fire and very short response time for the tactical commanders’ needs. These are powerful arguments, but those advantages can now be equaled or exceeded with new technologies and new military organizations. We have also learned that reliance on airpower alone carries high risks. What is required is a mix of capabilities. Programs must be conceived with that mix in mind. Arguments for a system or capability without consideration of the emerging joint character of warfare are not uncommon and indicate additional areas for elimination.

[Whereupon, at 11:25 a.m., the subcommittee adjourned.]

**DEPARTMENT OF DEFENSE AUTHORIZATION
FOR APPROPRIATIONS FOR FISCAL YEAR
2004**

MONDAY, MARCH 31, 2003

U.S. SENATE,
SUBCOMMITTEE ON EMERGING THREATS
AND CAPABILITIES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

**SCIENCE AND TECHNOLOGY PROGRAM AND THE ROLE
OF DEPARTMENT OF DEFENSE LABORATORIES**

The subcommittee met, pursuant to notice, at 2:04 p.m., in room SR-222, Russell Senate Office Building, Senator Pat Roberts (chairman of the subcommittee) presiding.

Committee members present: Senators Roberts, Dole, Cornyn, Kennedy, and Reed.

Majority staff members present: Carolyn M. Hanna, professional staff member; Paula J. Philbin, professional staff member; and Joseph T. Sixeas, professional staff member.

Minority staff members present: Richard W. Fieldhouse, professional staff member; and Arun A. Seraphin, professional staff member.

Staff assistants present: Leah C. Brewer, Andrew W. Florell, and Sara R. Marenco.

Committee members' assistants present: James Beauchamp, assistant to Senator Roberts; Christine Hill, assistant to Senator Dole; Russell J. Thomasson, assistant to Senator Cornyn; Mieke Y. Eoyang, assistant to Senator Kennedy; Elizabeth King and Neil D. Campbell, assistants to Senator Reed; William K. Sutey, assistant to Senator Bill Nelson; and Andrew Shapiro, assistant to Senator Clinton.

OPENING STATEMENT OF SENATOR PAT ROBERTS, CHAIRMAN

Senator ROBERTS. The Subcommittee on Emerging Threats and Capabilities will come to order. A special good afternoon. Thank you all for joining us today. This afternoon the Subcommittee on Emerging Threats and Capabilities meets to receive testimony from representatives of the Department of Defense (DOD) on the Defense science and technology (S&T) program and the role of Defense laboratories.

Before we begin, I would like to take a moment and extend my sincere appreciation to the witnesses for their attendance today.

This hearing was rescheduled. We were in the midst of what we call the vote-a-thon on the budget. I know you have rearranged your schedules in order to accommodate the subcommittee, so I truly appreciate your patience and flexibility, and look forward to your testimony.

These are challenging times for our country. As we watch events in Iraq unfold and the incredible technology being deployed, it is apparent just how important and timely this hearing is. The S&T program is a small slice of the Defense budget, but it is critical to the success of our Armed Forces. The investments the Department made decades ago are now paying off tenfold as of today.

The Defense S&T program relies not only upon the wise foresight of our leaders, but their faith that has been the case throughout our history, and that is that the investments made in intangible and almost unimaginable ideas often transform into awesome technological advantages. As shepherds of today's S&T budget, we thank our witnesses for their foresight, their continued faith, and the innovation of this country.

Although this hearing was postponed until today, we were fortunate the other morning to get a first-hand view of the technologies that the DOD is providing our Armed Forces. These technologies, many of which are currently being deployed around the world, not only enable our troops to be more lethal, more informed, and more aware, but are being employed to combat terrorism and also defend the homeland.

These technologies are the real game-changers, if I can use that word, that our country depends upon. They are critical to our assured success in both winning the war and also keeping the peace.

This morning's hearing will address several issues concerning the Defense S&T program. The hearing will provide oversight for the fiscal year 2004 budget request for Defense S&T, in particular the role of S&T in transformation, and how it supports efforts to protect the homeland and combat terrorism. The witnesses will testify about the challenges they face transitioning technology out of the lab through the acquisition process, and to the warfighter. Finally, the hearing will address issues surrounding the defense labs, in particular the challenges and initiatives impacting the defense laboratories' workforce.

I look forward to hearing from each of the witnesses. Please note that your full written testimony will be included in the record. To allow plenty of time for questions and answers, you may summarize your remarks. Again, thank you for being with us this morning.

I would like to recognize the distinguished ranking member, Senator Reed.

STATEMENT OF SENATOR JACK REED

Senator REED. Thank you very much, Mr. Chairman. Let me also join you in thanking the witnesses for responding among their busy schedules to this delayed and deferred hearing. I appreciate that very much.

The subject of the hearing, DOD's S&T programs and the defense laboratories, may be the furthest thing from our minds as we watch current military operations all over the world, but we need

to remember that the superior military technology that we depend upon to fulfill critical missions and protect our service members grows from these very investments and from the organizations that we will discuss today.

Every day, we are seeing how advanced technologies like Global Positioning System (GPS)-guided munitions, unmanned aerial vehicles, and night vision devices can be used with great success. All of those systems grew out of defense research programs and are being used as we speak in military operations all around the world, but technological innovations and the military capabilities that they enable only occur if we faithfully invest relatively small but stable resources in S&T. They only occur if we have the best technical minds in our labs and tech centers working on ways to overcome the threats of today and tomorrow, threats like chemical and biological weapons, ballistic missiles, and cyber attacks.

I look forward to hearing our witnesses describe their views on how well we are funding the innovations that will produce tomorrow's military capabilities, and how well we are supporting and growing our innovation centers, the defense labs, and technical centers. In particular, I am anxious to learn their plans for ensuring that we have the finest quality workforce in our defense laboratories.

Secretary Rumsfeld, the Quadrennial Defense Review, the Defense Science Board, and Congress have all endorsed the idea of investing 3 percent of the defense budget in S&T programs. I note with concern that this year's request does not achieve that goal and is projected to fall to 2.4 percent of the budget by 2009, and that is moving in the wrong direction.

In fact, the S&T request has been cut \$1 billion from last year's appropriated level. This includes reductions to many of the programs that support the activities of the defense labs, as well as fundamental research programs conducted by universities and small high-tech businesses. I look forward to learning how these budget decisions have been made.

I hope that in this hearing we can also discuss how we can work together to create a funding process and entrepreneurial environment that reward innovation and risk-taking among program managers. This will help us transition the best technology into the hands of our warfighters as quickly as is possible.

Our earlier hearing on joint experimentation made it clear that this transition step is key to transformation. I once again welcome all of our distinguished witnesses to the hearing, look forward to the discussion, and again, thank the chairman.

Senator ROBERTS. Senator Dole, do you have any opening comments?

Senator DOLE. No, I do not.

Senator ROBERTS. Senator Kennedy.

Senator KENNEDY. No, thank you.

Senator ROBERTS. Then we will move to our witnesses: Hon. Michael W. Wynne, who is the Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics; followed by General Paul Kern, who is the Commander of the Army Materiel Command; and General Lester Lyles, of the U.S. Air Force, who is the Commander of the Air Force Materiel Command; Vice Admiral

Joseph W. Dyer of the United States Navy. He is the Commander of the Naval Air Systems Command.

Secretary Wynne, would you proceed?

STATEMENT OF HON. MICHAEL W. WYNNE, PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY, AND LOGISTICS

Secretary WYNNE. Mr. Chairman, Senator Reed, Senator Kennedy, Senator Dole, and the members of the subcommittee, it is my pleasure to be here, and thank you for the opportunity to appear before you today.

It is really a pleasure to have the opportunity to testify about the S&T program of the Department of Defense, and express our continued belief that S&T is the engine that will drive the transformation of the Department. I would like to start with a thank you to this subcommittee and Congress for your continued support to the Department of Defense S&T program.

Continued support for S&T, complemented with our acquisition policy changes, such as the Federal Acquisition Regulation (FAR) part 12, offer stability and forward-planning opportunity that provides vision and purpose to the laboratories and the development activities within the Department, the many colleges, universities, and small technology houses that many times are the source of our innovations. This is in addition to our current actions regarding the 5,000 series to clear away some of the bureaucratic cobwebs while getting at the fundamentals of good process management.

The Department has and will be forwarding several legislative proposals to Congress that seek to retain and expand flexibility to deploy technology to acquisition programs of record. For example, the Department has forwarded to Congress two proposals on the use of other transaction authority to extend the current authorities of the other transactions past 2004, and to expand authorities of other transactions to allow them to be used for existing systems as well as new systems.

Reflecting back on President Bush's goal to move beyond marginal improvements to replace existing programs with new technologies and strategies, he made technology a cornerstone of the plan to transform and modernize defense. We have taken on a similar goal within the acquisition technology and logistics community as one of the highlighted goals. That goal is to initiate high-level technologies to create warfighting capabilities, systems, and other strategies for the future.

How are we doing? Let me use this opportunity to review recent accomplishments and have a look at the future direction for S&T to provide part of the answer. The Department of Defense request for S&T in fiscal year 2004 is \$10.2 billion, or 2.69 percent of the overall Department of Defense request.

This administration has increased the budget request for S&T by nearly 25 percent in just 2 years. However, simply adding money to S&T accounts will not by itself ensure transformation, so in comparison to our plan we find that about 80 percent of all the S&T dollars are, in fact, aligned to enhance capability in one of Secretary Rumsfeld's six critical operational capabilities as outlined in the Quadrennial Defense Review. The Services are also investing

in other high-profile transformational projects which I am sure you hear of separately.

In addition, we have increased our investment in Defense Advanced Research Projects Agency (DARPA), the defense agency charged with conducting high-risk, high-payoff technologies, by almost \$1/2 billion a year. DARPA continues to support the technologies that have historically been at the center of DOD's capabilities, materials, microsystems, and informational technology.

DARPA is the most agile of our components with respect to changing program direction and entering into agreements with each of the Services to develop cutting-edge technology and demonstrations. DARPA is connected and critical to the transformation road maps of each of the Services. DARPA has focused on not only developing lab-type technologies, but on transitioning them to either advanced concept technology demonstrations (ACTD) or service S&T programs which are more customer-, i.e., warfighter-focused.

Also, we have increased the investment in demonstrations, primarily through the ACTDs by almost 50 percent over the past 2 years, from \$150 million in fiscal year 2002 to over \$213 million in fiscal year 2004, and invested in transformational technology initiatives as well. One is the National Aerospace Initiative and the Hypersonic Road Map, developed cooperatively by DOD and National Aeronautics and Space Administration (NASA), which provides long-term potential for affordable access to space and a clear military advantage that is gained from speed.

A second transformational technology thrust is energy and power technologies. One of the present limiting factors to military operations is a logistics tail that provides energy to forces and systems. I want to highlight as well the support this subcommittee has provided for hybrid electric vehicles, which the National Automotive Center is using in conjunction with the automotive and truck manufacturers to jump start a potential path to manage energy consumption domestically, and in our Army to truly reduce our logistics footprint in a meaningful way. I strongly urge you to continue to support this high-leverage area.

A third is surveillance and knowledge systems. This initiative is fairly simple. It will develop the technology to turn information into wisdom.

With regard to technology transition, I was pleased that the Fiscal Year 2003 Authorization Act supported the Quick-Reaction Special Projects (QSRP). The objectives for a QSRP is the speed of rapid technology development. Three programs structured under QSRP are complementary with the focus of developing technology at different maturity levels. We seek continued congressional support for this program, and seek your help in ensuring there is sufficient flexibility in the program to allow the Department of Defense to most effectively be able to move fast to meet the needs of the warfighter.

The decline in scientists and engineers becomes more acute when considering the production by academia of scientists and engineers who are American citizens. Simply, one can argue the U.S. national security advantage over the past half-century was fueled by the

production of science and engineering talent. America has had the intellectual capital advantage.

At the broader strategic level, the Department is becoming concerned with the overall production of scientists and engineers available to work on national security issues. Over the past decade, the total number of Ph.D-level scientists and engineers produced by U.S. universities has, in fact, declined. Recently, I participated in an inaugural workshop using laboratory scientists and science modules created by Northwestern University to bring to our Nation's high schools and colleges more interesting content which will attract young science and engineering talent.

For several years now, the Department of Defense has been actively testing many management flexibilities, to wit, pay banding, pay for performance, and simplified classifications. The Office of the Secretary of Defense incorporated these best practices into a legislative proposal for creation of the National Security Personnel System for Department of Defense civilians. It adopts many of the features from successful acquisition demonstration projects and has carefully preserved the best practices from each of the lab demonstrations dating back to the China Lake demonstration, all key to attracting and sustaining an agile civilian force, which is vital to the total force readiness, not to mention attracting imaginative laboratory scientists.

Again, I want to thank the subcommittee on behalf of all of us who serve for your interest in and support of the state of S&T in defense. I am prepared to answer your questions. Thank you.

[The prepared statement of Secretary Wynne follows:]

PREPARED STATEMENT BY HON. MICHAEL WYNNE

INTRODUCTION

Mr. Chairman, members of the subcommittee, thank you for the opportunity to appear before you today. It is a pleasure to have the opportunity to testify about the S&T program of the Department of Defense, and express our belief that S&T is the engine that will drive the transformation of the Department. I'd like to start with a thank you to this subcommittee, the full committee, and Congress for your continued support to the Department of Defense S&T program. Your continued push for a flexible approach to providing operators access to technology has been met with a corresponding change to the acquisition policies and regulations to begin to bring about rapid technology insertion throughout the DOD. Continued support for S&T complemented acquisition policy changes such as FAR part 12 and our current actions to revise the 5000 series documents to clear away some of the bureaucratic cobwebs, while getting at the fundamentals of good process management. I'd further ask that your support be continued, as it offers aspects of stability and forward planning that provides vision and purpose to the laboratories, and development activities within the Department and the many colleges, universities, and small technology houses that many times are the source of our innovations. The Department has forwarded several legislative proposals to Congress that seek to retain and expand flexibility to deploy technology to acquisition programs. The Department has forwarded to Congress two proposals on the use of "Other Transaction Authority" to extend the current authorities of the other transactions past 2004 and to expand authorities of other transactions to allow them to be used for existing systems as well as the new systems. The continued use of other transactions provides an effective mechanism for industry and government to work together, and enhances technology transition capability.

Reflecting back on President Bush's goal to "move beyond marginal improvements—to replace existing programs with new technologies and strategies, he made technology a cornerstone in the plan to transform and modernize defense. We have taken on a similar goal within the acquisition, technology, and logistics community, as one of our highlighted goals. That goal is to initiate high leverage technologies to create the warfighting capabilities, systems and strategies of the future."

Well, how are we doing? Let me use this opportunity to review recent accomplishments and have a look to the future direction for S&T to provide part of the answer to this question.

I'll start with a look at the S&T program, and then cover the technology transition areas. I'll address workforce concerns, and discuss how we are accelerating technology to the warfighters. I'm often asked if the war on terror has revised our focus, and I respond that it has expanded our focus, as it added missions, but did not relieve us of any other missions. Technology will allow us to confront this expansion of mission in the most expeditious and effective manner.

S&T INVESTMENT

The DOD request for S&T in fiscal year 2004 is \$10.232 billion, or 2.69 percent of the overall Department of Defense request. The fiscal year 2004 President's budget request is a very good budget request for S&T. First, the budget request achieved greater than 0 percent real growth for S&T, even compared to the combined fiscal year 2003 President's Budget Request and Disaster Emergency Relief Fund. Perhaps more significant is the overall growth in S&T investment that has occurred under the current administration. This administration inherited a legacy budget request of \$7.8 billion in fiscal year 2002. This administration has increased the budget request for S&T by nearly 25 percent in just 2 years. However, simply adding money to the S&T accounts will not, by itself, ensure transformation.

S&T AND TRANSFORMATION

In addition to increasing the overall budget request for S&T, we have focused the budget request on several important technologies that should enhance transformation and deliver superior military capabilities for years in the future. About 80 percent of all S&T dollars are aligned to enhance capability in one of Secretary Rumsfeld's six critical operational capabilities as outlined in the Quadrennial Defense Review. The six critical operational capabilities define the cornerstone of Secretary Rumsfeld's transformation, and are: protect bases of operations; deny enemy sanctuary; project and sustain U.S. forces; enhance space operations; assure information operations; and leverage information technologies. Additionally, under the able guidance of the Honorable Ronald Sega, Director of Defense Research and Engineering (DDR&E), three broad, new cross cutting initiatives could accelerate the development of critical transformational technologies in areas that the DOD needs to address. The three areas are: the National Aerospace Initiative; Energy and Power Technologies, and Surveillance and Knowledge Systems.

The Services are also investing in other high profile transformational projects. Among the major highlights are the Army Future Combat System, which is an example of combat and support vehicles and unmanned air and ground systems which will work together as an integrated system-of-system, and Objective Force Warrior, which will decrease the equipment weight of the deployed infantry soldier from around 100 pounds to 40 pounds. The Air Force is developing enhanced precision weapons and directed energy weapons that will provide a battlefield option to deal with a threat with graduated effects. The Navy is moving rapidly to an electric force, with propulsion and electric weapons. Taken all together, the fiscal year 2004 President's budget request for S&T represents a budget that continues to develop the technologies the U.S. military will need to remain viable well into the 21st century.

In addition, we have increased our investment in Defense Advanced Research Projects Agency (DARPA), the defense agency charged with conducting high-risk, high-payoff technologies, by almost a half billion dollars a year. This additional DARPA investment is largely allocated to space technology, but in total, DARPA emphasizes research in eight strategic thrust areas. These eight areas are: counterterrorism; assured use of space; networked manned and unmanned systems; robust, self-forming networks; detect, identify, track, and destroy elusive surface targets, characterization of underground structures; bio-revolution; and cognitive computing. DARPA also continues to support the technologies that have historically been at the center of DOD's capabilities: materials, microsystems, and information technology. I would like to highlight a couple of DARPA projects to give a feel of how DARPA's investment is supporting transformation of the department. The Organic Air Vehicle (OAV) unmanned aerial vehicle (UAV) is a small, man-portable UAV that can fly and hover in a battlefield. The UAV looks very much like a sombrero—and uses a large horizontal fan for moving and hovering. The UAV has been tested in 9, 15, and 21 inch version—and each can carry different payloads—from on-board camera to chemical or bio agent detector. This “system” is being developed as a component of the Army's Future Combat System—which is the acquisition pro-

gram to transform the Army. Another DARPA technology that is worth mentioning is the orbital express space demonstration—which is a demonstration of on-orbit refueling capability for space systems. The orbital express could usher in a new era in space, whereby the U.S. uses primarily refuelable, small satellites to provide a more robust, enduring capability. While I only mention two DARPA programs, there are many, many more truly transformational technologies under development at DARPA. Additionally, DARPA is connected to the Services through several specific transformational projects—as will be described in the portion that covers technology transition.

In addition, we have increased the investment in demonstrations, primarily through Advanced Concept Technology Demonstrations (ACTD) by almost 50 percent over the past 2 years, from \$150 million in fiscal year 2002 to over \$213 million in fiscal year 2004. The ACTD program was instrumental in developing and demonstrating the utility of UAVs such as the Global Hawk and Predator. The ACTD program harvests the technology developed in the Defense laboratories and industry, and integrates these technologies into demonstrations that provide a glimpse into the future. While there are over 70 ACTD projects currently underway, I would like to highlight a few. The Homeland Security ACTD provides a detachable command center to focus responders in the case of a terrorist or natural disaster. In effect, it brings the power of the traditional military command post to bear for homeland security. We all know it is expensive to launch and operate some reconnaissance satellites. The High-Altitude Airship ACTD will integrate technologies to determine if the military can also use survivable very high altitude dirigibles to conduct many reconnaissance missions. The Active Denial Technology ACTD is demonstrating the ability of high power microwave systems to potentially control crowds—in effect, giving the military commander a non-lethal option to protect an area. I only highlight these three—but suffice it to say we could hold a hearing on the ACTD program alone. We have increased also our investment in experimentation, primarily joint experimentation, and are executing the investment through Joint Forces Command. This new investment lets the Department conduct large scale “experiments” or war games to effectively “try technology before it is bought.”

I would like to take a moment to discuss the joint transformational technologies initiatives. The first is the National Aerospace Initiative (NAI). The complete initiative consists of hypersonic flight technology, affordable space launch, and enhanced on-orbit space technologies. In the fiscal year 2004 budget request, the Department focused the increased investment into hypersonic technology, investing over \$150 million additional investment in hypersonics. We seek congressional support for the fiscal year 2004 budget request for hypersonic technology. We seek this because hypersonic technology could be truly transformative, in that, when developed, hypersonics provides the opportunity to conduct tactical strikes from a strategic distance. The NAI is the right initiative for America as we celebrate the first century of manned flight. Technology has progressed to the point where we believe that demonstrations to Mach 12 by 2012 are within reach. This would more than double any currently demonstrated system. The development of hypersonic technology could diminish vulnerability of existing systems, while potentially providing a true capability to strike so quickly that we could effectively deny enemy sanctuary anywhere in the world. Additionally, the hypersonic roadmap, developed cooperatively by DOD and NASA provides long term potential for affordable access to space. In short, the NAI is one of those technology opportunities that has the potential to capture American interest in technology, much like the race to the moon in the 1960s.

A second transformational technology thrust is Energy and Power Technologies. One of the present limiting factors to military operations is the logistics tail to provide energy to forces and systems. The energy and power technologies thrust involves a coordinated investment by all three Services and DARPA to generate, store, and use power in systems ranging from microsystems to future generation electric ships. This initiative is investing in technology that could develop batteries with over five times the energy density, fuel cells that are reliable and safe to use in the battlefield; capacitors that will decrease size needed to store electricity on ships by a factor of 5–10. In short, this thrust could also truly transform the military.

The final cross cutting initiative is surveillance and knowledge systems. This initiative is fairly simple—it will develop the technologies to turn information into wisdom. Consequently, this initiative will seek to develop low cost sensors with various capabilities (such as optical, IR, acoustic, magnetic, and so forth), connect these information sources to tactical networks, route the data from tactical to strategic level, and finally, the initiative will develop technologies that can assist the decision-maker. The initiative could begin to make the vision of network centric warfare a reality.

TECHNOLOGY TRANSITION

In October 2002, Deputy Secretary of Defense Wolfowitz rescinded several defense acquisition directives and regulations—in effect throwing approximately 250 pages of bureaucracy out the window. He directed the Department to revise the 5000 series documents to create “an acquisition policy environment that fosters efficiency, flexibility, creativity, and innovation.” In rescinding the regulations, Secretary Wolfowitz proposes to replace the 250 pages of directives with only 40 pages of interim policy and guidance. These 40 pages contain the fundamental elements of acquisition, as it were. Most significantly here, these 40 pages contain numerous references to the need to accelerate technology transition or insertion. The Secretary reaffirmed a streamlined acquisition process built around spiral and evolutionary acquisition. The key element of spiral acquisition is a process that allows the Department of Defense to field ever increasing capabilities brought about by enhanced technology without having to initiate a new acquisition program. This is a capabilities-based approach, and is consistent with Secretary Rumsfeld’s mandate to transform the DOD capabilities. The reason I begin the discussion of what the Department has specifically done to enhance technology transition is to stress that at the largest scale, the processes are being revamped and instituted that could allow much more effective technology transition. This is a cultural change, and will take time and leadership. This administration is committed to effecting such a cultural change.

Following the streamlining of the overall DOD acquisition process, the Office of the Secretary of Defense has taken several additional steps in the past year to enhance technology transition. At the organizational level, the Department has brought both technology transition programs and policy oversight under the Director, Defense Research and Engineering, who has consolidated the functions under Ms. Sue Payton, the Deputy Under Secretary of Defense for Advanced Systems and Concepts. This office executes both the Advanced Concept Technology Demonstration, a program that uses demonstrations to allow the Department to “try before buying” technology and the Foreign Comparative Test program which overcomes the “not invented here” syndrome that occurs. Demonstrations are a cornerstone to spiral or evolutionary acquisition, and ACTDs are the flagship demonstration program. As stated previously, ACTD’s assemble mature technologies from the science and technology base and accelerate the flow of technology to the operator.

Another key step to enhancing technology transition is having a means to provide incentives to any program that has to accept the new technology. Changes to programs of record carry risk. Yet the budget process can be slower than the technology process. By use of incentives, the Department can reward risk. In Secretary Rumsfeld’s budget hearing this year, he demonstrated that time lag between when funding is allocated to a capability in the budget process and when the first dollar is spent is 18–24 months. This in a world where “Moore’s Law” states computer capability doubles every 18 months. To break this cycle, the Department is testing three pilot projects contained in the “Quick Reaction Special Project” program. I was pleased that the fiscal year 2003 Authorization Act supported the Quick Reaction Special Projects (QRSP). The objective for QRSP is the speed of rapid technology development. Three programs structured under QRSP are complementary with the focus of developing technology at different maturity levels. These three programs are the Defense Acquisition Challenge Program, the Technology Transition Program, and the Quick Reaction Fund. All three require vetting by the acquisition, technology, and warfighting community, but can fund a specific technology within the execution year. The Quick Reaction Fund, initiated in fiscal year 2003, is already developing technology that could be used in current operations and is modeled after the success of the fiscal year 2002 Quick Reaction Munitions Fund. We believe the potential payoff from the Quick Reaction Special Program is very large—and have consequently added \$50 million more in the fiscal year 2004 budget request compared to fiscal year 2003. We seek continued congressional support in the program, and seek your help in ensuring there is sufficient flexibility in the program to allow the DOD to most effectively be able to move fast to meet the needs of the Department. We request the program not be further divided or earmarked, so we can have the freedom to manage to effect change for the Department and America.

Why do we seek flexibility? In the fiscal year 2002 appropriations bill for the Defense Emergency Relief Fund, Congress identified \$15 million for the Quick Reaction Munitions Fund. Two successful projects resulted from the funding. The first was the Thermobaric Hellfire Enhanced Capability that increased blast lethality in multi-room structures of the hellfire missile. Within 1 year, the project went from chemistry to the field at a cost of \$12 million. The Low-Cost Guided Imaging Rocket (LOGIR) was the second project that is enhancing the accuracy of the unguided

2.75" "hydra" rocket used in close air-to-ground operations. The type of outcome we achieved from the Quick Reactions Munitions Fund should occur through use of the Quick Reaction Special Projects—and should effect technology transition.

Another key facet to enhancing technology transition has also come to fruition in the past year. Effective technology transition occurs when the three or four communities involved in developing and transitioning technology must be in close contact throughout the process. The communities are the technology, acquisition, operational, and the logistics community. Effectively, the program manager, technologist, the end user, and logistician must come together to provide the best possible supportable technology at the right maturity. In effect, the acquisition and operations risk is reduced and technology enhanced.

DARPA'S ROLE WITH THE SERVICES

One concern I have heard since coming to the Department is most interesting—that concern is that DARPA is disconnected from the rest of the Department of Defense and supporting acquisition programs. Nothing could be further from the truth. In fact, this administration has put more money into DARPA because we are trying to change the technologies being developed within the Department, and DARPA is the most agile of our components with respect to changing program direction. But, DARPA has used this agility and entered into agreements with each of the Services to develop cutting edge technology and demonstrations. For instance, DARPA and the Army are linked, through formal agreement, to enable the development of the Army of the future with networked tactical equipment and vehicles, the Future Combat System. Additionally, DARPA and the Navy are joined, through memorandum, to develop the Hy-Fly missile—a supersonic demonstrator that is on the glide path to be an early NAI hypersonic demonstrator. Finally, there is the Unmanned Combat Aerial Vehicle (UCAV)—a system demonstration in conjunction with the Air Force. Each of these three systems—NAI, UCAV, and Hy-fly are at the nexus of critical capabilities needed by the Services—and a large programmatic change, so DARPA's agility was instrumental in meeting the need. Instead of the limited criticism that DARPA is not connected to the Services, I would turn it around and say DARPA is connected, and critical, to the transformation road maps of the Services. DARPA is in fact more critical and connected than ever.

NATIONAL DEFENSE RESEARCH LABORATORIES AND CIVILIAN WORKFORCE

The decline in scientists and engineers becomes more acute when considering the production by academia of scientists and engineers who are American citizens. Simply, one can argue the U.S. national security advantage over the past half century was fueled by the production of scientists and engineers—America has had the intellectual capital advantage. There are signs that America's advantage is eroding. It really does not matter how many of the scientists and engineers ultimately go to work for the Department of Defense—what matters is how large is the pool of quality scientists and engineers to select from. One could argue that the national defense engine of the end of the 20th century was in part fueled by the increase in scientists and engineers produced in the U.S. after the launch of Sputnik and the Cold War. There was an excitement about science that resulted in an ample supply of scientists and engineers that would work on national security issues. The United States was able to produce stealth, the global positioning system, night vision devices, and precision weapons by this pool of scientists and engineers. The Department of Defense pioneered the development of the internet through the "ARPANET". The large capacity of scientists produced the capabilities leading to the superior military capabilities today. We believe it is time to rekindle the excitement of science and engineering as a national asset.

The Department of Defense has initiated several small programs in the fiscal year 2003 and fiscal year 2004 budget that we hope will begin the rekindling of imagination. Operational Joint Precision Educational Strike is a focused pilot initiative sponsored by Dr. John Hopps, the Deputy Under Secretary for Laboratories and Basic Science, to increase the interest in high school students in science and engineering; to reduce the number of college freshmen who leave the sciences in their freshman or sophomore year; and to increase the graduate fellowships in science and engineering. The Department has adopted the Northwestern University's Materials World Module pilot to develop interesting, challenging modules to capture middle and high school student's imagination. We are expanding upon the module by extending the opportunity of middle and high school teachers to train and intern at DOD laboratories. The kickoff for this effort will occur at the end of this month at Picatinny Arsenal, New Jersey.

These initiatives supplement the ongoing Department of Defense Basic Research program. The fiscal year 2004 President's Budget Request for Basic Research is \$1.3 billion, of which over 50 percent goes directly to universities. We estimate that every \$1 million of university research supports between 10–15 graduate students, who work in areas of interest to the Department. Clearly, the DOD is putting pieces into place to attempt to generate more scientists and engineers.

At the broader strategic level, the Department is becoming concerned with the overall production of scientists and engineers available to work on national security issues. This challenge facing America is greater than an issue just for the Department of Defense. In December 2002, the National Science Foundation issued a report called "Science and Engineering Doctorate Awards 2001." This report provides the overall production of scientists and engineers in U.S. universities. Over the past decade, the total number of Ph.D.-level scientist and engineers produced by U.S. universities has declined.

COMBATING TERRORISM

Within a week of the terrible attacks of September 11, the Department had established the "DOD Combating Terrorism Technology Task Force". This task force is still ongoing, and meets as needed to address specific technology opportunities and or needs. The task force is comprised of executive level technology members from all DOD components, flag-level officers from the Joint Staff and selected Combatant Commanders, the Central Intelligence Agency, the Department of Energy, and now the Department of Homeland Security.

Phase I lasted roughly from September 2001 through winter 2002. This phase resulted in such capabilities as the GBU-118 "Thermobaric Bomb," a backscatter gamma ray system to inspect cargo without going into the container; a small chemical detector, called the nuclear quadrupole resonance system, that can detect small quantities of explosives remotely. We also used the task force to commission a rapid study to determine radiation levels needed to kill anthrax spores—knowledge that helped the Government have an option for dealing with the anthrax scare of late 2001.

What is significant about phase I of the task force is not the specific technologies—but the fact that when the Department needed new capabilities, the continued investment in technology development over the past decades had put technologies "in the cupboard" when needed. I think this is a very important point for technology and transformation. Good technology development is largely achieved through long-term, stable investment in technologies. Not every technology needs to be transitioned immediately. The technologies can be developed and stored in a near ready state until needed. But without the continued stable long-term investment, the "cupboard could be bare." The fiscal year 2004 President's budget does focus on transformation technologies. But it also maintains long-term technology based investment in such capability areas as materials and nanotechnology, electronics, sensors, and so forth. The balance has been, and remains, important.

The task force met only periodically throughout the spring and early summer of 2002—but began to accelerate again when the national focus expanded to weapons of mass destruction. During phase II of the DOD Combating Terrorism Task Force, the focus has been on technologies to detect and neutralize chemical and biological agents. The task force has worked primarily with both the Central Command and Special Operations Command. Specific details are still classified, but may be provided in an appropriate forum.

CONCLUSION

In closing, the S&T program and the objective of Secretary Rumsfeld to provide transformational capabilities to the DOD are absolutely intertwined. I am pleased to be able to detail just a few successes of the DOD S&T program. But, throughout the technology program of the Department, and the priorities of the DDR&E, a theme emerges I believe the successes being built by the DOD in technology, technology transition and transformation are very significant, and I appreciate the opportunity to come before you today to tell you about them. Thank you.

Senator ROBERTS. We thank you.
General Kern.

**STATEMENT OF GEN. PAUL J. KERN, USA, COMMANDER, ARMY
MATERIEL COMMAND**

General KERN. Mr. Chairman, Senator Reed, members of the subcommittee, thank you for permitting me to testify today before your subcommittee on the investments you have made and will continue to make in our S&T. They are truly paying off for us today.

If you will permit me, Senator Reed, I have a picture which I will leave with you from Specialist Ashline which was taken at our demonstration here, where we have demonstrated the protective gear which he was wearing, which you and this subcommittee have helped develop, in fact, saved his life in Afghanistan. It is emblematic of the work that science can do in supporting our soldiers.

Army transformation has many parts to it today, and the S&T is working in collaboration with academia, industry, and with the other service laboratories and with DARPA. Our priority is getting technology to our soldiers faster. We have a series of university-affiliated research centers, which began with a University of Texas in Austin center, and we have then continued with the University of Southern California in establishing a center focused on bringing the best of training technology through what capability universities and entertainment can bring. That is paying dividends today, as we learn how to train in more realistic environments.

We will open early in May a third center, a university-affiliated research center with the Massachusetts Institute of Technology (MIT) in the nanosciences, a new area which we are beginning to explore. I met at lunch today with Dr. Covington, who is running that facility for us, and have some very exciting ideas of what nanosciences can bring to the Army to reduce the weight and burden on our individual soldiers. We have one other, which we will award this year, in the bioengineering area to complete a center of excellence in the new areas as well as the more fundamental areas of training and ballistics.

I would like to focus on three areas: transformation infrastructure, people, and organizations. In transformation, we are focusing on new threats. We are looking at the agility, sustainability, reliability, lethality, survivability, and maintainability necessary for the future. A critical piece of this is the development of the future combat system. We will go to a review with the Office of the Secretary of Defense in May for the next steps in that. Today, 98 percent of our S&T is focused on the Objective Force, including the Future Combat Systems (FCS). The priority of that work is going to our laboratories.

We are seeing successes in some of our new initiatives, soldier systems of protection, chemical and biological detection and defense, reducing our footprint for logistics, sensor technologies, unmanned ground vehicles and unmanned aerial vehicles. An example of the ground vehicle is a PacBot, a project which was started with DARPA and which we have taken into the caves of Afghanistan, where robotics systems are now going down into the caves, as opposed to soldiers having to go in harm's way.

In medical technologies, we are looking at current operations as well as our objective force to improve our ability to respond in that first magical hour to save soldiers' lives.

We have begun a revitalization of the Army laboratories in 1999, and we are increasing our support to the program executive officers and program managers. That was an area that you wanted to explore further on how rapidly we could transition to our program offices through the acquisition process. We have world-class laboratories in sensors; robotics; command, control, communications, computers, intelligence, surveillance and reconnaissance (C⁴ISR) that combination of C⁴ISR which is providing us vital battlefield information.

We are concerned about the people. The Engineering and Science Career Development Program has a great deal of focus for us on revitalizing our workforce. We have increased our hiring by 1,100 people between 1999 and 2002, and we have an increase in Ph.D and masters' degree holders. Recruitment and retention continues, however, to be a major focus on what we must do to keep our S&T alive.

We are also looking at outreach programs at the historically black colleges and universities (HBCU) and with our high-performance computing centers. We have started a program for seventh- and eighth-graders called E-Cyber Mission to reach out to young children to bring them into the area of S&T, and this year we have developed a Research, Development, and Engineering Command to integrate all of our S&T, not by commodity or specific areas, but across all of the sciences, much as our universities are today. Major General John Doesburg, who is joining me here, is the transition director for that and bringing those areas into fruition.

I would be remiss if I did not mention some critical people that we have. Army scientist, Richard Fong, who has been with us for many years at Picatinny Arsenal is absolutely the world's greatest scientist in warhead technology. He knows how to make our systems smaller and lighter for all of our Services.

Dr. Melissa Holland, an engineer psychologist who has developed the Falcon language translator, has taken the work that was done previously in DARPA and again put it into commercial off-the-shelf components and we are using it today in Bosnia and Afghanistan.

Chuck Vessels, an engineer at our Army Missile and Research Development Center, which has helped to develop the warhead in use by both the force and the Army on our Hellfire missiles, and done that very quickly and very effectively.

It has been a very ambitious journey this past year. It will be even more ambitious in the future, as we bring on the S&T needed for the future combat systems and leading to the Objective Force.

I look forward to your questions, sir.

[The prepared statement of General Kern follows:]

PREPARED STATEMENT BY GEN. PAUL J. KERN, USA

INTRODUCTION

Mr. Chairman and members of the subcommittee, thank you for the opportunity to appear before you to discuss the Army's laboratories and S&T efforts. I want to thank the members of this subcommittee for your valuable role in making our Army the preeminent land combat force in the world. Your support of our Transformation goals has been vital to our progress. We welcome your continued advice and support.

Army Transformation is multi-faceted. Comprising many of those facets are the numerous S&T efforts being pursued across our Army, in collaboration with aca-

demia and industry. Those efforts do not stop at our shores. We are working closely with our allies on projects for mutual benefit. From sensors to simulators, from bullets to batteries, from ammo to armor, Army Transformation is being accelerated through integrated efforts, creating invaluable synergy to ensure we provide our Nation a dominant land force capability as well as support our homeland defense.

Out of the lab and into the hands of our soldiers is the number one priority of our S&T work. Faster is better. We are reaching out and connecting with experts in fields that a few years ago might not have been associated with the United States Army. For example, we approached Hollywood, the game and entertainment industry a few years ago, to create a center where simulation would really be "outside the box." Another great example is the Institute for Soldier Nanotechnology at the Massachusetts Institute of Technology, where we are researching a wide range of possibilities, from climate control clothing to biomedical monitoring.

It would take several books to cover all we are doing in S&T and expect to do in the future. Therefore, it becomes practical to focus on three areas for discussion at this time—Efforts, Infrastructure, and People. First, we will define some of the critical efforts that are key to Army Transformation—to the Objective Force, and within that, the Future Combat System (FCS). Second, we will lay out the extraordinary capabilities that reside in our S&T infrastructure, which includes our in-house laboratories and our research, development, and engineering centers. The third area that significantly impacts all areas is the people arena, as well as how we organize our people.

EFFORTS SUPPORTING ARMY TRANSFORMATION

The Army is fundamentally changing the way we fight and is creating a force that is more responsive to the strategic requirements facing our Nation. We are building a joint precision maneuver capability that can enter a theater at the time and place of our choosing, maneuver at will to gain positional advantage, deliver precise joint fires and, if necessary, to close with and destroy the enemy.

The Objective Force is an army designed from the bottom up around a single, networked, integrated command, control, communications, computers, intelligence, surveillance, and reconnaissance (C⁴ISR) architecture that will enable us to link with joint, interagency, and multi-national forces. It will be a rapidly deployable, mounted formation, seamlessly integrated into the joint force and capable of delivering decisive victory across the broad spectrum of military operations.

The Objective Force will leverage and deliver with precision the combat power of joint and strategic assets. It is a capabilities-based force that rapidly responds to the requirements of the strategic environment, no matter what the mission, the threats, or the risks. The Objective Force will be responsive, deployable, agile, versatile, lethal, survivable, and sustainable.

A critical piece of the Objective Force is the FCS which is on track to be fielded by the end of this decade. There will be a Milestone B decision in May 2003. FCS is being developed in partnership with the Defense Advance Research Projects Agency (DARPA). In addition, the Army has selected and employed an industry team to serve in the role of Lead System Integrator (LSI), which will ensure that all the best and most innovative sources of technology are leveraged and exploited. The FCS is a synergistic mix of manned and unmanned systems being developed and fielded as a complete family to achieve the warfighting capabilities the Nation requires to defeat adaptive, asymmetric, conventional, and unconventional adversaries.

The Army is placing similar emphasis on the soldier of the Objective Force. The Objective Force Warrior program is the Army's flagship S&T soldier system effort led by the Army Material Command (AMC) to provide revolutionary improvements in warfighting capabilities for the soldier and small team. The program takes advantage of ongoing Army S&T integrated with the technological expertise of the private sector to provide our soldiers with overwhelming advantages, both with respect to soldier safety and survivability as well as lethality capability.

S&T is the enabler of the Objective Force. The S&T community inside the Army consists of laboratories belonging to AMC, the Medical Research and Materiel Command, the Corps of Engineers, and the Space and Missile Defense Command. The total Army S&T funding for fiscal year 2004 is over \$1.8 billion, of which 98 percent is focused on the Objective Force, including FCS. The work of Army laboratories is highly leveraged with activities in industry, academia, other government agencies, and foreign countries. The scope of efforts spans the spectrum from vehicle platforms and munitions to drinking water and food.

Priorities in the Army labs in support of the Objective Force include protection of the soldier; reduction of the logistics footprint; improvements in network centric

command, control and communications; development of unmanned capabilities; and increasing the lethality and survivability of the overall force. In addition to support to the Objective Force, the Army S&T community has contributed significantly to Homeland Defense initiatives.

Soldier protection is always a major concern. Efforts in improved body armor, lightweight vehicle armor, active protection systems, and signature management ensure that soldiers are hard to find and even harder to defeat. A significant transition success story is the Interceptor Body Armor and Small Arms Protective Insert developed by the Natick Soldier Center (NSC) for the U.S. Marine Corps and leveraged by the Army. Through advancement of new, lightweight ceramic composite materials, the NSC was successful in achieving a 13-percent weight reduction in the ballistic vest and over a 40-percent weight reduction in the ballistic insert, without performance degradation and while addressing a new blunt trauma requirement. NSC also successfully executed a Manufacturing Technology Program that evaluated the different ballistic plate materials and manufacturing processes. The end result is a technology that is not only mass producible, but reduces the cost by 25 percent. Another recent transfer from S&T was a crack arrestor technology that improves the multiple hit capability of the ceramic composites used in SAPI. Undoubtedly the most meaningful result is the soldiers' lives saved by this technology advancement. As the Honorable Pete Aldridge, USDAT&L, noted, "Every bullet deflected by advanced body armor, represents a visit not paid to a spouse or parent by a military chaplain."

The Edgewood Chemical Biological Center (ECBC) is well known for its contributions to CB agent detection equipment, such as the Joint Biological Point Detection System, which is currently in its third generation in 10 years. Each new version has been smaller, lighter, more durable and more capable—in a word, better. ECBC is now hard at work on the fourth generation of this biotechnology application. Recently, ECBC design and technology development supported full-scale development transition of the Joint Service General Purpose Mask (JSGPM) program. The JSGPM satisfies all joint service chemical/biological mask field and combat vehicle applications for the next generation soldier and is significantly influencing future civilian respiratory protection systems.

Transformation in logistics requires a reduction in the logistical footprint. A fighting force expends large amounts of materiel, from food to ammunition to batteries. All of this needs to be brought into theater and maintained if the force is to be effective. The S&T community continues to invest in smaller, more reliable ammunition and armament, more nutritious and long lasting foods, and more efficient energy sources. There are several efforts underway to reduce the amount of water that needs to be transported. Current efforts include recovery of usable water from vehicle exhaust and finding efficient ways of drawing water from the atmosphere, even in desert climates.

See First, Understand First, Finish Decisively! Sensor technology and information fusion is critical to situational understanding. Modern warfare depends highly on accurate timely transfer of information to the warfighter. The highly mobile, lighter force envisioned in the Army Transformation will depend on this ability more than ever. Investments in self-healing networks, remote and robotic sensors, data fusion techniques, and leader development help ensure that up-to-date information is always available and decisions can be made quickly and accurately. Many of the technologies developed by the Communications Electronics Research Development and Engineering Center to support the Army's warfighting capabilities will, it is believed, be adapted for homeland security needs. Sensors, including infrared, acoustic, and radar—used singly or in combination—can provide intrusion detection and perimeter security. Multi-spectral x-ray technology can facilitate real time inspection of baggage and small crates at security checkpoints. Hyper-spectral infrared imaging can detect chemical and biological agents, while Armaments Research Development and Engineering Center improved non-lethal munitions can increase security perimeters by stopping threats at a greater range and incapacitating antagonists if required. High value targets can be protected by layered defenses incorporating acoustic cannons and hypersonic sound devices, while smart audio and video surveillance systems can more effectively control crowds and yield intelligence about hostile threats.

A recent major technical accomplishment is the integration of a Hellfire laser-guided missile with an Air Force Predator UAV and its improvements/modifications to give the Predator the capability not only to identify targets of opportunity on the battlefield but also to engage and destroy these targets in real-time. The Aviation and Missile Research Development and Engineering Center (AMRDEC) quickly developed critical technologies for the Hellfire MOD-K to meet an urgent operational need to provide fragmentation lethality against a broad range of targets. The pri-

mary urgency was related to Global Military Operations involving the U.S. The MOD-K is an excellent example of AMRDEC transitioning advanced technology to deployment in a very short time at minimal cost. The MOD-K effort, including simulation, design, fabrication, test, and deployment, provided a joint service capability in less than 8 weeks. In addition, the RDEC supported urgent requirements for deployed forces, designing, producing, and modifying satellite communications (SATCOM) radios in country in support of OEF. This included the design and test of Army aviation Blue Force Tracking capabilities which supported the modification of 200 Army aviation assets in Southwest Asia and the current designing and testing of improvements for AH-64A/D instrument flight rules (IFR) capabilities which will provide significant operational improvements. AMRDEC's Prototype Integration Facility (PIF) is a Government Owned, Government Operated (GOGO) facility/concept concentrated on meeting the rapid response needs of Army, Department of Defense (DOD), and ultimately the warfighter. Customers buy solutions, not technology; therefore, the GOGO PIF concept focuses on assembling and integrating the necessary Government and Industry expertise to render a true rapid response.

The Army Research Laboratory (ARL) has been working with DARPA for over 5 years on the development of the PacBot robot. We have provided two PacBot platforms (Hermes and Professor) and an infrared imager to the forces in Afghanistan that was used in the caves and closed environment. An improved platform with a fully articulated sensor head under complete remote control of the operator is ready for troop evaluation and may be available for the deployed troops.

The U.S. Army Tank Automotive Research Development and Engineering Center (TARDEC), in partnership with industry and ARL, is currently developing semi-autonomous and follower capability for unmanned ground vehicles under its' Crew-integration and Automation Testbed (CAT) and Robotic Follower programs. At the request of the FCS LSI, TARDEC adapted their program to form the basis of the FCS program's Unmanned Combat Demo (UCD). The CAT operates as a surrogate FCS Command and Control Vehicle and the Robotic Follower together with ARL's Experimental Unmanned Vehicle operates as two surrogate FCS Armed Reconnaissance Vehicles (ARV). The goals were to demonstrate one to one soldier to ARV robotic control, conduct a remote fire engagement, and to generate much needed experimental data in support of the FCS Milestone B decision. The UCD field experiments culminated with the first ever successful remote firing from a ground robot under semi-autonomous control. This effort went from first discussion to successful field experimentation in less than 18 months and involved multiple Army agencies and industry partners. We continue to do field experimentation at Ft. Bliss to generate data in support of the FCS Milestone B decision.

The Medical Research and Materiel Command (MRMC) is playing a key role in inserting new medical technologies into both future acquisition programs such as the Objective Force Warrior, and directly into operational forces. Recent technology successes include:

Battlefield Medical Information System—Telemedicine (BMIS-T), which captures longitudinal patient information (predeployment, deployed, postdeployment) and epidemiological data. The system provides first-responder and forward deployed and home-station physician access to critical information, knowledge bases, and medical consultation that will greatly improve the quality of medical data acquisition, processing, and storage, regardless of the point of care. BMIS-T is currently being deployed as part of the U.S. Special Operations Command (USSOCOM) Health Surveillance System and is a component of the DOD Theater Medical Information Program, as well as current Army medical surveillance architecture (BMIS-T/Composite Health Care System II—Theater).

Chitosan Dressing (CD) is expected to provide a marked improvement in the ability of front-line medics to control severe life-threatening external bleeding on the battlefield. Developed under Army contract, the Food and Drug Administration (FDA) approved the CD on 4 November 2002 for temporary control of severely bleeding wounds. Research has shown that the CD is also effective in reducing internal bleeding after severe liver injury, and work is continuing to allow FDA approval for internal use of the dressing. Through a combination of fiscal year 2002 and fiscal year 2003 funding, a total of 27,000 dressings are being procured. Delivery of these dressings is under way, and production will continue through the summer of 2003, with the initial dressings designated for delivery to the USSOCOM and the remaining dressings to be distributed in Army channels.

Combined Camouflage Face Paint is a U.S. Environmental Protection Agency-approved blend of face paint with DEET insect repellent to provide a minimum of 8 hours of protection against biting insects. Inclusion of insect repellent protection will reduce nuisance factors by repelling insects near the face and help reduce diseases, such as malaria and dengue fever, transmitted by biting insects. DEET has been

previously used as a separate product, but caused existing face paint formulations to run. Its integration into face paint is intended to simultaneously improve ease of use and compliance, optimizing protection.

In keeping with the Army's Executive Agent responsibilities for the use of INDs (investigational new drugs) for force health protection, USAMRMC has currently deployed two Special Medical Augmentation Response Teams to the Middle East to oversee the operational use of IND products. The IND products are not yet approved by the FDA for every day use. These products must be administered by a physician under an approved human use protocol and require consent forms. Regulatory requirements warrant maintenance of complete and accurate records by the principal investigator(s). IND products being used are a new hemostatic dressing for medic use in the control of severe external bleeding, and botulinum toxoid vaccine, human botulism immune globulin, and botulinum antitoxin to prevent and treat illness caused by use of botulinum toxin as a biological warfare agent. These teams will oversee the use of the products, and provide training to field medical personnel in their use, the collection of informed consent, and required record keeping. The team devoted to botulinum toxin prevention and treatment is also overseeing compliance with FDA requirements for storage and transfer of products to ensure their effectiveness.

These technologies, as well as many others, will provide capabilities which will be introduced into the Objective Force. This Force, with the FCS as its centerpiece, will be a leap ahead for the Army and its ability to defend the Nation.

INFRASTRUCTURE

The FCS program has had a significant impact in revitalizing Army laboratories. Dr. Michael Andrews, the Assistant Secretary of the Army for Acquisition, Logistics, and Technology—Research and Technology, initiated this effort. Beginning in 1999, Dr. Andrews refocused, reshaped, and reinforced Army S&T efforts to speed the development of those critical technologies essential to transform the Army into the Objective Force. Continued revitalization of the Army laboratories is key to the success of this reshaping effort.

In-house laboratories provide the Army with a critical source of objective expertise, corporate memory, niche-area technologies of little interest outside the Army, an understanding of the user's problems, and innovative technology breakthroughs. The Army laboratory facilities are located throughout the world. Currently the Army has seven major laboratories located within the United States. This represents almost 8 million square feet of laboratory space. We also maintain facilities in other parts of the world, such as Africa, to study disease where it occurs. These facilities represent our ability to develop technologies for tomorrow's weapons and our ability to develop defensive technologies for the future.

The Army laboratories provide Subject Matter Experts in support of the Army acquisition community throughout the entire system lifecycle from concept exploration to disposal. Army laboratories provide engineering support to the Program Executive Officers/Program Managers, materiel managers, and other customers. Army laboratories played a vital role in the development of the FCS requirement documents and request for proposal to industry, and are active participants in the source selection process.

Our Army laboratories have developed an in depth capability to conduct research in a variety of specialized areas. Many are world class. Most Army laboratories have a very strong modeling and simulation capability within their facilities for virtual design, development, and testing as part of our efforts to decrease the time between laboratory research and fielding. For example, the Tank-Automotive Research Development and Engineering Center (RDEC) operates a 360-degree immersive collaborative virtual environment (CAVE) for design, development, and testing of automotive systems. In conjunction with the CAVE, the RDEC developed the Power Wall, a single screen 3-D, one to one scale analysis tool. Both tools can be linked across multiple sites and have generated interest from major contractors associated with FCS. The Army Research Laboratory has the Zahl Physical Sciences Laboratory. This laboratory contains a 6,400 square foot clean room used for chip development and small-scale manufacturing as well as facilities for nanotechnology, Infrared, and Wide Bandgap Technology research. At the Engineering Research and Development Center (ERDC) in Vicksburg, MS, the Army Corps of Engineers operates the Survey and Global Positioning System Laboratory. This facility is used to develop and test survey techniques and equipment for use in positioning and navigation, and, in conjunction with other systems, for obtaining high-accuracy terrain and navigation channel elevation data. The Army also maintains one of its two DOD High Performance Computing Major Shared Resource Centers at ERDC. This

55,000 square foot facility includes multiple, state-of-the-art High Performance Computing Systems, which provide some of the most powerful scientific and engineering computing capability in DOD. The U.S. Army Medical Research Institute for Chemical Defense is the DOD lead laboratory for development of medical countermeasures against chemical warfare agents and for training personnel in the medical management of chemical casualties. The institute's facilities support chemical casualty care training, physiology, drug assessment, pathophysiology, pharmacology, analytical chemistry, neurotoxicology, veterinary surgery, chemical safety/surety, medical maintenance, information and resource management, logistics support, and quality assurance. The Army Medical Research Institute of Infectious Diseases maintains containment laboratories that are a unique national and international resource for the safe study of high-hazard disease agents. This lab was instrumental in the recent anthrax investigation.

PEOPLE AND ORGANIZATIONS

Army laboratories are staffed with some of our country's most talented and dedicated civilian and military scientists and engineers. The Engineering and Scientist Career Program is extremely important for the Army because it establishes career development programs for its many scientists and engineers that maintain the highest levels of technical and managerial competency. The career development program reflects current and future needs for education, training and developmental assignments so that Army engineers and scientists bring state-of-the-art skills and knowledge to their jobs. In large part, because of the Army's focus on FCS and the Objective Force, and the enabling laboratory personnel demonstration authority championed by this subcommittee, we show an upward trend in the numbers of engineers and scientists. Between 1999 and 2002, AMC hired over 1,100 engineers and scientists. The technical expertise of the workforce at ARL has shown significant improvement with an increase in the number of engineers and scientists holding doctoral degrees increasing from 22 percent in 1992 to 32 percent in 2002 and individuals with master's degrees rising from 34 to 47 percent. However, recruiting top talent in specific emerging technology areas remains a challenge. One way we are addressing this challenge is by Army laboratories maintaining an active recruiting presence on major university campuses to attract the best and brightest talent. Another way we are responding is through the unique hiring, compensation, and performance management authorities Congress has provided the DOD laboratories over the last 8 years. The importance and excitement of the work within the Army labs is attractive to many college graduates. We are also aggressively pursuing opportunities to revitalize the S&T workforce through participation in the DOD Laboratory Quality Improvement Program which will shape the new National Security Personnel System development. We are working with the Office of the Secretary of Defense through the Director, Defense Research and Engineering (DDR&E) to include critical flexibilities.

The Army has a number of initiatives to reach outside our laboratories to leverage talent, ideas, and technologies. Typically our labs and RDECs attempt to achieve a ratio of 35 percent for in-house research to 65 for outsourcing research. These figures vary from lab to lab from a low of approximately 8 percent in-house to a maximum of approximately 72 percent in-house. The variance in these percentages results from specific missions of the organizations. The weapon system commodity based organizations typically have higher industry interest in solicitations due to quantity or profit potential. Some of our organizations deal with very specific low volume solutions that are service unique thereby necessitating an in-house capability to address Army or DOD unique problem.

The Army is committed to a significant outreach program toward institutions of higher learning and, in particular, to an outreach program towards Historically Black Colleges and Universities/Minority Institutions (HBCU/MI). These institutions of higher learning form the nucleus of the next generation of scientists and engineers for our country and for the Army. In fiscal year 2002, the Army sent over \$296 million in funding to colleges and universities. Of the \$296 million, the Army awarded over \$35 million to HBCU/MI in fiscal year 2002.

The Army is taking extensive advantage of the research capabilities associated with our universities. One of the ways we do this is through University Affiliated Research Centers (UARC). UARCs provide or maintain essential engineering, research, and/or development capabilities through DOD contracts awarded under the authority of 10 U.S.C. 2304(c)(3)(B). Currently, the Army maintains three UARCs. They are: the Institute for Advanced Technology at the University of Texas at Austin, the Institute for Creative Technology at the University of Southern California, and the Institute for Soldier Nanotechnology at the Massachusetts Institute of Tech-

nology. We are currently in the process of soliciting for a fourth UARC to be known as the Institute for Collaborative Biotechnology.

There are several notable examples of partnerships that the Army has with both institutions of higher education and HBCU/MIs, one of which is the Army High Performance Computing Research Center (AHPCRC) located at the University of Minnesota. University researchers use state-of-the-art computers to solve real world problems for the Army. Specific examples include work in computational solid mechanics to model ballistic armor perforation of a layered ceramic target and computational aerodynamics dealing with the airflow past advanced parachute designs. As part of its contract, the University of Minnesota partners with six HBCU/MIs to investigate phenomena of interest to the Army. Recently the AHPCRC concluded a computational fluid dynamics model of aerosol dispersion in downtown Atlanta. This model demonstrated the effective radius of a chemical or biological attack based on specific weather conditions and is relevant to Homeland Defense planning.

eCYBERMISSION is a national science competition for seventh and eighth grade students initiated by the Army. It is a web-based science, math, and technology competition for teams at U.S. based public or private schools, Department of Defense schools abroad or U.S. based home schools. Teams consist of three or four students in the same grade and region with a team advisor. Each team selects a challenge in any one of four areas: Sports and recreation, arts and entertainment, environment and health & safety. The Army hopes to stimulate interest in the sciences and technology through this program. This program represents one way in which the U.S. Army can demonstrate its gratitude to the citizens of this Nation for giving their sons and daughters to military service in defense of freedom.

Uniformed Army Scientists and Engineers provide a vital link between the work in the laboratories and the operating forces. The expertise derived from military training and experience is a key success factor contributing to the design, conduct, and interpretation of operationally relevant studies of technologies in actual deployment or under field conditions.

The need for uniformed Army scientists and engineers is particularly great in the medical area, as the medical R&D laboratories provide the personnel necessary to perform significant operational support roles, in addition to and separate from their research mission. These roles include management and oversight of the use of Investigative New Drug products in theaters of operation, operational laboratory support for contingencies (e.g., anthrax attack response), and performance of specialized in-theater assessments and consultations to operational commanders on matters affecting health and performance. Medical R&D personnel also augment deployable Combat Health Support by providing professional fillers (PROFIS) to Table of Organization and Equipment medical units and by serving as members of deployable Special Medical Augmentation Response Teams.

Today, our needs are changing as we face new threats. We must get technology out of the lab and into the field faster. It is vital that we optimize the benefits of technology by sharing across the old commodity oriented stovepipes. We must organize to do so.

In October 2002, AMC established the Research, Development, and Engineering Command (Provisional). It has three major objectives. The first is to integrate research, development, and engineering across all areas of the Army, the other services, universities and all other sources. The second is to get emerging technology to the soldier faster. The third is to demonstrate the agility to rapidly take advantage of opportunities no matter where they may arise. To achieve these objectives requires new and innovative approaches to all aspects of the development of technology for the soldier.

The first organizations assigned to the new command were the Army Research Laboratory, the Army Materiel Systems Analysis Activity, the International Cooperative Programs Activity, the International Research and Development Standardization Groups, and the Field Assistance in Science and Technology Activity, the S&T portion of HQ AMC and the S&T portion of the former Simulation Training and Instrumentation Command. We intend to formally stand up the full organization, including the RDECs, October 2003.

The Command is establishing a formal relationship with the Army Training and Doctrine Command (TRADOC) and the Army Test and Evaluation Command (ATEC). The relationship with TRADOC will include the full integration of Doctrine, Training, Leadership, Organization, and Soldier considerations into the technology development and transition process. Similarly, with ATEC the relationship will include the comprehensive testing considerations into the integration of technology and technology programs to facilitate the rapid and effective development and transition of technology to the soldier and maximum verification with modeling and sim-

ulation. No longer will technology be developed or acquired without a very close link to these two Commands.

The RDE Command will look at the capabilities the Army needs from a systems of systems perspective. For example we will focus on supportability and lethality capabilities instead of commodities such as helicopters or missiles, which will enable the scientists and engineers to integrate those technologies across multiple disciplines. We will use modeling and simulation (M&S) to reach across all the labs so that they can operate in a virtual environment from any location.

The M&S that the RDE Command is developing and integrating will feed into the Advanced Collaborative Environment. This virtual, distributed environment will tie together M&S, life cycle cost, requirements, testing, and training. We are using it now in the Future Combat System acquisition process. It will continue to grow and become the means by which all of the Army shares concepts and breaks down organizational walls. The days of single, independent platforms are coming to a close. The future will require each platform to be linked to all the others. The only way we can learn to operate that way is to first build the modeling and simulation capabilities. We will start at the beginning with the simulation and carry that all the way through in a way that ensures the training devices and the systems are fielded together.

I see the RDE Command as a key part of the process the Army is using to transform itself. We are breaking down our old barriers. Transforming the way we acquire and develop technology for our soldiers is a step further down that road.

CONCLUSION

We have only touched the surface of some of the facets of Army Transformation, but it is apparent that the S&T facets are essential to success. The Army has embarked on an ambitious transformation journey. We must provide technology solutions essential to current and future warfighter needs across the full spectrum of Army operations. A diverse S&T portfolio will enable the Army to support evolving and emerging capabilities. Innovative initiatives will revitalize our workforce and laboratories and ensure our world-class labs continue to be equipped with modernized equipment and staffed with a dedicated and highly skilled workforce. Effective partnerships and collaborations will speed the transition of technology solutions to the soldier. The Army S&T community remains committed and focused to support Army Transformation and provide the warfighter with "Technology to Win". Our Army and a team of people from industry, academia, and other nations are committed and focused on enabling a faster transformation. At the end of the day, our soldiers, our civilians, our contractors, and our allies—our world benefits from the power of S&T applied across a remarkable spectrum.

Senator ROBERTS. Thank you, General Kern.
General Lyles.

STATEMENT OF GEN. LESTER L. LYLES, USAF, COMMANDER, AIR FORCE MATERIEL COMMAND

General LYLES. Thank you, Mr. Chairman. Senator Roberts, Senator Reed, Senator Kennedy, Senator Dole, Senator Cornyn, I appreciate the opportunity to provide testimony on the fiscal year 2004 Air Force Science and Technology Programs. As noted, I have submitted my prepared testimony for the record, and I would like to summarize just a few key points here, then I look forward to responding to your questions.

First, let me say that the United States Air Force is fully dedicated to a robust S&T program that enables us to maintain our vision of being an integrated Air and Space Force capable of rapid and decisive global engagement. By continuing our investment in transformational technologies and our commitment to reduce cycle time in our acquisition process, the Air Force will retain the dominance of air and space in future conflicts against both traditional and asymmetrical threats.

Mr. Chairman, we have all been faced with the reality of fiscally constrained budgets and an operationally demanding environment,

but in spite of this, we have increased our S&T funding while maintaining a balanced S&T portfolio.

The Air Force fiscal year 2004 President's budget request for S&T is \$2.2 billion, an increase of more than \$535 million from the fiscal year 2003 President's budget. The most significant change in that S&T request is the devolvement of \$350 million from several OSD-sponsored programs to the United States Air Force. This includes high-performance computer modernization, the University Research Initiative Program, and high-energy laser programs.

Mr. Chairman, I would like to summarize quickly our three strategies and principles for S&T in the United States Air Force. First, to pursue integrated technology solutions that support our warfighters' highest needs. Second, to pursue fundamental enabling technologies that will improve both today's Air Force and the Air Force of tomorrow. Last, and certainly not least, to attract and nurture our most valuable S&T asset, the outstanding scientists and engineers whose intellectual capital provide us with the cutting-edge capabilities we enjoy today and we will certainly need for tomorrow.

Let me briefly make a comment about each one of them, then I will close and look forward to your questions.

In the era of integrated technology solutions, we are focusing our S&T talents to support our warfighters' need. That is an imperative for our United States Air Force. One relevant example of today, in today's environment, concern about terrorist threat, is something called exterior explosive blast-coating polymer.

This was developed by the United States Air Force to protect buildings and installations from close-proximity explosions or from air-dropped weapons or truck bombs. This easy-to-apply spray coating provides greater structural integrity of exterior walls and prevents dispersion of debris, as well as separation of wall elements. This coating is currently being used in many different applications, and is actually being applied to the outer walls of the Pentagon.

Also, Mr. Chairman, as you are aware, both in Operation Enduring Freedom in Afghanistan, during our war on terrorism, and today in our war in Iraq, Air Force Special Tactics Combat Controllers have literally changed the very nature of warfare. By performing operations deep in enemy territory, they helped determine who the adversaries are, where their weapons are located, and who the innocent civilians might be so that we can precisely direct air power to confront and to kill a threat if one warrants it. These Special Tactics Combat Controllers are also there to provide instant battle damage assessment.

We call these deep engagements battlefield air operations (BAO), and as a result of integrated efforts between our S&T laboratories, our developers, and these special tactics warriors, we will soon have, literally within the next few days, a new capability we are providing to them to help provide integrated solutions to solving their needs on the battlefield.

This includes digital machine-to-machine capability that helps quickly connect the right aircraft with the right weapons, the right munitions, precisely to the right target, on time, at the right time, and they do this very decisively. This automated process was started literally about 2 months ago, led by one of our Special Tactics

Controllers, working with our laboratories, and working with our scientists to give this kind of rapid capability and to field it very quickly.

In the second strategy, enabling technologies to improve tomorrow's Air Force, our S&T strategy is to pursue enabling technologies that will continuously provide improvements to our capabilities. Amongst the many transformational technologies that we are rapidly developing is directed energy in various forms, including laser and high-powered microwave technology. One such transformational directed energy effort is the vehicular-mounted active denial system (VMADS). VMADS is being developed by Air Force laboratories primarily today for use by the United States Marine Corps, but as you will soon see, it will have applications in a wide variety of different ways.

This defensive millimeter wave system is used for perimeter defense applications today. It is a directed energy weapon that emits a nonlethal, nondamaging beam which heats up the skin of a potential enemy when in close proximity to the system. The resulting temporary pain causes the person to flee or disperse. The pain stops when the person is no longer in the path of that particular energy, and Mr. Chairman, I think you, Senator Reed, and Senator Cornyn saw a demonstration of that with the little finger test device at the demos a couple of weeks ago.

We are looking to expanding this program very quickly, again both for the Marine Corps and for many applications, including commercial applications for crime-fighting.

One other new technology area that I think is really on the cutting edge and will actually dramatically change lots of things that we do in the future is one mentioned by General Kern. It is the future application of nanotechnology. It will provide the greatest change in how man operates, since we will be operating at the atomic and molecular level to create structures, materials, and devices never thought of before. We are looking at putting monies into nanotechnology and technology programs working closely with the other services and other agencies because of the tremendous benefits we will get from nanotechnology.

As an example, an order of magnitude increase in the strength of materials, a twofold improvement in material thermal properties, a threefold reduction in power consumption, and an order of magnitude increase in the energy in munitions and propellants. Nanotechnology is going to revolutionize the way we do everything in our activities in S&T.

The last strategy of our three-prong strategy is the one I consider to be the most important and the most severe, and that is to attract and nurture a world-class S&T workforce. We are working diligently in many ways to ensure that we have the scientists and engineering workforce to meet our needs for the Air Force today and for the future.

Both Secretary Roche and General Jumper are deeply involved with me, with Major General Paul Nielson, sitting behind me, the Director of our laboratories, to ensure that we shape the workforce, our future sciences and engineering workforce. Air Force civilians and military scientists and engineers are highly motivated and productive today. We cannot lose that.

The Air Force is unique in that 20 percent of our laboratory scientists and engineers are actually Government personnel, active duty military. This gives us, we think, a better direct link to the warfighter. We are committed to making sure we maintain that excellence and relevance in our S&T programs.

There are a wide variety of initiatives that we have undertaken to make sure that stays the case, the Airman Education Commissioning Program, the Technical Degree Sponsorship Program, our own current Air Force Laboratory Demo Project, which has been ongoing since 1997 to today, the future National Security Personnel System, and budgets that we are applying to ensure we can recruit and retain the scientists and engineers we need for the United States Air Force.

In conclusion, Mr. Chairman, the Air Force is fully committed to providing this Nation with the advanced air and space technologies required to meet America's national security interests. We are an integral part of the DOD S&T team, and we look forward to working with Congress to ensure a strong Air Force S&T program tailored to achieve our visions and the visions needed for the future.

Mr. Chairman, I will close right there, and I will look forward to questions from you or the subcommittee.

[The prepared statement of General Lyles follows:]

PREPARED STATEMENT BY GEN. LESTER L. LYLES, USAF

INTRODUCTION

Mr. Chairman, members of the subcommittee, and staff, I very much appreciate the opportunity to provide written testimony on the Fiscal Year 2004 Air Force S&T program. The United States Air Force is transforming to a capabilities-focused Expeditionary Air and Space Force. We are doing this through the development of the Concept of Operations for each of the seven major tasks the Air Force must be capable of accomplishing. Our goal is to make the warfighting effects and the capabilities we need to achieve them the drivers for everything we do. This is especially true in our S&T program. We have taken the effects and capabilities required by the seven Concepts of Operations and mapped them to the Long-Term Challenges and Short-Term Objectives identified in the congressionally-directed S&T Planning Review completed in February 2002. Not surprisingly, we have a high correlation between our S&T programs and the capabilities required by these Concepts of Operations. This is because the Air Force Research Laboratory (AFRL) closely links the technologies reflected in its S&T plan to warfighter capability needs.

The United States Air Force is committed to a robust S&T program that enables us to achieve our vision of becoming an integrated air and space force capable of rapid and decisive global engagement. By continuing our investment in transformational technologies that support a reduced cycle-time, spiral development acquisition process, the Air Force will retain its dominance of air and space in future conflicts, against both traditional and asymmetrical threats.

Innovation is a vital part of our heritage and is key to ensuring the Air Force will meet the challenges of tomorrow. Transforming our warfighting capabilities towards this end will involve continued innovations in how we think about employing our forces to defend our Nation, as well as quantum leaps in our technology. We must be prepared to counter regional instabilities, the worldwide availability of advanced weapons, and other emerging and less predictable asymmetrical threats. We are developing transformational technologies that permit flexible forces to operate far from home, on short notice, and for extended time periods. However, we must also be able to afford these innovations once we develop them in order to re-capitalize the Air Force to fulfill our vision. To meet these objectives, we search out the most promising and affordable technologies in order to win decisively, protect our forces, and minimize collateral damage.

S&T BUDGET/SENIOR LEADERSHIP INVOLVEMENT

We have been faced with the reality of a fiscally-constrained, but operationally-demanding environment. The high operations tempo the Air Force has sustained in support of peacekeeping operations and conflicts, such as Afghanistan, has placed a great burden on our people and system.

In spite of these requirements, the Air Force is working to increase S&T funding, while maintaining a balanced S&T portfolio. The Air Force fiscal year 2004 President's budget (PB) request for S&T is \$2.2 billion, an increase of more than \$535 million from the fiscal year 2003 PB. The most significant change in the S&T PB request results from the devolvement of \$350 million for several Office of the Secretary of Defense efforts to the Air Force S&T program. This includes the High Performance Computing Modernization program, the University Research Initiative program, and the High Energy Laser program. Another significant addition to S&T in fiscal year 2004 is over \$150 million for the National Aerospace Initiative.

The Air Force understands the concerns of Congress regarding the level of support for these devolved programs and is working hard to ensure execution of the programs transferred to the Air Force continues to support the diverse multiple military objectives inherent in each of these programs. Further, the Office of the Secretary of Defense will continue to provide policy guidance and oversight for these efforts.

In a separate action, the Seismic Research Program for detection of nuclear explosions has been transferred back to the Air Force from the Defense Threat Reduction Agency (DTRA). The Air Force is working to reclaim the knowledge and experience it possessed before transfer of the program to DTRA in 1997.

One area in which the Air Force has increased its investment is in space communications technology with initiation of the transformational communications technology development program. This program will identify, develop, and demonstrate the wideband technologies needed to build a space-based laser communications network that could provide higher data throughput and higher frequencies, thus transforming our military satellite communications infrastructure.

In conjunction with the increase in S&T funding, there has also been a significant increase in the involvement of the warfighting commands and senior Air Force leadership in the planning, programming, and prioritizing of Air Force S&T. For example, we have conducted S&T summits where the Secretary of the Air Force, the Air Force Chief of Staff, and the Air Force four-stars and other senior leaders review the S&T portfolio. The latest S&T summit focused on transformational technologies that can be developed to assist in combating terrorism and other asymmetrical threats.

WORKFORCE

The Air Force scientist and engineer (S&E) workforce is another area where senior Air Force leadership involvement plays a pivotal role. Both Secretary Roche and General Jumper are deeply involved in shaping our future S&E workforce. Air Force civilian and military S&Es are highly motivated and productive. The Air Force is unique in that 20 percent of its laboratory S&E government workforce is active duty military. This gives us a direct link to the warfighter. Some of these military S&Es come directly from operational commands, while others will serve in operational commands later in their careers.

The Air Force is committed to shaping its S&E workforce with the vision to enhance excellence and relevance of S&T into the 21st century and appreciates the support Congress has already provided. This challenge requires the Air Force to maintain a dominant edge in technology and also requires us to provide clear direction and growth for our S&E workforce. However, we, as do others, find it is difficult to recruit and retain S&Es. The Air Force has several initiatives, both civilian and military, that address recruitment and retention issues.

AFRL was the first laboratory in the DOD to take advantage of legislation allowing us to experiment with alternative personnel management systems for our civilian S&Es. The simplified classification system, broadband pay levels, and contribution-based compensation that form the cornerstone of the Air Force Laboratory Demonstration Project have provided AFRL with some key flexibilities needed to compete with private industry for critical S&E talent and properly compensate our high contributors. We will need to consider these flexibilities as we develop the National Security Personnel System (NSPS).

We have found that our centers have the greatest difficulty in recruiting high quality minority member scientific and engineering candidates. We have implemented a command-wide recruitment program targeting this group of highly sought after candidates. The following is a list of national career fairs that we have at-

tended or plan to attend this year: Black Engineer of the Year Award Conference; Society of Hispanic Professional Engineers Conference; National Society of Black Engineers Conference; and Hispanic Engineering National Achievement Awards Conference. We provide the resumes that we obtain from these conferences to our center civilian personnel offices as a ready source of high quality applicants. This targeted recruitment, in conjunction with the hiring flexibilities of the Federal Career Intern Program, is enabling us to make more timely offers to highly sought after S&E graduates. To ease the confusion that applicants for the Air Force Material Command (AFMC) positions can experience, we developed a public web page, which explains what we have to offer and how to apply for specific vacancies. The page links to each center's public web page for more detailed center explanations.

Other civilian initiatives include the recruitment of college students with critical S&E skills via recruiting incentives, a robust marketing effort, and a co-op central funding program that hires college students while still in school. Central funding for recruiting bonus and retention allowances for journeyman level S&Es also promises to provide much needed assistance with civilian recruitment and retention.

On the military side, we're employing the Airman Education and Commissioning Program and the Technical Degree Sponsorship Program to recruit additional S&Es into the military workforce. Bonus programs such as the Critical Skills Retention Bonus are essential to shrinking the current shortfall of military S&Es within the Air Force and the Air Force is currently exploring additional bonus programs.

The Air Force is committed to its S&Es and recently published a "Concept of Operations for Scientists and Engineers in the United States Air Force." We also baselined the requirement for the Air Force S&E workforce and, upon analyzing this baseline requirement, found that while our military and civilian authorizations were about right, our actual demographics were seriously short in some key areas. As such, we are shifting our focus to retaining the workforce we have and infusing it with the vitality of new S&Es to meet tomorrow's need. During the next 7 years, we are investing nearly a third of a billion dollars to support the retention and reshaping of our technological workforce. As we replenish our S&E workforce, we are providing career guidance and mentoring that will enable us to meet our 21st century challenge. Initiatives, such as the special hiring legislation authorized by Congress in PL 106-398, which provides "DARPA-like" hiring authority to the military departments, should also produce positive results in shaping our S&E workforce. This authority has only recently been delegated to the Air Force, but we are optimistic about its potential. Again, we express our thanks to Congress for your continued support.

MAXIMIZING OUR S&T DOLLARS

We will continue to leverage technology to achieve new levels of combat effectiveness. Our strategy is to pursue integrated technology capabilities that support our warfighter's highest priority needs. We must also pursue the fundamental enabling technologies that will improve tomorrow's Air Force. As technological superiority is increasingly a perishable commodity, we work hard to optimize our S&T funding, by not only "inventing the future" ourselves, but also by speeding the introduction of new technologies to our warfighters.

One way we are doing this is through our Applied Technology Councils and the Advanced Technology Demonstrations (ATDs). The councils are composed of two- and three-star representatives from AFRL, our acquisition product centers, and our major user commands who formally prioritize ATD programs. We hold an Applied Technology Council meeting with each Major Command twice every year and have commissioned 34 ATDs that have transition funding in the fiscal year 2003 budget. The Applied Technology Council process is extremely important in linking the S&T program to both the system developers and the operational user. This process facilitates technology transition to operational use and secures user commitment for resources to do systems design and development and fielding of the technology. Currently about 50 percent of our Advanced Technology Development (6.3) budget is committed to these programs.

Since deployed technology may remain in use for decades, the Air Force S&T program not only focuses on enhancing performance, but also on sustaining our fielded warfighter capabilities. Emphasizing affordability from the very beginning through training of our management, and science and engineering staff, as well as through an in-depth review of technology development efforts, increases our potential to reduce the costs of technology early in the system development process and throughout a product's life cycle.

We maintain an excellent balance of military, civilian, and contractor expertise, which allows us to be very selective about investing in high payoff technological op-

portunities. We constantly seek opportunities to integrate Air Force planning and leverage our S&T funds by cooperating with other Services, Agencies, the private sector, and international partners. For example, we rely on the Army as the lead Service for defensive chemical-biological technology development. The Air Force also has strong inter-Agency efforts, such as our program in aging aircraft, which is focused on detection and management of corrosion and fatigue in aging structures. It is closely coordinated with the civilian aging aircraft research programs at the National Aeronautics and Space Administration (NASA) and the Federal Aviation Administration (FAA). Our partnership with the industrial and university research base is very strong. In fact, we outsource over 70 percent of our S&T funding. Finally, the Air Force is involved in international cooperative technology development efforts for S&T, such as the software defined radio development, insensitive high explosives, and aircraft battle damage repair efforts conducted with France, Germany, and the United Kingdom. Another example of international cooperation is the multi-domain network management program with Australia and Canada. This program is developing the concepts and tools for creating and managing secure computer networks with our coalition partners.

WORLD CLASS RESEARCH

The quality of our program is assessed by the Air Force Scientific Advisory Board (SAB) through yearly reviews. The SAB conducts an in-depth review of half of the S&T program each year, covering the entire program over a 2-year period. Twelve technical areas have been identified as world class research during the last cycle of reviews—let me highlight a few of these areas that were identified as world class.

The Directed Energy Directorate's Starfire Optical Range at Kirtland Air Force Base, New Mexico, is leading the adaptive optics research for use in large ground-based telescopes to image satellites and propagate laser beams through the atmosphere. This will enable high-quality, ground-based observations of space objects and propagation of laser beams through a turbulent atmosphere. Astronomical images using this technology can rival those obtained with the Hubble Space Telescope.

Our Propulsion Directorate's Hypersonics Technology (HyTech) work at Wright-Patterson Air Force Base, Ohio, is acknowledged by the SAB as world class and a cornerstone of the Office of the Secretary of Defense's Director of Defense Research and Engineering's (DDR&Es) National Aerospace Initiative. Our HyTech program has continued to advance the state of the art in scramjet engines and conducted the first ever ground test demonstration of a scramjet producing positive net thrust back in 2001. In February 2003, HyTech tested a flight weight scramjet Ground Demonstration Engine operating at Mach 4.5. While the 2001 Performance Test Engine used copper heat-sink hardware and weighed 1,500 pounds, the 2003 Ground Demonstration Engine used JP-7 fuel to cool the scramjet engine walls and weighed less than 150 pounds. This marked another first for the HyTech program—demonstrating the structural durability of a hydrocarbon fueled, actively cooled scramjet. Testing at Mach 6.5 will start in March 2003 and should be completed in April 2003. Pratt & Whitney developed this particular engine in collaboration with Air Force scientists and engineers.

Another SAB-rated world-class research program is the Warfighter Skill Development and Training efforts worked by our Human Effectiveness Directorate at Brooks City-Base, TX. Specific research areas include Integrated Panoramic Night Vision Goggle (PNVG) and Distributed Mission Training. The Integrated PNVG will improve situational awareness and terrain avoidance at night through its wider field of vision and improved resolution. It will also provide protection from laser target designators, laser rangefinders, and laser threats through compatibility with existing laser eye protection technologies. Distributed mission training will provide an integrated set of training, simulation, and mission rehearsal technologies that will improve warfighter capabilities and mission readiness by enhancing operator and team performance skills. Technologies will increase operational readiness by providing more effective methods and approaches to train and assess personnel. These technologies will contribute to a more highly trained and flexible cadre of personnel at a reduced cost.

Working closely with operational users, AFRL researchers in the Materials Directorate at Wright-Patterson Air Force Base, Ohio, continue to develop and transition new filter technologies that provide improved eye protection for aircrews from varied levels of laser threats. The Laser Eye Protection program is enabling aircrews to conduct day and night air operations without visual jamming or personal injury.

Our research in Electro-Optic Warfare at Wright-Patterson Air Force Base, Ohio, will allow future laser-based sensor systems to penetrate moderate cloud cover, obscurants, and camouflage. This will provide improved target detection and identi-

fication for our weapons systems. "See and Avoid" sensors will ease restrictions on unmanned air vehicle operations in civilian airspace and allow autonomous operation in conjunction with manned aircraft. These technologies may also be applied as low-cost missile warning sensors to affordably protect military and commercial aircraft from surface-to-air missiles. Also, experimental research in infrared countermeasures is developing threat adaptive techniques for robust defeat of current and future infrared weapons and sensors.

Space weather research at Hanscom Air Force Base, Massachusetts, is another SAB-rated world class operation. We have a strong modeling capability that specifies and forecasts space weather from the sun to the ionosphere. Assessment capability of space environment and its effects using compact sensors will be incorporated into a high energy particles sensor that is under development.

At Edwards Air Force Base, California, the Propulsion Directorate is working on world class research in polynitrogen propellants. The goal is to enable high performance monopropellant rocket propulsion systems with revolutionary performance. By improving the specific impulse of the propellant, we will have environmentally benign exhaust and reduced signatures. This could potentially improve storage, manufacturing, and rocket engine size.

COMBATING TERRORISM

While the traditional focus of S&T has been on developing long-term capabilities, the Air Force S&T program also contributes to the current needs of the Nation and our troops deployed in hostile areas. One example of an Air Force project receiving a great deal of attention since September 11 is the Exterior Explosive Blast Coating polymer, which was developed by the Air Force to protect key buildings and installations from close proximity explosions, such as air dropped weapons or truck bombs. This easy-to-apply spray coating provides greater structural integrity of exterior walls and prevents dispersion of debris as well as separation of wall elements. This coating is currently being applied to the interior of the outer walls of the Pentagon.

Another transformational effort is the Vehicular Mounted Active Denial System (VMADS). The VMADS is being jointly developed with the U.S. Marine Corps and is a defensive millimeter wave system used for perimeter defense applications. It is a directed energy weapon that emits a non-lethal, non-damaging beam, which heats up the skin of a potential enemy when in close proximity to the system. The resulting temporary pain causes the person to flee.

In the war on terror, Air Force Special Tactics Combat Controllers are changing the very nature of warfare. By performing operations deep in enemy territory, they help determine who the terrorists are, where their weapons are located, and who the innocent civilians are. Then, they precisely control the elements of airpower to defeat the terrorist threat, while taking care to spare innocent civilian casualties and minimize collateral damage. Then, these same Special Tactics Combat Controllers are there to provide instant battle damage assessment. We call these deep engagements, "Battlefield Air Operations (BAO)."

AFMC is providing needed help for these brave Special Tactics Warriors. The Air Force Research Laboratory is accelerating new technology to these Special Tactics Warriors in the form of significant improvements to their BAO kit of equipment. The Aeronautical Systems Center is providing a Special Tactics System Program Office to assist in rapid procurement of these new BAO kit items. The Electronic Systems Center is helping to ensure these new digital machine-to-machine data communications are interoperable with the rest of our Global Grid of military command and control communications systems. As a result of this AFMC-wide enterprise, our Special Tactics Warriors will soon have a digital machine-to-machine capability that helps to quickly connect the right aircraft, with the right munitions, guided precisely to the right target, at just the right time, to achieve the desired effect. This new automated process helps to reduce the time it takes to target the terrorist threat, while at the same time reducing human error in the targeting process.

Working collaboratively with the Special Tactics Warriors, this AFMC "BAO Tiger Team" has also partnered with a national team of industry to field significant enhancements of increased capability, while reducing the weight and size of the individual BAO kit equipment. They are performing these improvements by developing, prototyping, testing, building, and fielding these BAO kit improvements in very rapid spirals. These new BAO capabilities will help to save American lives, and the lives of innocent civilians. BAO provides a revolutionary and highly effective way to combat the terrorist threat.

One of the premier munitions almost ready to transition from the munitions lab at Eglin Air Force Base into acquisition is Crash PAD (Prompt Agent Defeat). The objective of the Crash PAD program is to demonstrate a blast/frag multi-purpose

warhead that can be used to damage fixed biological and chemical targets while producing an environment that will mitigate bio agent collateral damage. The range of applicable targets includes soft to moderately hardened. Sled track testing occurred in late January and flight test occurred in late February. This program has the potential to be a significant resource for the warfighter in destroying chemical and biological weapons with minimal effects to civilians.

TRANSFORMATIONAL TECHNOLOGIES

There are many other Air Force technology areas that deserve special mention. Let me highlight just a few examples. As mentioned earlier, there's our transformational communications technology development program, whose laser communications technology efforts promise to increase data transfer rates at least ten-fold compared to current radio frequency communications systems. Additionally, laser communications uses a narrow beam, which decreases the likelihood of intercept and increases resistance to jamming. While laser communications have a high potential to revolutionize satellite communications, there are technical challenges to overcome such as precision pointing and tracking, weather constraints, and adapting the equipment for use in space. We continue to work on the technology challenges and are also conducting a study to determine the best architecture for implementing laser communications technologies to complement and integrate with radio frequency-based systems.

To increase aircraft survivability and operational efficiencies, the Air Force is developing both manned (F/A-22 and Joint Strike Fighter) and unmanned flight vehicles that can carry and employ weapons from both external and internal weapons bays. To increase the number of weapons the flight vehicle can fit into their internal weapons bays, part of our investment strategy focuses S&T funding on developing and demonstrating smaller precision weapons.

One of the small munitions currently being flight demonstrated at Eglin Air Force Base is the Low Cost Autonomous Attack System (LOCAAS). The LOCAAS is a 100-pound class powered munition of which the primary target set is moving and relocatable targets. This Advanced Technology Demonstration (ATD) program will demonstrate the effectiveness and military utility of this type of munition for the Lethal Suppression of Enemy Air Defenses (SEAD), Theater Missile Defense (TMD) Attack Operations, and Armor/Interdiction mission areas. LOCAAS will integrate a laser radar precision terminal seeker with autonomous target recognition algorithms, a multi-modal warhead, Global Positioning System (GPS)/Inertial Navigation System (INS) mid-course guidance, and a miniature turbine engine with a fly-out range of 100 miles. This ATD program will complete five flight tests by the end of fiscal year 2003, culminating in a planned autonomous flight with active seeker and warhead against a real target. The first flight test was successfully completed on February 4, 2002, and demonstrated the powered flight envelope, GPS waypoint navigation, and simulated attack of a SEAD target. The second flight test, successfully completed on November 4, 2002, was a guided LOCAAS that demonstrated real-time autonomous search, and automatic target acquisition algorithms that could detect, identify, and simulate attack against a TMD target.

Plans are also being made in fiscal year 2004 to conduct a cooperative program with the Royal Australian Air Force (RAAF) using the LOCAAS vehicle. A test program on the RAAF F-111 aircraft in Australia is scheduled for the first quarter of the fiscal year. This will be an important test for both nations—the U.S. is able to test munitions release at supersonic speeds and Australia benefits from the test results. These results could enable maturation of the computational simulation codes for separation of symmetric and asymmetric miniature weapons, providing for a reduction in the risk and cost of weapons certification efforts for aircraft with internal weapons bays such as the F/A-22, Joint Strike Fighter, and UCAVs.

To continue the trend of miniaturization of space platforms, the Air Force and Defense Advanced Research Projects Agency (DARPA) have provided funding to 10 universities to explore the military utility of innovative, low-cost nanosatellites. These nanosatellites, weighing 2 to 10 kilograms, could demonstrate efforts such as differential Global Positioning System navigation, miniaturized sensors, and micro-propulsion technologies. In December 2002, two "pico satellites" weighing slightly more than two pounds each, were successfully released from a specialized spring-loaded launcher assembly mounted on the sidewall of the Space Shuttle Endeavor. This was the joint Air Force/DARPA-developed PICOSAT Inspector experiment to demonstrate a significant step forward in the development of an onboard autonomous inspection capability.

The Air Force is also conducting the Experimental Satellite System (XSS) series to demonstrate increasing levels of microsatellite technology maturity. The XSS-10,

the first microsatellite in the series launched on schedule during fiscal year 2003. It demonstrated semi-autonomous operations and visual inspection in close proximity of an object in space—in this case a Delta II upper stage. In fiscal year 2004, we plan to launch XSS-11, which will demonstrate autonomous operations and provide experience with command and control in proximity operations to another space object.

One of the most transformational and quickly deployable technologies available today is command, control, and communications technology, also known as information technology. This technology is at the heart of our Moving Target Indicator Exploitation program, which is developing web-enabled automated tools to exploit data from current and future sensor systems such as the Joint Surface Target Attack Radar System, better known as JSTARS. The effort is focused on four technology areas: ground moving target tracking; motion pattern analysis; behavioral pattern analysis; and sensor resource allocation and scheduling, which provide the capability to track moving targets and get the information to the operations center. This system is in southwest Asia today.

BREAKTHROUGH TECHNOLOGIES

In recent years, we have all come to appreciate the success of unmanned vehicles. We hear over and over again the tremendous operational advantages that systems such as Predator and Global Hawk are bringing to warfighters from all Services. Over the first two decades of the 21st century, advances in micro unmanned air vehicles will provide significant additional capabilities to our Armed Forces. Micro air vehicles utilize advances in microscale aerodynamics, electronic miniaturization, munitions, and propulsion to package sensory and weapons payloads into highly reliable, on-demand systems. These systems will provide unprecedented levels of situational awareness in the most severe threat environments. Whether we are operating in urban environments, sensing bio-chemical dispersion through the atmosphere, or looking over the next hill, our troops will have the awareness needed to fight and survive. These systems will provide the persistent intelligence, surveillance, and reconnaissance in high threat environments needed by our troops on the ground and our airmen in the air. When called for, swarms of these vehicles will cooperate together to generate both lethal and nonlethal effects.

In the next 50 years, advancements in nanotechnology will provide the greatest change in how man operates since the invention of powered flight itself. Nanotechnology is a science and a series of disciplines that works at the atomic and molecular level to create structures, materials, and devices through improved molecular organization. By working with elements at the level of nanometer scale, we have access to the building blocks of nature. This will fundamentally change the way materials and devices will be produced in the future. The ability to synthesize nanoscale building blocks with precisely controlled size and composition and to then assemble them into larger structures with unique properties and functions will revolutionize segments of the materials and device industry. The benefits that nanostructuring can bring include lighter, stronger, and programmable materials; reductions in life cycle costs through lower failure rates; innovative devices based on new principles and architectures; nanosensors and nanoprocessors; and use of molecular/cluster manufacturing, which takes advantage of assembly at the nanoscale level for a given purpose.

Another significant breakthrough technology that will change the way we develop systems is our work in biotechnology. Biology has developed unique materials and processes that may be exploited in non-biological systems. We are studying the fundamental science necessary to incorporate biological components and organisms into Air Force systems. For example, in biomimetics, we research the adaptation of natural biological sensor in reptiles. The natural infrared sensors in reptiles do not need to be cooled. We hope to adapt this biological process to Air Force sensor applications that normally require cryogenic cooling.

TECHNOLOGY TRANSITION

The majority of Air Force S&T is contracted with industry and universities. This promotes relationships between the scientists and engineers conducting the research and lays the foundation for technology transition. Strong connections between the technology supplier and the end user help speed transition of technology to the warfighter. In addition, the various transition programs in which the Air Force participates further cement this foundation. Air Force technology transition efforts include Advanced Technology Demonstration projects, Small Business Innovation Research (SBIR) contracts, and Cooperative Research and Development Agreements (CRADAs) among others.

The Applied Technology Councils discussed earlier were initiated in fiscal year 1999 to foster top-level user involvement in the transition of technology from the laboratory to the system developer to the operational user. As noted, these Councils review and approve Air Force Advanced Technology Demonstration projects and ensure that the Major Commands plan for the transition of successful technology by tying approved Advanced Technology Demonstration projects to planned Major Command Future Years Defense Program funding.

Another Air Force technology transition tool is the SBIR program, which funds early-stage efforts at small technology companies. These programs serve a defense need, but also have the potential for private sector and/or military market commercialization. A similar program, the Small Business Technology Transfer (STTR) program, funds cooperative efforts involving a small business and a research institution (i.e., a university), a Federally-funded research and development center, or a non-profit research institution. A CRADA is an agreement between a government laboratory and a non-Federal party under which the laboratory provides personnel, facilities, equipment, or other resources (but not funds) with or without reimbursement and the non-Federal party provides funds, people, services, facilities, equipment, or other resources to conduct specific research and development efforts that are consistent with the agency's mission.

These efforts along with many other programs, such as Dual-Use S&T, Independent Research and Development, Mentor-Protégé, Personnel Exchanges, etc., are mutually beneficial to the Air Force and the contractors and universities with whom we collaborate. Technology transition is a key component of the Air Force S&T program and is vital to our pursuit of national security requirements.

SECTION 253 STUDY

Section 253 of the National Defense Authorization Act for Fiscal Year 2002, Public Law 107-107, directed the Air Force, in cooperation with the National Research Council of the National Academy of Sciences, to carry out a study to determine the effect of S&T program changes of the past 2 years. The Air Force Science and Technology Board (AFSTB) of the National Research Council will prepare a written report for the Secretary of the Air Force to forward to Congress by the May 1, 2003, deadline. While we do not have any insight into the AFSTB study results, we expect this study will reflect the positive impact of changes instituted by the Air Force in its S&T planning process.

CONCLUSION

In conclusion, the Air Force is fully committed to providing this Nation with the advanced air and space technologies required to meet America's national security interests around the world and to ensure we remain on the cutting edge of system performance, flexibility, and affordability. The technological advantage we enjoy today is a legacy of decades of investment in S&T. Likewise, our future warfighting capabilities will be substantially determined by today's investment in S&T. As we face the new millennium, our challenge is to advance technologies for an Expeditionary Aerospace Force as we continue to move aggressively into the realm of space activities. The Air Force is confident that we can lead the discovery, development, and timely transition of affordable, transformational technologies that keep our Air Force the best in the world. As an integral part of the Department of Defense's S&T team, we look forward to working with Congress to ensure a strong Air Force S&T program tailored to achieve our vision of an integrated air and space force.

Mr. Chairman, thank you again for the opportunity to present written testimony, and thank you for your continuing support of the Air Force S&T program.

Senator ROBERTS. General, thank you very much, and thank you for your emphasis on stressing the importance of nanotechnology, particularly in regard to consequence management. I know there are several nanotechnology solutions around all of the services that they can utilize. We do just happen to have a very fine organization in Kansas called Nanoscale Materials, Inc. in Manhattan, Kansas.

Now, I want everybody to know that I did not write your speech, and you are not writing mine, but we may want to work on that. At any rate, the Marine Corps is working on specific reactive nanoparticles to neutralize any anthrax stimulants, and we look forward to that technology, and I could not pass that up. You gave me a softball so I decided to respond.

General LYLES. Thank you, Mr. Chairman.

Senator ROBERTS. Senator Reed. I am sorry, Admiral Dyer. We do not want to leave the Navy out.

**STATEMENT OF VICE ADM. JOSEPH W. DYER, USN,
COMMANDER, NAVAL AIR SYSTEMS COMMAND**

Admiral DYER. Sir, thank you very much.

Mr. Chairman, Senator Reed, distinguished members, it is a pleasure to be here with you today.

Moving technology quickly from the scientist's bench to the sailors and marines that fight our wars and support our country is a most important undertaking, and I would offer up the sensor resolution and the weapons delivery accuracy that you are seeing played out real time, right now and over this last year or so, as an example of our success.

I am the Commander of the Naval Air Systems Command, the senior flag officer in the Navy materiel community, and I represent today the Naval Sea Systems Command, the Navy Office of Research, and others. We recognize that a long-term stable and sustained investment is necessary to transition S&T to research and development (R&D). We are committed to accelerating and validating that investment via experimentation.

The thermobaric weapon much in the news over the last few years, and capable of taking out inhabitants deep within caves or bunkers, is an example of a technology that has been in development for over 30 years. Quickly displayed to the battlefield, it nevertheless represents work that started 30 years ago on synthetic organic chemistry, and reflects that many times when you step out in R&D you do not know what path it is going to lead, but contributing to the body of knowledge, and especially to defense knowledge, is important to us.

The Navy's S&T investment has increased via the fiscal year 2004 budget submission some \$1.45 billion over the Future Years Defense Program (FYDP), and includes such things as the Navy UCAV, our unmanned combat aerial vehicle, supersonic cruise missiles, down through things like the Coast Guard vessel tracking system, which helps to protect and monitor our harbors.

We are also gratified by the subcommittee's interest in test and evaluation, and the Navy is a strong supporter of the Defense Test Resource Management Center, and we are working with the Under Secretary Acquisition, Technology, and Logistics (AT&L) to establish that office.

I will shorten my remarks on transformation because you have heard a lot about medical, nanotechnology, materiel, and autonomous vehicles from my fellow briefers this morning, but these are exciting technologies, and it is an exciting time. We view S&T within two contexts. One is a time line, and the other is a philosophical organization piece.

Time lines, we look at today in quick technology to the work place and to the battlefield. We look at the next Navy, looking out 5 to 15 years, and then we look at the Navy after next, some 15 to 30 years in the future. Our Sea Power 21 construct, where we look at Sea Strike, our ability to deliver striking power to the enemy; Sea Shield, our ability to protect our fleet, our people, and

our friends; Sea Basing, faster logistics and a smaller footprint, both standing atop a foundation of improved efficiencies relating to Sea Enterprise; and to Sea Warrior, where we look to take better advantage of our human capital and our human assets.

Our S&T investment is guided by three pillars: rapid response, feedback from our operational forces via the experiment and now via actual combat; national naval responsibilities, where we have unique defense interests such as naval engineering and acoustics that are not necessarily shared by the other services; and what we call, Grand Challenge, those things that while 15 to 30 years out, questions that have answers, and solutions if found, represent breakthrough technology to serve our future needs.

The Navy's future Navy capabilities is an important program, and one that we believe is serving us very well, where we work in partnership among scientists, industry, requirements folks, acquisition, and warfighters. Two-thirds of the Navy's 6.3, or advanced technology funding, is in the FMCs and 40 percent of our 6.2, or applied research money, is reflected in the future Navy's capabilities as well.

I would share what you have heard I think from all three of the other folks this morning, sir, that it is the demographics and the shaping of the workforce that we believe is the must-solve challenge for going into the future. We are able to recruit young folks with great talents. We use the excitement of our business and a re-emerging sense of service. It is the necessity to keep those folks as they become journeymen scientists and engineers and reach the peak contribution years of their careers that is of most concern to us.

We look forward to taking your questions.

[The prepared statement of Admiral Dyer follows:]

PREPARED STATEMENT BY VICE ADM. JOSEPH W. DYER, USN

Mr. Chairman, distinguished members of the subcommittee, thank you for this opportunity to discuss Naval Science and Technology. You and the other members of the Senate Armed Services Subcommittee on Emerging Threats and Capabilities have been leaders in calling attention, both nationally and in the Department of Defense, to the importance of moving new technology quickly from the scientist's bench to our sailors and marines.

As Commander, Naval Air Systems Command (NAVAIR), I oversee the operation of two Naval Air Warfare Centers. My counterparts at Naval Sea Systems Command (NAVSEA), Space & Naval Warfare Systems Command (SPAWAR), and the Office of Naval Research (ONR), operate an additional six Naval Surface Warfare Centers, three Naval Undersea Warfare Centers, three Space and Naval Warfare Systems Centers, one Naval Research Laboratory and numerous other field activities. Among us we cover the wide range of technologies the Navy and Marine Corps use. We report to the Assistant Secretary of the Navy for Research, Development, and Acquisition. I think this division of labor has proven valuable in allowing the separate Systems Commands to better focus their resources on their applicable technologies.

As the senior Naval officer directly responsible for many of the issues being covered today, I have been asked to represent all of the Navy Systems Commands and the Office of Naval Research. We collaborate closely, and we face similar challenges, particularly with respect to attracting and retaining technical talent. I will address some of those challenges later in my statement.

Let me begin with an overview of our scientific and technological portfolio. The return on the Nation's investment in naval S&T is measured in capabilities. This is particularly important in a time when we must not only fight and win a global war, but also transform the Navy and Marine Corps. We hear a great deal about al Qaeda and others posing an "asymmetric threat" to us. But our scientific and technological edge gives us a tremendous asymmetric advantage over our enemies.

We've already seen some of that advantage at work in Operation Enduring Freedom, and naval transformation will depend on our ability to sustain and exploit our lead in S&T. To do that you need a long-term, stable, and sustained investment in S&T transitioning to research and development, validated through ongoing experimentation, with transition to the fleet and force in a continuous cycle of progress.

It is difficult to exaggerate the importance of sustained scientific effort: investment in research is always a long proposition. We have seen some very quick delivery of new, advanced capabilities already in this war. These can seem like overnight successes. Take the thermobaric bombs our forces dropped on al Qaeda and Taliban positions last year in Gardez, Afghanistan. That thermobaric fill—developed at Naval Surface Warfare Center, Indian Head, and weaponized by the Navy in collaboration with the Defense Threat Reduction Agency and the Air Force—was more than 30 years in preparation. This particular Naval investment in basic, synthetic organic chemistry (for that's what produced thermobarics) began in the late 1960s after the disastrous accident and fire aboard U.S.S. *Forrestal*. So basic science answered a Naval need, and the necessary work had been done to produce an effective, new class of weapons. You might consider it an overnight success that depended on 30 years of work.

With this in mind, I am pleased to report that the Department of the Navy's S&T funding has shown real growth from fiscal year 2003 to fiscal year 2004 (based on comparison of the President's budget requests for those years). This is our positive response to the Defense guidance and congressional mandates that have called for more Defense S&T funding. During fiscal year 2004 budget development, the Department of the Navy's S&T Future Years Defense Plan (Fiscal Year 2004–2009) was increased by a net \$1.45 billion.

The significant increases in fiscal year 2004 include programs that are both transformational and bear directly on the current war:

- Naval Unmanned Combat Air Vehicle +\$98 million
- National Aerospace Initiative—Supersonic Cruise Missile +\$22 million
- Strategic Systems Infrastructure +\$20 million
- Joint Project Office—Special Technology Countermeasures +\$14 million
- U.S. Coast Guard Vessel Tracking +\$10 million

The Department of the Navy is gratified by consistent congressional support of our S&T program. We trust that we are managing that support effectively to achieve the objectives of our program.

We are particularly gratified by congressional interest in testing and evaluation—we owe sailors and marines the assurance that the systems we put in their hands work as advertised, especially when they're delivered under wartime exigencies. Regarding, for example, the Defense Test Resource Management Center Congress has recently mandated, the Department of the Navy certainly supports the concept. We are working with the Under Secretary of Defense for Acquisition, Technology, and Logistics to support the establishment of this new field activity, and we look forward to supporting its mission.

Let me return to my earlier theme of transformation in a time of war. To keep perspective, recall that transformation occurs over the near-term, mid-term, and long-term. Naval S&T is a sustained journey from discovery to deployment in which innovation (invention) and experimentation (validation) transform the operating forces. Because this is a continuous cycle, we find technological advance in "Today's Navy and Marine Corps," the "Next Navy and Marine Corps" (roughly the forces that will emerge over the next 5 to 15 years), and the "Navy and Marine Corps After Next"—which we will see in 15 to 30 years.

How do we choose where we invest? We are guided by:

- *Programs for Rapid Response*—immediate feedback from the operating forces. We get this through participation in experimentation with those forces, in exercises like Millennium Challenge, through the Naval Research Science Advisors posted to the staffs of each major Navy and Marine Corps Command, and through our Tech Solutions initiative. When an immediate challenge, problem, or opportunity lends itself to scientific resolution, we are able to shift a relatively small but nonetheless crucial investment to a decisive area.
- *National Naval Responsibilities*—fields in which the Department of the Navy is the only significant U.S. sponsor. These include fields like Naval Engineering, Ocean Acoustics, and Underwater Weaponry. If the Department of the Navy didn't invest in them, it's unlikely that anyone would. It's vital to keep such fields healthy, not only for the sake of our own capabilities, but to avoid technological surprise as well.

- *Naval Science and Technology Grand Challenges*—big, difficult, challenges that, if met, could give us decisive capabilities 15 to 30 years in the future. We encourage the Nation's scientific community to achieve breakthroughs in difficult but achievable scientific challenges like Naval Battlespace Awareness, Advanced Electrical Power Sources for the Navy and Marine Corps, Naval Materials by Design, and Multifunctional Electronics for Intelligent Naval Sensors.

- *Future Naval Capabilities (FNCs)*—programs to shape the next Navy and Marine Corps. Developed and managed by integrated product teams with members of the acquisition, requirements, science and technology, resource, and above all warfighter communities, the FNCs fill the gap that all too often opens between S&T on the one hand and acquisition on the other.

A great deal of our transformational effort is lodged in the FNCs. S&T enable Navy transformation by achieving the FNCs' goals. The key to successful transformation is the strong business partnership among scientists, industry, requirements, acquisition, and warfighters.

The FNC process delivers maturing technology to acquisition program managers for timely incorporation into platforms, weapons, sensors, and process improvements. With a total investment of \$577.6 million in fiscal year 2002 and over \$640 million in fiscal year 2003 and \$500 million planned for fiscal year 2004, FNCs support the Secretary of the Navy's goals to: (1) increase combat capability, (2) enhance personnel performance, (3) introduce advanced technology, and (4) improve business practices.

The Office of Naval Research devotes approximately two-thirds of its 6.3 (advanced technology development) funds and about two-fifths of its 6.2 (applied research) funds to FNCs. We currently have 12 approved FNCs. I'll describe each one briefly, and provide the basics as to where it fits into the Department of the Navy's concept of Sea Power 21:

- *Autonomous Operations*—This program is pursuing a dramatic increase in the performance and affordability of Naval air, surface, ground, and underwater autonomous vehicles—unmanned systems able to operate with a minimum of human intervention and oversight. The Autonomous Operations FNC gives us a great potential to operate effectively in what would otherwise be denied areas. It contributes to Sea Shield and Sea Strike. In fiscal year 2004, for example, we will transition the Gladiator Tactical Unmanned Ground Vehicle to the Marine Corps. Gladiator is intended to support dismounted infantry across the spectrum of conflict and throughout the range of military operations. It will enhance tactical commanders' ability to detect, identify, locate, or neutralize a broad range of threats.

- *Capable Manpower*—The focus here on affordable human-centered systems that give our sailors and marines the ability to operate effectively under conditions an enemy can barely survive. The primary goal of this program is to get the right person in the right job with the right training at the right time in order to meet the needs of the Navy and Marine Corps. A great deal of progress has been made in this last area. In particular, two products have already transitioned: Models of Navy Compensation and Personnel Behavior (MODCOMP)—a tool for manpower analysts to rapidly develop retention forecasting models through ready-access to relevant data sources, intuitive linkage to highly sophisticated statistical tools, and export capability to populate existing decision support tools, and Comprehensive Officer Force Management Environment (CHROME)—a tool for monitoring actual officer inventory behavior and a 12-month loss-forecasting model to predict officer losses for each primary category. Capable Manpower is most directly aligned with Sea Warrior.

- *Electric Warships and Combat Vehicles*—The future of naval warfare is electric. Warships will have revolutionary power plants that permit new hullforms and propulsors, reduce manning, streamline logistics, power advanced sensors, and enable future high energy and speed-of-light weapons. We have already successfully demonstrated the essential elements of a high temperature superconducting motor for the next generation of warship, and a hybrid diesel-electric reconnaissance vehicle for the Marines. This FNC is aligned most closely with Sea Strike, Sea Shield, and Sea Basing.

- *Fleet/Force Protection*—We have very capable ships, aircraft, and ground combat vehicles. It's our business to ensure that they don't fall to the sorts of asymmetric threats our enemies pose. This FNC, aligned with Sea Shield, is working to develop effective organic means of protection: weapons, sensors, countermeasures, stealth and damage control. It has already

transitioned Real Time Damage Detection, Assessment, and Response to acquisition. As well, the President's budget for fiscal year 2004 supports the execution of full-scale development of an Integrated Torpedo Defense System for protection of heavy combatants and amphibious forces operating in the challenging littoral environment. This effort is the culmination of support, from Congress, for torpedo defense R&D activity over the past several years, and is focused on the ability to rapidly deliver threat-sensitive capabilities to the Navy's high value forward deployed assets.

- **Knowledge Superiority and Assurance**—Information technology is as crucial to Naval superiority as it is to any other aspect of contemporary life. This program is developing our ability to distribute integrated information in a dynamic network with high connectivity and interoperability. It will ensure knowledge superiority, common situational understanding, and increased speed of command. Knowledge Web technology from this program has been deployed with the U.S.S. *Carl Vinson* Battle Group, engaging the enemy in Operation Enduring Freedom. This FNC is a key enabler of FORCEnet.

- **Littoral Antisubmarine Warfare**—This program is part of our shift of emphasis to littoral, expeditionary operations. The antisubmarine warfare challenge in coastal waters is a tough one, so we focus scientific effort on enhancing our ability to detect, track, classify, and engage enemy submarines in a near-the-shore environment before they are close enough to harm our forces. A number of products have already entered acquisition from this program: the Environmentally Adaptive A/N SQQ-89 sonar instrumented tow cable fibers and signal processing, for example. Sea Shield will benefit from the products of this FNC.

- **Littoral Combat and Power Projection**—This FNC has two major thrusts: Expeditionary Logistics (an important step toward Sea-Basing) and Littoral Combat (essential to Sea Strike). It focuses on deploying uniquely capable combat and logistics systems necessary to deploy and sustain the Fleet and the Force without building up a large logistical infrastructure ashore. The program has already transitioned a baseline logistics command and control system for expeditionary warfare.

- **Missile Defense**—This program is directed at the threat expeditionary forces face from cruise missiles. In particular, it's working toward the ability to track and destroy overland cruise missiles that threaten both ships at sea and marines ashore. It will also contribute to our general air defense capability through a single integrated air picture, composite combat identification, distributed weapons control, and overland intercept capability. This new capability will greatly mitigate the likeliest and most dangerous air threat to our forces. The Missile Defense FNC is nearing transition in several of its product lines, including, for example, the Reactive Materials Warhead and Affordable Ground-Based Radar. Missile Defense forms an important part of Sea Shield, but this shield is extended to cover forces ashore, as well.

- **Organic Mine Countermeasures**—Mines are a cheap, deniable, and able to infest the battlespace with a menace far out of proportion to their numbers, mines have been and will continue to be deployed against us by terrorists and their state sponsors. We're working to give our forces an organic—that is to say, an inherent—ability to detect, characterize, and neutralize mines wherever they may be encountered. Closely aligned with Sea Shield, this FNC has transitioned several important products. One of them, the REMUS autonomous underwater vehicle, is now in the hands of our operating forces. It was pressed into service in the weeks immediately following September 11 to help secure ports on both of our coasts. REMUS emerged from a basic oceanographic research program—another piece of evidence that overnight successes are long in preparation.

- **Time Critical Strike**—Here we are substantially reducing the amount of time it takes to hit critical mobile targets, like theater ballistic missiles, command centers, and weapons of mass destruction. One of this FNC's products, the Affordable Weapon (a loitering cruise-missile-like system that can carry a variety of payloads) is being deployed to the CENTCOM area of responsibility soon. Time Critical Strike is aligned with Sea Strike.

- **Total Ownership Cost Reduction**—This FNC is using advanced design and manufacturing processes to decrease significantly the cost of buying, operating, and maintaining our systems. We are working to reduce total lifecycle costs, and that includes obvious work in design and manufacturing as well as less obvious savings realized from reduced manning, better envi-

ronmental compliance, and more sophisticated cost-estimating tools. Aligned most especially with Sea Enterprise, this FNC has transitioned a number of products to industry. One example includes advanced coating techniques for hot-running turbine engines.

- Warfighter Protection—Improved casualty prevention, care, and management are the goals of this FNC. Aligned with Sea Shield and Sea Warrior, this program has already transitioned a life-saving clot-inducing bandage to our forces in Afghanistan.

Our investment portfolios are not built in isolation. The Defense Reliance process integrates the Services' S&T programs while preserving the healthy diversity of vision and approach that has given us the technical agility we enjoy today. Our relations with the DARPA are excellent and productive. Much of the Office of Naval Research's basic and applied research investment is designed with a view to handing scientific advances over to DARPA for further development and exploitation. The Unmanned Combat Air Vehicle-Naval (UCAV-N) program is an excellent example of this kind of collaboration.

I will now address some of our challenges concerning the health of the Navy's Laboratories and Warfare Centers. The Naval Research and Development Centers, which include the SYSCOM Warfare Centers, the Naval Research Laboratory (NRL) and the Medical and Health Research Centers, employ world-class technical experts who execute much of the Navy's S&T portfolio, developing innovative solutions and transformational capabilities for the Navy and Marine Corps. These centers, spread throughout the United States, currently employ around 40,000 civilians, about half of who are scientists and engineers. They perform cutting edge work upon which we depend to preserve its military superiority. The effectiveness of the warfighting systems employed by the Navy and Marine Corps of the future depends as much on investment in these dedicated, capable civil servants as it does on the size of the S&T budget itself.

The past decade's frequent downsizings, coupled with the declining number of American students—particularly women and minorities pursuing mathematics, engineering, and physical science degrees—has left us with a dwindling pool of scientists and engineers available to become the next generation of researchers. This situation jeopardizes our ability to perform essential research in support of, ultimately, sailors and marines.

Recent warnings about the decline of the Navy's S&T workforce come from a variety of sources. In the Naval Institute's Proceedings, Dr. James E. Colvard, former director of civilian personnel policy for the Department of the Navy and chair of the panel that developed the report, "Civilian Workforce 2020, Strategies for Modernizing Human Resources Management in the DoN" notes the Navy has "put its institutional capability in science and engineering at peril." Colvard also comments, "The Navy has lowered its level of intellectual involvement in research and development and weakened its entire infrastructure, which at the end of WWII was the strongest in the world."

The DoN's "Civilian Workforce 2020" study pinpointed workforce modernization as the defining issue pushing S&T revitalization. The study concluded: "It is not possible to achieve a functional workforce that is prepared to meet the management, technical, and political challenges of the future without investing financial resources and leadership attention."

Recently, a tri-Service laboratory study chartered by the Director, Defense Research and Engineering, and carried out under the auspices of the Naval Research Advisory Committee produced a report: Science and Technology Community in Crisis. In the report, the panel commented that all of the laboratories they visited reported that "maintaining a quality scientific and engineering staff is growing more difficult." The report continued: "The real issue is not whether the laboratories can muddle through under the current system and fill science and engineering vacancies with entry-level personnel. It is whether they can compete effectively for, and retain, the best and brightest technical talent, e.g. the top 10 percent."

A total commitment to improving our ability to attract and retain a cadre of world-class scientists and engineers will be necessary to meet the simultaneous challenges of performing transformational research while replenishing the aging talent base. Simple demographics show that over the next 10 years we will lose most of our current workforce. Although some organizations are holding their own in recruitment, many indicators are going negative, and managers report greater difficulty in hiring quality scientific personnel. If we cannot invest at an appropriate level in promising research scientists and engineers today, we believe that the options and opportunities the Naval R&D labs and center have provided our fighting forces for more than the past 60 years or more will begin a decline that will be difficult to reverse.

The Navy has launched an initiative called "N-STAR"—Naval Science and Technology for Advancing Revitalization. This program is addressing the personnel issues associated with: refreshing our technical workforce with the small pool of recruits available to fill positions vacated by retiring scientist and engineers, and with the professional and technical enhancement of the current workforce as they move into senior positions at the Naval Research and Development Centers. N-STAR is a collaborative effort, concentrating on integrated relationships with partners within the university community and other Federal agencies interested in the future of the Nation's scientific and engineering workforce.

In fiscal year 1995, Congress provided the Department of Defense labs with the opportunity to test a variety of new personnel tools. Section 342 of the Fiscal Year 1995 National Defense Authorization Act permitted some of our labs and centers to implement a number of personnel reforms not previously available. The personnel initiatives being tested under this program have broad acceptance and are achieving very positive results.

For several years now, the Department of Defense has been actively testing many management flexibilities, i.e. pay banding, pay for performance and simplified classification. Acknowledging the success of the demonstration projects and alternate personnel systems, the Under Secretary of Defense for Personnel and Readiness began a review of the personnel management flexibilities already in use within the Federal Government. Multi-component, multi-functional work teams and senior functional executives completed this yearlong review that identified "best practices"—those with the highest rate of success. The Office of the Secretary of Defense is considering many of these best practices for inclusion in a legislative proposal on human resource management.

In conclusion, the return on the Nation's investment is clear. Naval transformation depends on a long-term, stable, and sustained investment in S&T, validated through ongoing experimentation and transition to the warfighter in a continuing cycle.

Mr. Chairman, thank you again for the opportunity to share with the subcommittee some of the good things the Navy is doing in the S&T world.

Senator ROBERTS. It is the chair's intention to have 6-minute rounds, and as many of those as members would like. In the order of recognition, it will be Senator Reed, Senator Dole, Senator Kennedy, Senator Cornyn, and then I will bat clean-up.

Senator Reed.

Senator REED. Thank you very much, Mr. Chairman. Thank you, gentlemen, for your testimony today, and let me start off by asking each of you if you agree with—and this is not a trick question—the Secretary of Defense that the goal for S&T should be 3 percent of the DOD budget.

Secretary Wynne?

Secretary WYNNE. Sir, I think we need a benchmark. Against that benchmark you measure yourself for progress, and 3 percent is an appropriate benchmark.

Senator REED. General Kern?

General KERN. Senator, I think the 3 percent is a good goal for us all to meet each year. It has its challenges as we try to reach those levels, but I think as Secretary Wynne has suggested it is a very good benchmark.

Senator REED. General Lyles?

General LYLES. Senator, I also agree. I think it is a great benchmark. Personally I hope we can exceed it one day in the future, but it is a great benchmark for us to try to achieve right now.

Senator REED. Admiral Dyer?

Admiral DYER. Short answer, yes, but with a comment, if I may.

Senator REED. Yes, sir.

Admiral DYER. We are blessed in the Navy right now with the products of S&T that are supporting us in programs like Joint Strike Fighter (JSF) and into the E-2 program and to emergence

in networkcentric warfare, so in a sense our success in S&T in previous years is presenting us with opportunities to transition and actually procure those technologies today, such that there is an ebbing and flowing of S&T and the product of it.

We are challenged with the affordability of doing everything all the time, but we are enjoying today the previous investment of S&T.

Senator REED. Thank you, Admiral Dyer.

Let me begin, Admiral Dyer, with a follow-up question for each of the panel. Projections suggest that the S&T funding will go down by 2009 to about 2.4 percent, and the question I have, what are the risks that we are going to run if this level of funding is projected over the next several years?

I think you suggested, everyone suggested, we have a problem retaining scientists. That is one risk. We might have a potential risk that other countries that are developing high-tech sectors like China or India, just for example, can begin to match our efforts and begin to erode our advantages. I do not know if you want to comment on those points. There might be other risks, too. But Admiral Dyer, and then everyone else.

Admiral DYER. We have great discussions in my organization across the Navy that says, how much S&T is required. The answer is enough, and a benchmark is required, but it is hard to know exactly what that is. You draw an important nexus, I think, and that is this relationship between S&T funding and people, because to keep scientists and engineers, we have to give them exciting work to do. They have to be a part of it, and they have to feel their effect in the future. That is the thing that can hire people away, and we think that it is critically important.

Senator REED. General Lyles.

General LYLES. Senator Reed, I agree with Joe Dyer in terms of how we define what is enough or what is not enough. Certainly we think we need to maintain a robust program, and the way I see it, because of the balance that we have to look across the board to other investments, we need to put priorities on where we allocate the dollars.

Certainly taking care of the critical S&T workforce is number 1, making sure we maintain emphasis on cutting-edge technologies like nanotechnology and biotechnology, which have tremendous opportunities to leverage significant things in the future. We should not let that melt away, but because it is going to be very tough for all of us to just get to 3 percent right away, what I would like to see, and what we are trying to do in the Air Force, is make sure we are doing a better job of leveraging the similar activities that go on in the Services, other agencies in DOD, or even other agencies outside of DOD.

I think for instance, nanotechnology is an obvious one. Each one of us mentioned that, but I dare say all of our nanotechnology programs are harmonized. If we cannot meet the 3 percent, at the very least we need to make sure where we have common goals, common technologies, that we bring those things together and leverage the dollars that we have so we do not fall back.

Senator REED. Thank you.

General Kern.

General KERN. I would agree with all of the previous comments. There are two areas in particular I think that we are at risk of falling behind. Clearly the one is the nanosciences, which we see emerging as a very bright potential right now for many of the problems that we face in weight reduction, reducing our footprint and increasing survivability. The second is in the area of quantum computing, which we are beginning to see some demonstrations of its applicability, but we clearly have a long way to go before it becomes practical.

The third point I would make is that there are other countries, two in particular, that have a billion people each, India and China, which have many brilliant people. Their investments in those areas and their studying in this country will bring many of those ideas outside of the continental United States to worldwide access, and so we will be challenged to keep up with them both economically and from a security standpoint if we allow ourselves to fall behind.

Senator REED. Thank you.

Mr. Secretary.

Secretary WYNNE. There is really a two-part answer that I think is necessary here. Part one is that the things that we can see out into the outyears, we can cost, and what is happening is, the things that we can see in S&T are percentage-wise less than the things we can see in procurement, operation and maintenance (O&M), health costs, things that make up the top line.

One of the unique features about S&T is that you know what you know today. You cannot see very clearly beyond 24 months, so one of the things that happens to us is, our ideas begin to shrink, if you will, relative to the pressing needs and the must-pay bills of health care, people, and the procurement accounts. But as time nears, what we find that we do is, we have postulated, for example, real growth. We have improved our accounts over 25 percent the last 2 years, and we can see very clearly the benefits of that coming out.

That does not mean that in 2007 or 2008 when we get there the numbers will actually be 2.4. It is what we can see today.

Senator REED. Thank you, Mr. Secretary. My time has expired.

Senator ROBERTS. Senator Dole.

Senator DOLE. First of all, as has been mentioned previously, transitioning technology into warfighter capability continues to be a real challenge. Some Special Forces programs have been able to transition technology from the concept to capability at much faster pace, primarily due to Major Force Program-11 (MFP-11) funding. I am wondering if, as acquisitions chiefs, you have had an opportunity to explore the possibility of transition-type funding, nonprogram-specific, that would be a way to more rapidly field some of the most promising technology.

General LYLES. Senator Dole, just speaking for the Air Force, I think we have looked at ways that we could get the benefits of MFP-11, as Special Operations Command (SOCOM) has it, without necessarily coming up with a new appropriations cycle just the way they have today.

We are trying to ensure that, as we look at all of our technology programs, we work closer with our warfighters, the operational users, because in the Air Force, they are the ones that actually

fund the transition dollars. By setting up some established programs and processes that we call the applied technology council, we actually have their vote and their say and input into the technology programs and their commitment to put transition dollars in the budget so we can quickly get a mature technology into their hands.

That is similar to, in some respects, some of the benefits of MFP-11, but it allows us to attain that without again going through a whole different appropriations process like that, so we are trying to get the benefits without necessarily changing the way we do things.

Senator DOLE. Would others like to comment on that?

Secretary WYNNE. Senator Dole, I would like to just add that we have an ACTD process, each of the Services has an advanced technology demonstration process. Each of those, the problem is transitioning into the actual fielding and warfighting. I think one of the things that SOCOM has done pretty well is, they have followed up with funding promising technologies in the outyears. But I will tell you also that under the advanced concept technology development we have all the warfighters show up at what is called a breakfast club, and they do quite a bit of feedback into the system. We have, in fact, fielded quite a few things that have come through that, and are currently fielding, or being requested to field, other things.

It has to do a lot with laying in the logistics and training, and the compactness of the SOCOM is something that we could all learn.

Senator DOLE. Thank you. Please, go ahead, General.

General KERN. I was just going to add, Senator, that we do work across those boundaries today. We have memorandums of agreement and research centers that we share with the Special Operations community. We are taking advantage of the work, but more importantly the processes, I think, which they have used to expedite technology to the field, and that has allowed us to copy some of the things that they have done both in a process and the technologies themselves, and bring them into the rest of the force.

Senator DOLE. Thank you.

Secretary Wynne, let me ask you about the Medical Free Electron Program. I understand this is a merit-based research program, currently involves five academic centers, including Duke University. It is peer-reviewed, competitively awarded, and the application of this research ranges across the board from surgical advances to improvements in wound-healing, burn technology, burn recovery especially. Last year the funding was moved from the DOD to National Institutes of Health (NIH), and then Congress moved the funding from NIH back to DOD with a reduction in the funding, and that continues this year.

I know that many programs are able to adapt through adjusted levels of effort, but then there are others where it is a necessity to cut personnel, and where delays ensue because of this uncertainty in terms of the funding. I wonder if you could tell us more about your efforts to identify programs with tangible potential and what you are doing to stabilize the year-to-year funding for these programs, and I just mentioned, you referred to the ACTDs.

In this same vein, a lot of small technology niche companies often shy away from DOD projects, I understand, because of the uncertainty of the year-to-year funding. How can reduced cycle times and a greater use of the ACTDs encourage more private industry participation in the DOD approach?

Secretary WYNNE. The application of FAR part 12 has, in fact, induced many companies to come on board, even small ones. One of the transformational proposals we are making to you is to try to extend that to production. One of the things that FAR part 12 does is, it allows, if you will, the forgiveness against all of the FAR regulations, which are fairly dense and are, in fact, an inhibit to a small businessman because he immediately needs a lawyer.

Now, after we get through the development program, we are now faced with fronting the first production contract that we would award if we want to really move out and field a finding, and now we do not have the authority to award under FAR part 12. We would like to get that. It results in the fact that you get a small business, they develop a really good thing, and then at the end of the day we confront them with a production contract that is three times as thick as the one they signed before, and it contains several civil penalties for various nefarious crimes, like not reading the document. They tend to drop out at that point, and that is really a problem that we are faced with.

I would tell you that your support of the Quick Reaction funding is really a big benefit, whether it be through the ACTD process, the ATD process, or, in fact, several of the grant monies that you give to DARPA. All of this is a tremendous benefit to us in stabilizing the funding.

As opposed to the Medical Free Electron Program, we do feel like it was a better fit over in the NIH, frankly, but it may have been needed to follow up with a direction to them as to how to proceed. I know that many of you all see the benefits of using the Department of Defense is that we do, in fact, follow through on things, and we appreciate that, but in that particular instance I still would tell you that it probably is better over in the NIH, because it has a lot more application here domestically.

Senator DOLE. Thank you. My time has expired. Thank you, Mr. Chairman.

Senator ROBERTS. Senator Kennedy.

Senator KENNEDY. Thank you very much. All of us want to thank all of our witnesses here and those that are behind them as representatives of our fighting men and women abroad. You may get tired of hearing of it, but we are deeply grateful to you, and we are also enormously grateful to you for the technology that has been developed.

This is a lot of hard work. You have enormous competition within the various services for a lot of different kinds of issues, but I think if we have the best technology with the best-trained and the most highly motivated and skilled service men and women, the technology is really as a result of the work that has been done by all of you and your predecessors. This is an incredibly important issue and an incredibly important hearing.

I will come back, just generally, to the labs generally in my second or third question if I have the time. I would like to get to the

issue of the command and control in intelligence. One of the great tragedies that we have seen in the engagement in Iraq in these past weeks is the fact that so many servicemen, particularly the British, have lost lives because of the information or identification, whether it was the incidents in the helicopters, or whether it is the Patriot, or whether it is friendly fire incidents which we have had recently.

The importance of this kind of command and control in intelligence even seems to be much more important today than ever before because of the sophistication of these kinds of weapons or weapons systems and their complexities. I am interested if you could comment about whether we are doing enough in this area. I would ask General Lyles whether this has enough support or should we be doing more? Are you satisfied that we are doing enough?

General LYLES. Senator Kennedy, I think you hit it right on the head. This is increasingly a force multiplier in everything that we do in our military applications today. We realize that, and we are putting more emphasis on and more resources into command and control, intelligence, surveillance and reconnaissance, and ensuring that all of the programs that we are working on are network-centric, that they are all linked together, that we have an opportunity to achieve what our Chief of Staff, General John Jumper likes to refer to, machine-to-machine movement of data, movement of knowledge to allow us to better command and better control our forces.

Senator KENNEDY. I know you could go on. I just want to hear both in terms of the Army and the Navy, too, you have your own kind of centers of command and control. What is your own kind of evaluation of the progress that you are making? How do you all work together? How does that sort of integrate together? What are the areas that you think need to be strengthened, or did you find out that important progress has been made recently? What can you tell us just quickly, and then I want to come to one last question.

General KERN. Senator, I will go first and then let Admiral Dyer continue.

One of the improvements we have made in recent years is a system today we call blue force tracking, which we fielded to the members of the Armed Forces in Southwest Asia right now. If you can remember the studies that were done in the last gulf war, there are two parts to understanding where people are on the battlefield so that you can identify them correctly. One is a direct interrogation system and the other is a sense of the battlefield, situational awareness, as we have called it.

The blue force tracking allows us to develop that sense of awareness, or a situational understanding of where forces are on the battlefield so that you can identify friend from foe by their position location and not engage on the friendly forces. That has helped, but it is not as pervasive, clearly, as we would like it to be because we do not have 100 percent of the battlefield today, so it is clearly an area where we could use more.

I would tell you from my own personal experiences, and there is no such thing as friendly fire, wherever you get fires from it becomes hostile, and we need to continue to put investments in both

sides of that equation so that you have interrogation as well as complete, 100 percent situational understanding.

Senator KENNEDY. Admiral Dyer.

Admiral DYER. The Department of the Navy, and especially the Marine Corps, participate in blue force tracking as well, so I absolutely agree with the comments made by the other witnesses.

However, I think it is constructive to think about the construct a bit broader. As we in the Naval Service think so much and rally around networkcentric warfare, that is a piece and part of it.

General Kern, if I could quote an Army general officer friend of mine, I was told the other day that in the Naval Service we make networkcentric warfare way too complicated. He said that it is really the answer to the Army's two oldest questions, which is, where are the bad guys and oh, by the way, where are we? [Laughter.]

General KERN. Communicating that information on a network is the solution to this problem. It does require some rewicking of priorities, however. For years and years, I think, within the Army at least, we have looked at platforms, weapons, sensors, and links in that priority. To solve this problem and to really leverage networkcentric warfare, you have to take that construct and turn it over, and we have to look early on in our investment strategies to links, the communication between folks on the ground, in the air, on the surface, and beneath the surface, and then the capability to sense where they are and communicate it.

Senator KENNEDY. I would just say that this is enormously important and obvious. We have been on the Armed Services Committee long enough to know the lessons we learned from Grenada and others just in this very area. I am interested in how we are going to continue to make all this progress when you also have sort of this base realignment and closure (BRAC) holding over your head in terms of what is going to happen in terms of the laboratories.

This will be my final question. Secretary Wynne, your memorandum for the Director of Defense Research and Engineering, and Deputy Under Secretary (Laboratories and Basic Sciences), from October of last year, and you mentioned, "the conclusion that I drew is that labs are out of favor and no longer have a constituency within parent organizations, their budgets are cut, people are discouraged, overall, utility is in question." Then you make a suggestion about organizing a commission to identify the laboratories, imperative for the defense to retain the structure on this.

I would be interested whether that commission has been set up. No one can listen to the reports here and not understand the importance and significance over the long-term—particularly in the areas of education, and you are talking about workforce, which is another whole kind of area, if you could comment, Secretary Wynne. Was this commission set up?

We do not want to discourage at a time when we want to keep these laboratories performing at top speed, and the need, given our new challenges is so significant. What can you tell us about whether this commission has been set up and also what the impact of these laboratories is going to be in terms of looking out after, running through a whole process in terms of the whole BRAC process?

Secretary WYNNE. Senator, let me put a little bit of perspective. I received a briefing from a group called ENRAC who, in fact, pos-

tulated many of the same issues that you stipulated in my note, and I felt an absolute responsibility to alert the remainder of the services if they had not been aware that this was the course of at least the feelings from their ranks. In fact, I did that, and the response from my three coconspirators here as well as the Director of Laboratories and the Director of Research and Engineering was remarkable. They are putting together a group that has really professed to improve the quality of the laboratories. The intent of the memo was to spark, if you will, a renewed management intention to the laboratories and the situation that the laboratories were reflecting. I think the response, like I say, has been fantastic in that each of the laboratories will now tell you that their connection to the service has grown stronger ever since.

Senator KENNEDY. Thank you very much. My time is up.

Senator ROBERTS. So you were not being a critic, you were being a Dutch uncle and a Jiminy Cricket.

Secretary WYNNE. Yes, sir.

Senator ROBERTS. I see. The conclusion that I drew is that the labs are out of favor and no longer have a constituency with parent organizations. Their budgets are cut, people are discouraged, and their overall utility is in question. This, of course, then alerted them that there might be a problem.

Secretary WYNNE. I think the response was exactly that, sir.

Senator ROBERTS. I would guess that would be a response. Never mind what they would say, but they have said it to you, in other words.

Secretary WYNNE. It was excellent, yes, sir. I heard it from several sources. [Laughter.]

Senator ROBERTS. You had meaningful dialogue and you got a response.

Secretary WYNNE. Yes, sir.

Senator ROBERTS. Senator Cornyn.

Senator CORNYN. Thank you, Mr. Chairman, and thanks to each of you for appearing today before the subcommittee. There is obviously little doubt that strong S&T programs are critical to the true transformation of the armed services. I enjoyed coming by the demonstration the other day and experiencing the pain, I guess, that victims of directed energy weapons can feel, although fortunately it was on a small scale.

But my State plays an important role in research and development in this area, and so I have really just three quick areas I want to just cover. One involves small business innovation research programs. This program is critical to supporting much cutting-edge research currently being conducted by small businesses throughout the country.

I understand that while phase 1 and phase 2 funding appear to be working relatively well, that there are some problems when it comes to phase 3 funding, which I guess requires private sector or other than Department of Defense funding. I wondered if each of you might take the opportunity, if you have something to add on this, to comment about what you are doing to improve opportunities for small businesses to receive phase 3 funding.

General KERN. We held a conference this past year with all of our small businesses specifically looking at Small Business Innova-

tive Research (SBIR) programs. We have one small business in Massachusetts who has managed to break the code, I guess I would say, on phase 3 funding, and has continuously been able to implement that. We have asked them to put together some lessons learned for all of the other small businesses which we are sharing this year and we will continue to hold conferences.

In addition, we hold an annual conference with small businesses in which we invite large business in as well so that they can see what work is being done and get promises so that the two then can match up capabilities with some of their funding opportunities. We have found that that has been a very positive influence, because most of the larger corporations are coming to look for the good ideas that are being generated in the start-ups that we have had in phase 1 and phase 2.

The last area in many of our conferences that we hold now, we have also, in the past, had the small businesses somewhat separated, and we find that now, by including them in the center of our efforts, that they are getting a lot more attention, and in the area of where new technologies are emerging today, the business is beginning to flow their way.

Senator CORNYN. Thank you.

General LYLES. Senator, we have some similar initiatives to what Paul Kern mentioned for the United States Army. I find that we put a lot of emphasis on small businesses in general, and we work that very hard. To be honest with you, I am not quite sure if we work the Small Business Innovative Research program in the same manner, and this is one area where I think we can put a lot more efforts towards it.

I came back to this particular command from having commanded or directed the Ballistic Missile Defense Organization, and there I found that almost everything that we are doing in missile defense has some roots to some small business-innovated research somewhere downstream, somewhere in the past, and I came back to it with the commitment that we are going to try to revitalize that effort within the Air Force. I cannot tell you that we have succeeded yet, but at last there is a model that we can follow from another agency that I think can apply to what we are doing in the United States Air Force.

Admiral DYER. In the Naval Service, we have been spying on the CIA. [Laughter.]

By that, I mean their approach to venture capital. While we would apply it differently and use a different model of spinning out technology to the commercial sector, then spinning it back in for defense-related efforts we think is a very productive one.

We had a wonderful occasion just a few months ago where we took some two dozen venture capitalists from all over the country, hand-selected, out aboard a carrier to see us work in our environment. We think we have them excited, we are excited about filling just this gap, of bringing commercial funding to bear to further S&T efforts and to transition them.

Senator CORNYN. That is very encouraging.

My second question has to do with the decrease in 6.1 funding for primary research, and I noticed in looking at the various charts reflecting the direction of this research, everybody seems to be

heading south. Could you explain your reasons for cutting back on 6.1 funding, and do you think this is going to impact our current transformation efforts, cutting back on expenditures for primary research?

Secretary WYNNE.

Secretary WYNNE. Thank you very much, Senator. I would first say that this is a cyclic enterprise. Many of the ideas that we funded in 6.1 are being realized in 6.2 and 6.3, so it kind of looks a little bit like a porpoise or a sign wave in the sense of. I think right now we are benefitting from some of the research that was done in 6.1, whether it be hybrid fuel cells and/or whether it be the nanosciences or some of the other stuff.

My sense is now we are about to increase that again in the biologic sciences, which, by the way, has been the largest creator of patents over the course of the last 18 months. We have actually not funded at the rate at which the patents have been developed.

My take on that, sir, is that I think you will find that in a given year it could be a little bit down, but in a given year it could be way up.

Senator CORNYN. If any of you have anything you would like to supplement that with, please go ahead.

General KERN. I would add three things. First, there has been a reduction in the cycle time, particularly as we have seen in the communications electronics area, so that what had been a process of transitioning from 6.1, 6.2, into the production, today can go very fast, and cycle times are measured in 18 months in many of these S&Ts, so they do not necessarily fit the pattern of funding which we have established over the past few years.

Second, we have been a procurement holiday literally for the last 12 years. We have not purchased new systems, and so in the years ahead, we must take the technology developments and cycle them back into product and get them into the hands of our soldiers to replace those existing systems that are out there today. That is challenging us on the level of funding which we are able to maintain and sustain in the basic research area.

Finally, I think it asks for a little bit more flexibility to take advantage of what is emerging. As I mentioned earlier, we are starting these university-affiliated research centers, and we are looking for the mechanisms there to support the 6.1 research at the university level, and, at the same time, rapidly transition it into development efforts.

General LYLES. Senator, just one similar comment to Secretary Wynne. It does seem to be cyclic. Fiscal year 2004 and fiscal year 2005 are transition times for us in our 6.1 program. We are actually increasing, as we look at it in 2005. The objective is to try to keep the 6.1 up as much as we can because of the obvious benefits.

Admiral DYER. The Navy has historically been very aggressive in this area. Our funding of the universities throughout the Nation reflects it. It is always difficult, and takes tremendous discipline in times of affordability, but we are dedicated to sustain it.

Senator CORNYN. Thank you, Admiral.

Mr. Chairman, my time is up. Thank you.

Senator ROBERTS. We thank you, Senator. I have an observation in regards to Senator Kennedy's very timely question in reference

to the command and control in the intelligence community and the warfighter in the field. Having the privilege of being the chairman of the Intelligence Committee, which by the way is not an oxymoron—[Laughter.]

—let me say that Senator Levin, Senator Rockefeller, Senator Warner, and I went on a congressional delegation, a forced march, six countries in 5 days, but we spent a great deal of time in Doha and in Kuwait, and we were very impressed with the way the stovepipes are coming down. As a matter of fact, holding numerous hearings in this subcommittee and being a member of the Intelligence Committee for 6 years, why, I never thought I would see the changes rapidly develop as they have. Nothing like an exercise called Iraq to make that happen, but in terms of the big picture, that commander in the field, I would tell the Senator that Headquarters Doha in real-time intelligence is delivering that to the lance corporal or the private first class or, for that matter, the lieutenant or the staff sergeant. It is very impressive.

Of course, at the same time we got hit with the mother of all sand storms, and a threat that gives terrorism a new name in terms of conduct, recognized by everybody with the exception of Peter Arnett.

At any rate, I was impressed with the jointness, but I am troubled. In the millennium exercise, it has been well-publicized in the press, and we asked this question during the last hearing. I think I asked the question a year ago where the red team defeated the blue team, and as soon as they did, they said, okay, stop, take a lock, take a lock, we are going to continue the exercise, and he was using—he meaning General van Ryper—the same kind of asymmetrical tactics that are being used today in Iraq. Every time he won, he won three straight times, we stopped the exercise and we started over. I asked the question of Larry Myers, what is going on here, and of course the answer we got back, it said there is about a 50–50 proposition. You have to finish the exercise, but these lessons are lessons learned.

Would any of you have any comment on that in terms of the exercise and more especially the van Ryper suggestions? I could call them complaints, but I will label them suggestions.

Secretary WYNNE. I would say that I know General van Ryper, and he is one of the most imaginative combatants that we could have picked as the red team commander, and actually a really fun guy to be around in that regard, very imaginative.

One of the things I wanted to advise you is that we are, in fact, causing interoperability to be more and more of a watch phrase in our forces. We are finding out that is a real plus to situational awareness, when they can actually use the same symbology, use the same, if you will, signals to advise, be they Air Force, Army, or Navy, or the Marines for that matter, and getting the coalition forces on that same interoperable standard has been a real plus during this engagement, and I think there is yet more to come.

I think part of the situation that you are faced with there in Millennium Challenge 2002, and there may be some of my colleagues who are more familiar with it than I was, but when I went down to get my briefing on it, it is true that they were a force with an opening gambit, almost like in a chess game, that it was checkmate

before they got their pawns released, and I think there is no better thing to do than to reboot the system and sort of replace the warriors and say, hey, can we play that game again.

I think the lessons learned from the first couple, in fact, have been fed forward into the Services, and I think that is probably one of the reasons we can be as flexible as we are when faced with these—I think the word perfidy was used, but very pernicious attacks that have been made upon our troops.

Senator ROBERTS. When you look out 20 years in the future, this is for all of you gentlemen, what technological challenge in future threat concerns you the most? Pick one. What challenge? What threat? What are you worried about the most? What keeps you up at night?

General KERN. I will tell you that from my perspective on the ground force, I worry about two things, both of which are objectives of our S&T. The first is our footprint, and what that does in terms of restricting our agility and flexibility on the battlefield. So one of our objectives of our future combat systems and all of our work is to reduce the burden on the field commanders through S&T.

That gets at some of the earlier discussions of hybrid electrics, lighter-weight materials, much better active protection systems, and armor protection that will allow us to have a series of systems that are less demanding of fuel and maintenance on our future battlefields.

The second area that I worry about are the asymmetric-type threats that we are seeing today, to be able to identify essentially the terrorist wearing a bomb, and to be able to detect them from any other person who might be in the area that we see, and so that is a threat which is both here in the homeland and on the battlefields, as we are seeing today.

General LYLES. Mr. Chairman, I share the second concern that General Kern mentioned. The asymmetric threat is the one that concerns me, and we are trying to put a lot of intellectual capital to figure out how can either today's technologies, or the technologies we are working on in the laboratory, can that help us to counter that particular threat. We are still looking at different ways.

The second area is space.

Senator ROBERTS. Give me an example. Give me a specific example of what kind of technological superiority, other than the thing that burned into my finger in your demonstration—actually, it did not burn it. It just heated up.

General LYLES. Well, that is exactly the one that we have been talking about recently. If we had this directed energy millimeter wave technology that would allow us to repel forces without killing them, we can then give an opportunity for our forces to sort out who is bad and who is not.

Senator ROBERTS. Okay, and that had a range of 750 yards, as I recall, or something of that nature.

General LYLES. Yes, sir.

Senator ROBERTS. Okay. I am sorry. We will continue the question. My time has expired and I will go right to Senator Reed, but first Admiral Dyer.

Admiral DYER. Very quickly, 20 years, if you look forward 20 years, the specialty software is closing our leadership gap, so the ability to leapfrog or to transform into the future is the one that I would give you, sir.

As we go to speed-of-light weapons and their associated intensity, it is power generation on the large scale, power storage, and the ability to attend to electromagnetic interference to our own systems, and to be able to operate it with stealth, are the technologies that I would give you, sir.

Secretary WYNNE. I would just like to add information assurance. We are so becoming focused on C⁴ISR, and we are using it to the hilt, and it is great, but it takes a matter of trust. The individual soldier, when he hears over his earpiece, or looks on his screen, he must trust that that information is accurate and complete, and the day it becomes inaccurate or incomplete, we have to start over, so information assurance is the thing that concerns me the most 20 years away.

General LYLES. Mr. Chairman, if I could add one other thing that I was going to bring up, and that is space, space technology and space capabilities. The phrase, we own the night, is certainly appropriate today. You could also say that for space, we own space. We cannot allow anything to ever jeopardize the tremendous advantage we have from our space systems, and we have to make sure that they are always protected also.

Senator ROBERTS. I thank you for that.

Senator Reed.

Senator REED. Thank you, Mr. Chairman.

During the first round, several comments were made about the National Security Personnel System (NSPS) and also about the laboratory workforce demonstration program. These demonstration programs I find to be very popular. The Naval Undersea Warfare Center at Newport has such a demonstration program they find extremely useful in retaining scientists, having the flexibility to run a lab, which is much different from any other military organizations.

The fear I think I have heard expressed is that this NSPS will be one size fits all and will really leave the labs out in terms of the flexibility, the creativity, the uniqueness that they have, so Mr. Secretary and then gentlemen, can you comment upon these issues?

Secretary WYNNE. Right now I would tell you that when the NSPS arrives here in Congress, which we hope is in short order, I think you will see that it has tremendous flexibility beyond the expected. That having been said, the Office of Personnel Management has in their hands the DOD-released best practices, where we have assembled the best practice from each of the laboratory demos and intend to turn that back to them so that they could cherry-pick the one that they felt was most applicable to their particular laboratory situation.

We expect that will be published in the National Register and cleared within 30 days, so we are really excited about that.

The accommodation that you have given all of the laboratories over the years has been very well used, all the way back to, as I mentioned, the China Lake demonstration, but yet the laboratories

are, in fact, special purpose areas, and we intend to see that they do have their continued flexibility, sir.

Senator REED. Thank you, Mr. Secretary.

General Kern.

General KERN. Thank you, Senator. The laboratory demo programs have been extremely beneficial to us over the years, and we have learned lots of new ways of managing personnel and providing the right incentives. That has been a very positive incentive that you have given us.

On the other hand, we ended up with such a proliferation of them that it inhibited some migration between laboratories of people who were afraid to leave one personnel system to move to another, and so that was one of the challenges that we were all trying to find what was the best solution amongst all of those demo programs.

I think the solution that is being proposed has some of the attributes that we are looking for out of the best practices of all of those lab demo programs. I was also surprised to some extent to find some of the negative feedback I was getting from many of our research centers on the lack of flexibility they thought it presented. I, as a result, had a fairly detailed discussion with Dr. Chu on where we are going on that, and he was listening. So I think many of the concerns are being taken in and, as Secretary Wynne has suggested, when the program comes forward, they will be addressed in the proposals that will be made.

I also believe that it is something that we will not probably solve the first time around. It is going to take some iteration to find the right combination, but we all agree that we need some new personnel systems both in science and engineering as well as across the Department of Defense.

Senator REED. Thank you, General.

General Lyles.

General LYLES. Senator Reed, we also have been very pleased with our lab demo project since 1997. The flexibility it provides us and the way it has allowed us to do something I think is very significant, to change the culture of our scientist and engineering workforce, and to improve overall performance to make sure that we are paying people and rewarding people as a result of contributions or results, not just because they are sitting at the job.

They have broad band pay levels and simplified classification system. Those three attributes are the things we passed through to Dr. Chu and to others. We think they are being listened to, as the NSPS proposed, but those kinds of flexibilities, we think, are paramount to continue that success.

Senator REED. Thank you. Admiral.

Admiral DYER. Senator Reed, I was at China Lake during the genesis of that demonstration program. I believed then and I continue to believe that the attributes of the marketplace reflecting in Government personnel pay for performance, a simplified classification system, and perhaps surprisingly most of all I would give you speed. If we are to hire and retain a creditable technical workforce in the future, we have to be at parity with regard to the answers we can give people with regard to their hiring, with regard to their pay, and with regard to their classification.

Senator REED. Thank you very much, Admiral.

Mr. Secretary, the Total Information Awareness (TIA) Program started off with some rather grandiose goals, "all-encompassing megadata base," which presumptively would be manipulated to do interesting things.

Since that time, there has been some discussion about what those goals might be. Secretary Aldridge was before the committee, and he talked about there is just some connections between airline tickets and other publicly commercial data bases. What are the goals right now, from your perspective?

Secretary WYNNE. Right now, sir, it is the creation of advanced analysis tools. The models that are being talked of are what drive the analysis tools. There are translation programs which would assist people when the data base they are being permissively searched is in a foreign language, and the tools are being developed using synthetic data bases for the most part, so that there is no aspect of privacy possibilities.

We have put lots of policies in place to scale back any potential aspirations that were mentioned, but it is our intention to provide these tools to people who are, in fact, empowered or legally advised that have databases that can therefore use them in the absence of DARPA support.

DARPA is a builder of tools for warfighters, be they information warfighters or physical warfighters. We do not, at DARPA, fight wars. We provide those tools to warfighters. We will not, at DARPA, investigate data bases so much as to provide people who have the legal authority to investigate data bases.

It has been used, for example, in the instance of on Guantanamo, when they had a whole series of interviews with the prisoners. They used that very model, to find out what the difference between dirt farmers and potential terrorists were, and I think it really helped in the recent release program.

Senator REED. Can I just follow up, Mr. Secretary? Mr. Aldridge has created an oversight board, and also there is a report required by the Wyden amendment. Can you update us on the status of these aspects?

Secretary WYNNE. The oversight board has been published. Mr. Minow is the chairman of that board. We have candidates who are undergoing the standards-of-conduct interviews and the financial transaction disclosures that all of us have to go through. We hope that does not cause any fallout, but I do not think it will. These are pretty dedicated Americans who are very concerned with civil liberties. I think that will be good.

The secondary board is an internal board that consists of Secretary Aldridge as the chair and Secretary Feith and Secretary Zakheim as cochairs to try to go through and make sure that they have the policies of record done.

Senator REED. With the permission of the chairman, one follow-up question. You pointed out that DARPA builds the tools, but who in DOD, and maybe I am just asking you to repeat what you have said, is responsible for the deployment of these tools and the actual use of them?

For example, I understand that both Joint Forces Command (JFCOM) and Intelligence and Security Command (INSCOM) are using something like this, both testing it and using it.

Secretary WYNNE. It is really INSCOM for the Army. There is, if you are deployed overseas and you have freedom and permission on a foreign data base, but I would have to take for the record, sir, the issue about JFCOM.

[The information referred to follows:]

A number of agencies and commands of the intelligence, counterintelligence, and military operational communities have agreed to participate in the TIA experimental network: U.S. Army Intelligence and Security Command, National Security Agency, Defense Intelligence Agency, Central Intelligence Agency, DOD's Counterintelligence Field Activity, U.S. Strategic Command, U.S. Special Operations Command, Joint Forces Command, and Joint Warfare—Analysis Center.

These organizations, working with the TIA program, have established a collaborative environment in which the participants can form ad hoc groups across the organizations, discover new experts and ideas, and begin to work operational problems in the global war on terrorism, such as:

- Analyzing data from detainees from Afghanistan and finding relationships among entities in that data and with additional relationships from all-source foreign intelligence information.
- Assessing various aspects including weapons of mass destruction in the Iraqi situation.
- Aggregating very large quantities of information based on patterns into a visual representation of very complex relationships, which enabled rapid discovery of previously unknown relationships of operational significance.

The organizations participating in the experiments are potential transition partners if experiments are successful. Any agency contemplating deploying TIA tools for use in particular contexts will be required to conduct a pre-deployment legal review of whether the contemplated deployment is consistent with all applicable laws, regulations, and policies. The DOD General Counsel has directed each operational component within DOD that hosts TIA tools or technologies to prepare a substantive legal review that examines the relationship between that component and TIA and analyzes the legal issues raised by the underlying program to which the TIA tools will be applied. The General Counsel also has advised that all such relationships should be documented in a memorandum of agreement between TIA and the component to ensure that the relationship is clearly understood by all parties.

Senator REED. I do not want to belabor this, because Senator Kennedy needs a round, but I would feel more comfortable if I not only knew what DARPA is doing, which is essentially building the tool, but what is the overall DOD policy about how this tool is going to be used?

Secretary WYNNE. In each case where it is being used, we are putting a memorandum of agreement in place between DARPA and the using agencies, so we will have several chartered agencies, and they will equally agree to use these in a lawful sense in protecting the privacy of American citizens wherever possible.

The fact is that I think that policy or the lack of a policy led to some misunderstandings and potentially disagreements, but the fact is, those policies are now in place, and each agency that takes it on, be it INSCOM or JFCOM, has to sign an agreement with DARPA as to how to use it written by both of the general counsels.

Senator REED. Thank you, Mr. Secretary.

Senator ROBERTS. Senator Cornyn. We are going back and forth.

Senator KENNEDY. Fine. I just found that out.

Senator ROBERTS. This is in the tradition of the bipartisan nature of the former Chairman of the Health, Education, and Labor and Pensions Committee.

Senator CORNYN. I have just been so inculcated with the seniority system, Mr. Chairman, and I just automatically——

Senator KENNEDY. Don't forget it, either. [Laughter.]

Senator CORNYN. I thought I would be the last, regardless of party affiliation.

Senator ROBERTS. Just count your blessings and ask your questions. [Laughter.]

Senator CORNYN. Gentlemen, I was just curious about electromagnetic pulse (EMP) weapons. I know one of the challenges we have in the current conflict in Iraq is to degrade the regime's ability to communicate with the people on television and radio and otherwise to try to maintain at least some hope on the regime's part that Saddam would remain in control. I would like for you to respond to what is the potential of electromagnetic pulse weapons in modern warfare, and what are we doing for our part to make sure that as dependent as we are upon computers and electronic devices, that we are protected from those threats by our adversaries?

Secretary WYNNE. I will just start quickly that we have several hardening programs underway. We invent them, then we try to prevent at the same time. I think one of the lessons that we are learning is number 1, the effect of such a weapon, and how does it actually, as different from maybe what it was purported to do in the laboratory effect things. As we find things from the laboratory, we are moving towards hardening programs.

Senator CORNYN. Paul.

General KERN. I would say two aspects. First, we have moved very clearly and quickly into the electronic era of information processing. So many of those products are commercial off-the-shelf, and we have done a tremendous amount of testing and evaluation of those systems against EMP, and so we have a very good understanding of where our vulnerabilities are and where we need to do further work on hardening, so without going into a lot of details, we do understand that.

The second piece of it, though, is that we have been pleasantly surprised that many of the commercial off-the-shelf products demonstrate a great deal of resiliency that we did not expect. It is not all bad news and we have found some real successes in that area. I would not underestimate that we still need to do a great deal of work for the future systems as we see more and more of our weapons platforms moving to electronics information systems and exposing war vulnerability to EMP. We will continue to work the hardening of all of our future systems a great deal.

General LYLES. I will concur with what Paul mentioned. As we better understand exactly how the programs that we are working on provide effects, how they couple them to capabilities in computer systems or even in buildings, it then gives us an opportunity to figure out how do we counter that to make sure that something like that does not happen to us.

We are still relatively in our infancy, regardless of what you read in the newspaper, with some of these weapons systems, almost all of whom are in the special access category, but we are still in our infancy, and we are looking on both sides of the equation, both how do we use them effectively, but also how do we make sure that somebody does not use technology like that against us.

Senator CORNYN. Admiral.

Admiral DYER. I would just add that we are somewhat blessed in the Naval Service with the challenging electromagnetic environment that we face on board the carrier today. With the aircraft in close proximity and associated weapons systems of the ships we have had to be very focused on shielding for years. That will continue to serve us as a form of departure and, as Secretary Wynne indicated, we are all looking at the ways to improve shielding in future systems.

Senator CORNYN. Thank you, gentlemen. I yield back the remainder of my time, Mr. Chairman.

Senator ROBERTS. Senator Kennedy.

Senator KENNEDY. Thank you. Mr. Secretary, I have here the table of the 2005 BRAC time line, and the first item on it is April 15, 2003, the infrastructure Steering Group recommends initial categories for analysis. Then the next one is December 31, 2003, Secretary of Defense sends initial selection criteria to Defense Committees and publishes the same in the Federal Register.

Have you been working now, since it is 2 weeks away, and have these other representatives of the labs been working on the initial categories for the analysis?

Secretary WYNNE. Sir, we have barely started. A report, in fact, is due at 5:00 this afternoon.

Senator KENNEDY. You have about an hour and 15 minutes.

Secretary WYNNE. I recognize that. My boss does, too. Unfortunately, but we have barely begun the how-are-we-going-to-do-the-process. Our criteria is fairly broad, but does start with no military value, and I think frankly it is going to get—

Senator KENNEDY. Well, we could assume, if I could move on, that this will probably slip a bit, the April 15? Will the other members of the panel have an opportunity? Will they be asked to have an input in this?

General LYLES. Senator Kennedy, the answer is yes. As a matter of fact, I have identified one of my key scientists, mature scientists with a lot of experience to be part of this to ensure the right infrastructure equities are being accounted for in this process.

General KERN. I would add yes for the Army as well.

Senator KENNEDY. You will be involved in the process, good, and I assume the Navy.

Admiral DYER. Yes, sir.

Senator KENNEDY. This has been an enormously valuable hearing, Mr. Chairman. If I could ask Admiral Dyer, I was interested in how do the marines work with you in terms of their priorities. The one particular priority that I have been interested in over a long period of time is the countermining warfare at sea priority. This has been something in which, quite frankly, the marines have been interested and the Navy has not, and former Secretary Cohen and I have worked with the Navy on the program.

I was just wondering, on the kinds of issues that they might have, how does that work with you. I guess we will not hear from the Marine Corps today, but we will be interested at least to hear from you how you work with them in order to get their kind of input in terms of their priorities.

Admiral DYER. Yes sir, Senator Kennedy. Perhaps the best answer to that question is right behind me. The Chief of Naval Research is Admiral Cohen, and right beside him is the Deputy Chief of Naval Research, who is a marine one-star, so we are joined at the hip at the very top of organizing S&T and research and development in our Naval Service.

I would add that to look in my own area of naval aviation, it is very much naval. The Naval Air Systems Command attends to those systems for both Navy and Marine Corps aviation, and it is well-coordinated, no better example playing out in real time than the integration of Marine Corps aviation aboard carrier and the progress that we have made in the last couple of years, so I think it is a good news story, sir. I think you would be proud of it.

Senator KENNEDY. I will submit some later questions just with regard to the mine research, which I have been particularly interested in.

On the issue of researchers, foreign researchers, and the dependency that we have on the foreign researchers, are you working, Secretary Wynne, with immigration? With all of the problems, the challenges that we are having now and the restrictions in terms of permitting visas for a number of the countries which had provided us with researchers. Are you beginning to work with them on this, and are you satisfied that you are getting the grants to the visas, for the ones that are necessary now to work on these programs?

Secretary WYNNE. Sir, I have not personally been involved in that aspect.

Senator KENNEDY. It has not been brought to your attention as a problem yet?

Secretary WYNNE. No, sir.

Senator KENNEDY. Well, that is helpful, because I am on that Immigration Committee, and the numbers have gone down dramatically. A follow-on question, how are we going to react to these foreign students who are coming in terms of the security issues which now are an increasing kind of concern? How is that going to be the protocol, how is that going to be working through? I would be glad to have you get back to me on it, because this is rather technical.

Secretary WYNNE. I do know that it is affecting university research, because the professors there were somewhat dependent on that labor.

Senator KENNEDY. All right. I will submit those.

Finally, on the whole area of getting scientists and research, there have been a number of comments about the workforce, and this is something that I happen to be enormously interested in. I just mention one minor point and use up my last minute here.

We in Massachusetts are the first State now that is going to have an engineering course Kindergarten (K) through grade 12. It is principally sponsored now out of the Museum of Science in Boston. They have worked it out with the State, and they are going to include that in their curriculum now in terms of reaching the very goals in terms of proficiency, even under the No Child Left Behind Act. They are working on some enormously interesting research, and have had some very important success in terms of both minorities and with regards to young girls and women in this area.

This has been an area which has been, for far too long, limited for a variety of different reasons, but this is something that they are working on. So we welcome any of the kinds of programs that you are working on, and I will write to all of you on it, that you are being successful, because we want to try and, in other areas of public policy, give those encouragement. We need to do that in a great number of areas of public policy, and we would certainly benefit from what you have found to be helpful and successful in reaching your goals.

I thank you, Mr. Chairman.

Senator ROBERTS. Senator Reed.

Senator REED. Thank you very much, Mr. Chairman. Secretary Wynne, last year Congress enacted legislation creating a Defense Test Resource Management Center in order to help coordinate, plan, rationalize the use, the joint use of test facilities and evaluation facilities, to be headed by a three-star general officer. Can you tell us when we can expect that nomination to come before the Senate?

Secretary WYNNE. Sir, we are on track to construct such a directorate. The problem is that the solicitation of a three-star general, which is a flag officer, which is the stipulation, is somewhat difficult these days, with the Services all engaged in an active engagement. We are hoping, as everyone else is, for a relatively quick end and intend to resubmit that nomination to the Joint Chiefs when we feel like there could be a little bit more fertile ground for the three-star nomination.

We recognize that the committee might be kind to give us relief and perhaps substitute a Senior Executive Service member or something along those lines. We have not yet given up on the initial direction.

Senator REED. If there were some relief, then that civilian would be of equal rank to an O10, or O9, rather, a three-star?

Secretary WYNNE. Sir, I would have to go look at what we have available in that regard, and sometimes the capabilities far outnumber the rank, but I do not know what we have available, sir.

Senator REED. But your intention is to still try to find a military officer?

Secretary WYNNE. Yes, sir, right now it is.

Senator REED. Thank you.

Admiral Dyer, if I could ask one final question. I noted that the Navy's S&T budget request includes a number of programs transferred to it by the Office of the Secretary of Defense (OSD), others that pass through to JFCOM, and I understand without those programs, the DOD-interested program and the JFCOM programs, that the S&T request this year is down by \$50 million from last year's request, down nearly 25 percent, or \$400 million from last year's appropriated levels. What specific areas of investment do you have to cut back because the money that the Navy actually has, the Navy-initiated programs has been decreased?

Admiral DYER. Sir, to get the detail of what was cut back I would like to take that for the record.

Senator REED. Absolutely fair. Absolutely fair.

[The information referred to follows:]

While Basic Research (6.1) has benefited from the development of a portion of the University Research Initiative program to Navy, there remain difficult choices in Applied Research (6.2) and Advanced Technology Development (6.3) funding to maintain the best possible portfolio in the face of the significantly constrained budgetary environment.

In the face of the significantly constrained budgetary environment, we made difficult choices in Applied Research (6.2) and Advanced Technology Development (6.3) funding to maintain a viable portfolio to fund transformational S&T at a rate we can afford.

We cut the FNCs designed to deliver new capabilities to the warfighter in order to focus only on the highest priority projects within the 6.2 and 6.3 portfolios.

The following shows some of the primary FNCs' products that were reduced or not pursued in the fiscal year 2004 President's budget request:

- Low Observable Integrated Deckhouse
- Advanced Estimate of Sensor Performance
- Mission Responsive Ordnance
- Limits of Passive Sonar
- Underwater Surveillance Data Link Network

Senator REED. Just let me add for the record, too, that I have a very keen interest in the unmanned underwater vehicles, and those are issues which I hope are top priority and not on that list of things that had to be forgone.

Thank you, Admiral, gentlemen. Thank you, Mr. Chairman.

Senator ROBERTS. I just have a couple of wrap-up questions here. I remember 2 years ago, I asked Secretary Aldridge about whether the hiring authorities authorized by Congress would be implemented by the Department. He assured me that they would, 2 years have gone by and we really have not seen too much progress. The thought occurred to me if the NSPS has not submitted to Congress, or if it does not pass, will the authorities that were previously authorized then be implemented by the Department? For example, I am talking about the direct hire by lab directors.

That would be to you, Secretary Wynne.

Secretary WYNNE. We have submitted that as a best practice, and it would be in the Federal Register. Which means it would have the force of policy, which would implement the laws as it was passed. I think we were looking to the NSPS, if it is here and if you take kindly to it and pass it as well, would actually supplement the best practices until it was rejoined in the Federal Register, because each law has to be formulated in implementing instructions and then released in the Federal Register.

Senator ROBERTS. Oh, it would be commensurate, not an either/or thing.

Secretary WYNNE. Yes, sir.

Senator ROBERTS. Right. I want to follow up on Senator Reed's question in regards to our adversaries and even our allies who are investing in a specific technology which could provide them a technological advantage in the future. I would like to know what mechanism do you currently utilize to make an informed investment decision to identify the cooperative research opportunities and track, and this is the real nub of the question, and track foreign research efforts in emerging technologies so it is not only what we think we need, but what others are doing, and what we need to do to make sure that they do not gain an unfair advantage. What mechanism do we use, other than damned good intelligence?

Admiral DYER. Well, in the Navy's case, sir, we have field representation in Europe, emerging in Russia, and in areas in the Pa-

cific that represent the eyes and ears of the technical community to ensure that we do not suffer technological surprise.

Senator ROBERTS. General Lyles.

General LYLES. We have a similar situation, Mr. Chairman. We have a European Office of Aerospace Research and Development and a Japanese Office of Aerospace Research and Development both to look at their specific theaters and continents and work with both our friends and potentially understand what the adversaries are doing in research and development so that we can track them very closely.

Senator ROBERTS. Good.

General Kern.

General KERN. We have similar offices located in Europe and in Japan which were, many of them, co-located with the other services. In addition, we have foreign science internships where we work in the universities with some of our scientists to learn what they are doing. The third area that we are working right now is to expand what had been our historical locations into Eastern Europe, into the new nations of NATO, and to look at some of the other areas, and we use those other bases to move out from that.

I have organized all of that in the Army under our Research and Development Engineering Command, which had been spread out in the past under a number of different organizations, so that we can better coordinate it. I have even gone so far as to coordinate with the Foreign Service, the U.S. Navy, and I met with Admiral Cohen—[Laughter.]

—and we discussed how we could better coordinate our efforts together, as well as with Les Lyles.

Senator ROBERTS. What about a searchable data base, sort of a central repository, and it could be classified or unclassified? Would that be helpful, to know what it had?

Secretary WYNNE. Sir, we are doing two things. We do maintain the military critical technology list as far as outbound technology, and then we are, in fact, reinserting the intel community into the R&D planning and S&T planning so that we get first hand access to whatever data screening devices they might have relative to foreign science journals and such.

Senator ROBERTS. One final question. It would be helpful to request an unfunded priority list from you all from the Services for S&T. This would allow us to put more good Government into good zip codes, if you get the drift, so if you would do that for the committee staff, that would be most appropriate.

I thank you all for coming. Thank you for your time and patience, and more especially, thank you for what you are doing for this country.

Secretary WYNNE. Thank you, Mr. Chairman.

General LYLES. Thank you, Mr. Chairman.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR PAT ROBERTS

BANDWIDTH FOR UNMANNED SYSTEMS

1. Senator ROBERTS. General Kern, General Lyles, and Admiral Dyer, as was apparent at the technology demonstration, many of today's innovative technologies are unmanned systems. These systems will be responsible for sending tremendous

amounts of information around the battlefield and to the warfighter. What efforts do you have underway to enable the bandwidth necessary for these unmanned systems to be truly effective?

General KERN. Bandwidth is a concern for all of our systems to include the emerging unmanned systems. We are making positive strides to address bandwidth concerns but still have more work to do. The emergence of the software radio, specifically the Joint Tactical Radio System (JTRS) provides the capability to implement in software the communications waveforms that will better address these bandwidth concerns. We have come a long way from the primarily voice and fax networks that were the standards only a decade or so ago. DOD is developing KA band terminal for high bandwidth communication to future DOD wideband SATCOM systems (i.e., Wideband Gapfiller System). This enables UAVs to access significant bandwidth, beyond line of sight to control ground systems.

We do have some efforts currently underway and are in the process of putting others in place to address unmanned networking. The S&T community is addressing the bandwidth issue for all systems with the following three-prong attack to address the bandwidth issue. Specifically those areas are:

- 1) Focus on improving the communication systems themselves to increase their throughput capacity.
- 2) Develop (e.g., Multi-function On-The-Move Secure Adaptive Integrated Communications (MOSAIC)) bandwidth management mechanism that will allow the network to function more efficiently.
- 3) Engineering the applications/systems to more efficiently utilize the network.

The combination of these three thrust areas will lead to a system of system network that will optimize bandwidth usage and assure that critical information gets to its destination in the appropriate time.

Communication System Improvements: S&T efforts in this area are focused on transitioning technologies and supporting programs for PM Tactical Radio Communications Systems (TRCS) (JTRS), Warfighter Information Network—Tactical (WIN-T) and FCSs. Present programs include: more efficient, low profile and directional antennas; co-site and interference mitigation capabilities; new frequency radios (for example: Ka, Laser, and Ultra-wideband); frequency agile radios and more efficient waveforms such as Turbo coding. In the past, the flexibility of even our best tactical communications systems was greatly limited by their inherent hardware constraints, which in turn were limited by their original anticipated missions, their “stovepipe” approaches, and their rapidly obsolete technologies and designs. Consequently, deployed systems were not only years or decades old, but they were often unable to fully satisfy the continually changing needs of our military, regardless of the cost. The JTRS program will soon provide the critically needed flexibility to upgrade many of our tactical communications systems to the latest available technologies and waveforms, in addition to greatly improving interoperability, performance, capacity, and economy of production. It will also incorporate imbedded GPS location, automatic “gateway” functions between networks, and the new robust and flexible Wideband Networking Waveform (WNW). Due to the unique requirements associated with unmanned systems and the over-allocation of the JTRS wideband waveform the Army is pursuing the development of an additional JTRS compliant waveform under the Soldier-Level Integrated Communications Environment (SLICE) program. In addition the Army will leverage the emerging Transformational Communications Satellite (TCS) effort that will significantly enhance our ability to use satellite communications on the tactical battlefield with high data rate communications.

Bandwidth Management mechanisms: Primarily this area refers to the protocols that will seamlessly bind the sub-networks such as Satellite, JTRS, and WIN-T into a coherent overall network. These protocols include an overall Quality of Service (QoS) set of protocols that will assure the network Reserves sufficient bandwidth to support the individual task (such as voice calls or video) and the ability to prioritize them such that the higher priority tasks go through the network in a timely quality manner. Also included are protocols that allow the warfighter to join and leave sub-networks in an efficient timely manner, and ones that provide the ability to select the best route/network to utilize when more than one sub-network is accessible (note: FCS envisions a multi-tier network: satellite, airborne, terrestrial, and wired). Presently commercial protocols don’t support a dynamic multi-hop, multi-tiered, wireless network or the seamless interface between the different networks (for example JTRS, WIN-T, and Satellite) that are required for FCS. S&T programs are addressing these requirements as well as providing the commander’s management tools to change and optimize the network to the tempo of the battle such as shifting

priority from Video in the planning stage to Data in the execution phase to support call for fire.

Application/System Bandwidth design: This area is focused on how to design each application/system to more efficiently utilize the network and what can be done to reduce the load placed on the network. Areas to be considered include: frequency of updates; data compression; on-board processing; header information that identifies priority and traffic type such as video, voice, and data so the bandwidth management mechanisms can act upon them; packet size to match the packet size of the network; and various others. With regards to unmanned system several design approaches can have a tremendous impact on the bandwidth required. It should be noted that the bandwidth requirement associated with unmanned systems can be broken down into two major categories, the bandwidth necessary to control the system and the bandwidth required to transmit what is received from the unmanned system (sensor data). Control bandwidth is greatly affected by the amount of autonomous operation the unmanned system can achieve. Very limited bandwidth is needed for sensor (Unmanned Ground Sensor) fields and mines, UAVs require some control but their operations are getting more autonomous while unattended ground vehicles (UGVs) still have some challenges and require the most bandwidth. The sensor bandwidth can be greatly affected by the amount of on-board-processing (ability to locally interpret the information) and the frequency with which you send updates.

General LYLES. The challenge to our S&T program is to provide needed additional bandwidth, while reducing the load on the available radio frequency, or RF spectrum. The S&T program addresses this challenge in three ways: better use of existing RF spectrum, making advances in data compression techniques, and using our networks of RF links more effectively.

First, the existing RF spectrum can support more users by putting systems in the field that use more efficient RF waveforms. New advances in modulation and coding technology can transmit up to gigabit transfer rates in a limited amount of spectrum. Recent breakthroughs in the removal of interference will also allow more users to operate successfully in a limited frequency band. We are developing technologies to make better use of lower frequency bands that have been underutilized. Software-defined radios, such as the Joint Tactical Radio System, could let us implement these and future technologies. Improvements in antenna technology can support more users by covering broader ranges of frequencies and could support the reuse of frequencies by better controlling the direction of transmitted and received signals.

The second area, data compression, will allow more data to be passed within the same bandwidth. We are developing superior data compression techniques by examining both commercial and military unique procedures.

Finally, demands on frequency allocations can be reduced by smarter networking technology. Technology solutions in this area include the development of new techniques that are designed specifically for wireless links. We are developing new compression techniques to pack greater amounts of image and video data into fewer and fewer bits. Laboratory programs are developing prototypes that use multiple RF links at a time and can route information intelligently to reduce the need for bandwidth in congested portions of the RF spectrum.

The combination of these three approaches could reduce the demand on the bandwidth for unmanned systems.

Admiral DYER. The Navy S&T is looking at several approaches to increase information throughput. Increasing bandwidth is only one way to increase throughput. We have many programs aimed at this. We are looking at advanced protocols which would enable us to pack more information in the same bandwidth or to transmit information in a more efficient manner. Some of these have already transitioned to the Navy and non-Navy communities.

We are examining technologies to develop apertures that support high frequency communications which enable denser information packing. We are supporting intelligent compression techniques which enable us to transmit less bits of data, but the same amount of information. Again some of these techniques are already transitioning. We are supporting multi-function, multi-beam apertures so that effectively one has more communication capacity from a given aperture. Also, we are supporting Autonomous Decision Aides and Target Cueing technologies that will allow the UAV mission systems to filter the information, onboard the UAV, prior to transmission. Finally we are supporting high density memory technology. This would enable one to carry more information since much of the information in images and video are not changing. Thus one only needs bandwidth to transmit changes to information, not the full information.

NUCLEAR DETECTION CAPABILITIES FOR FORCE PROTECTION

2. Senator ROBERTS. General Kern, General Lyles, and Admiral Dyer, what nuclear and radiological detection capabilities do the Services currently employ for force protection and what areas require improvement to meet force protection needs?

General KERN. The Services currently employ the following nuclear/radiological detection capabilities for force protection. The AN/PDR-75 Radiac Set provides the capability to monitor and record the exposure of individual personnel to gamma and neutron radiation. The AN/PDR-77 detects and measures alpha and x-ray radiation. The AN/UDR-13 "Pocket" Radiac Set is a compact hand-held or pocket-carried tactical device capable of measuring prompt gamma/neutron dose from a nuclear event plus gamma dose and dose-rate from nuclear fallout. The AN/VDR-2 which is used to perform ground radiological surveys in vehicles or in the dismounted mode by individual soldiers as a hand-held instrument.

Future needs/improvements focus on automated, low cost dosimeter capabilities to enhance individual warfighter survivability. A Joint Standoff Radioactivity (RADIA) System and an Advanced Airborne RADIAC System remain on the Joint Future Operational Capabilities (JFOC) list as required radiological Early Warning capabilities. Standoff radiological detectors provide the commander with a capability to identify the content of a detected radiological hazard by specific type (source of radioactive hazard) before it impacts operational forces. Also required is Radiological Confirmation and Validation. This capability provides a rapid, valid, and reliable in-theater confirmatory laboratory analysis of a suspected radiological hazard presence in environmental samples and clinical specimens. This capability enables commanders with a mobile, versatile, and tailorable ability that can address all radiological threat hazards. Finally, while point detection for radiation exists, the age of several fielded dosimeters (AN/PDR-75 & AN/PDR-77) averages 20 years. Radiological detectors provide the commander with the ability to detect and identify the presence of radiological hazards in the immediate area of operations, on personnel within the area of operations, and provide information necessary to conduct immediate planning in support of timely medical and restoration decision-making activities.

General LYLES. Currently, all Air Force installations (including Active, Guard, and Reserve) are required to maintain a major accident response capability that includes ADM-300 radiological detection kits and Staplex Air Samplers. In addition to this home-station response capability, many bases also maintain a deployable detection capability (ADM-300). The Air Force also maintains three Response Task Forces that serve as DOD's primary response elements for command and control at the scene of a nuclear weapon/material accident. Each of these teams possesses organic radiological detection equipment (ADM-300). Finally, the Air Force Radiological Assessment Team has a suite of advanced equipment that permits detailed assessment of any radiological incident. Any or all of these assets could be used, as needed, to support force protection issues at fixed CONUS and OCONUS Air Force installations as well as at deployed locations.

All of our current systems are point detectors; they must be within meters of the radiological hazard to detect it. They are not linked to an automated monitoring system to facilitate remote operations. This limits their utility for early warning. Additionally, there are not standoff radiological detection systems currently available.

Admiral DYER. Navy has radiation detection devices available for force protection both at sea and ashore for the detection of low (and higher) levels of radiation associated with various nuclear and radiological events. Current capabilities are considered to be adequate in support of operational forces and installations.

DEFENSE LABORATORIES

3. Senator ROBERTS. General Kern, General Lyles, and Admiral Dyer, could you describe the coordination process your organization participated in during the formation of the National Security Personnel System (NSPS)?

General KERN. Army personnel from Headquarters, Department of the Army, and the Army Materiel Command participated in a series of OSD sponsored work groups to study best personnel practices from demonstration projects operating within DOD and across the Federal service in four key areas of human resources management. Each of these groups made recommendations to the members of the OSD Civilian Personnel Policy Council on what they considered to be "best practices". The Army Assistant G1 (Civilian Personnel Policy) served as the Department of Army representative on the Council. He participated in the development of the initial legislative language and reviewed and approved subsequent drafts. The Army and I

strongly support the NSPS because it will unify into one simplified DOD system the multiple personnel systems under which we currently operate.

General LYLES. Air Force Materiel Command was represented by the Air Force Research Laboratory Project Office and Headquarters Air Force, Directorate of Personnel Policy, on the Department of Defense "Best Practices Task Force." However, neither the Command nor Headquarters Air Force was formally asked to comment on the enabling legislation for the NSPS.

Admiral DYER. The Navy laboratories and warfare/systems centers that are designated as S&T Reinvention Demonstration Project Laboratories were consulted by the staff of the Office of the Director, Defense Research and Engineering (DDR&E) through the Personnel Sub-panel of the Laboratory Quality Enhancement Panel (LQEP) regarding a DOD Best Practices Personnel Demonstration Project, which may form the basis for the NSPS. More specifically, the LQEP Personnel Sub-panel was invited to send one representative to each of the four DOD best practices working groups. There was a LQEP representative on the Performance Management, Classification, and Staffing Working Groups. Through this process, the reinvention lab participants were able to provide feedback on some of the proposals of the Performance Management and Classification Working Groups. In addition, the staff of DDR&E requested the S&T Reinvention Demonstration Project Laboratories to provide information on the various personnel innovations, delegations, and flexibilities they needed to assist the laboratories in meeting their mission. This information was made available to the Senior Steering Group member from DDR&E representing the S&T Reinvention Demonstration Project Laboratories in the development of the best practices proposal.

DEVOLVEMENT

4. Senator ROBERTS. Secretary Wynne, this year your office devolved (transferred) several programs to the Services. Many of these programs reside in the Office of the Secretary of Defense (OSD) because of the inherent jointness of the program. What was the objective of moving these programs?

Secretary WYNNE. I expect no diminution of the jointness of these programs, and there are already many joint programs in the Service and Defense Agency budgets. We transferred budgetary responsibility, not oversight responsibility, by shifting the funding for the programs from OSD to the Services. The Services were already executing the programs and performing the day-to-day operations in any case, and certainly have the necessary expertise to manage programs efficiently and effectively.

OSD is a headquarters organization whose primary responsibilities and organizational structure are inconsistent with executing a number of programs. I also saw no reason to retain an extra layer of management for program execution within a headquarters organization. With this in mind, we shifted our emphasis into new "business areas" more attuned to those of Under Secretary Aldridge, and Secretary Rumsfeld's transformation agenda. We divested the organization of functions and workload. We returned to oversight and policy development responsibilities, and divested line management responsibilities to the Military Departments.

The OSD will continue program oversight responsibilities by establishing a set of output-oriented metrics to ensure the Military Departments meet the "core/joint service" objectives of the programs. In addition, the OSD will review execution plans and metrics prior to the start of each fiscal year, and at mid-year to determine future allocations. Programs also have senior review groups that will remain in place to provide monitoring from the OSD.

5. Senator ROBERTS. Secretary Wynne, for those programs that fund work in multiple Services, how does OSD intend to keep these joint in nature if they are devolved to a particular Service?

Secretary WYNNE. Senior review groups with members from the OSD will remain in place to ensure particular military departments meet the "core/joint service" objectives and metrics of the programs. The senior review groups will review execution plans and metrics prior to the start of each fiscal year, and at mid-year to make recommendations concerning future funding allocations.

The Physical Security Equipment, Unexploded Ordnance Detection and Clearance, and High Performance Computing Modernization programs are good examples.

Physical Security Equipment. Monitoring will continue to be provided by the Physical Security Equipment Action Group. The action group is composed of staff from the OSD and the military departments responsible for research, development, test, and evaluation to develop solutions for military department operational requirements. Representatives from other Federal agencies also attend meeting.

Unexploded Ordnance Detection and Clearance. An Executive Committee, Joint Board of Directors, and Joint Unexploded Ordnance Coordination Office will continue to complement each other to ensure a joint perspective for this mission area.

High Performance Computing Modernization. The High Performance Computing Advisory Panel will continue the oversight function. The High Performance Computing Advisory Panel members include the S&T and test and evaluation communities from the Military Departments and Defense Agencies.

FUNDING FOR DARPA

6. Senator ROBERTS. General Kern, General Lyles, and Admiral Dyer, the Defense Advanced Research Projects Agency (DARPA) has a critical mission of performing high-risk, high-payoff research and its budget has been increasing over the past several years. Currently DARPA's budget is about 28 percent of the defense S&T budget. How are you coordinating with DARPA and leveraging their resources?

General KERN. DARPA is an essential partner in transforming the Army. As such, the Army is coordinating with DARPA on many levels to ensure success. At the Department of the Army-level, memorandum of agreements are negotiated with the DARPA to leverage capabilities of both organizations and to combine resources. Prominent examples of this cooperation are the FCS and Unmanned Combat Armed Rotorcraft programs. Typical management arrangements are where DARPA has the program management lead until the Milestone B and the Army has program management lead after Milestone B—these programs transition directly into Army Acquisition Programs.

At the Army Materiel Command's (AMC) Research, Development, and Engineering Center-level, for programs that do not transition directly into an Army Acquisition Program, DARPA program managers coordinate with AMC's Science and Technology Objective Managers. An example of this is the A-160 Hummingbird program.

In addition to the three above, examples of other DARPA programs that the Army leverages are Organic Air Vehicle, Unmanned Ground Combat Vehicle, NetFires, Self-Healing Minefield, Airborne Communications Node, Small Unit Operations: Situational Awareness System, Lithium Ion Batteries, High Rotorcraft Radar, and Tactical Sensors—Unattended Ground Sensors.

The Army plans to continue partnering with DARPA on its path to Transformation.

General LYLES. The Air Force and the DARPA enjoy an excellent symbiotic relationship. In fact, last year, the Air Force Research Laboratory (AFRL) received approximately \$450 million in customer funding from DARPA and expects about the same amount in fiscal year 2003. This funding is connected with over 300 different efforts and AFRL's Information Directorate acts as DARPA's largest agent executing over 200 of these efforts. More importantly, the Air Force ensures that the research we do with DARPA is leveraged to support Air Force technology requirements. Examples of programs leveraging DARPA funding include:

- Control of Agent-Based Systems—\$7.4 million
- Intrusion Tolerant Networks—\$8.7 million
- DARPA Markup Language (DAML)—\$9.9 million
- Bio-Computation—\$10.0 million
- Basic Research—\$20.2 million

Admiral DYER. Our investment portfolios are not built in isolation. The Defense Reliance process integrates the Services' S&T programs while preserving the healthy diversity of vision and approach that has given us the technical agility we enjoy today. Our relations with the DARPA are excellent and productive. Much of the Office of Naval Research's basic and applied research investment is designed with a view to handing scientific advances over to DARPA for further development and exploitation. The Unmanned Combat Air Vehicle program is an excellent example of this kind of collaboration. We are working closely with DARPA on wide band gap semiconductors to support the radar, communications, and electronic warfare systems of the future, including the advanced multifunction radio frequency concept.

QUESTIONS SUBMITTED BY SENATOR JACK REED

MARINE MAMMAL ENVIRONMENTAL ISSUES

7. Senator REED. Secretary Wynne and Admiral Dyer, I know that the Navy has been facing a difficult issue in trying to balance operational and training requirements for active sonar tracking of submarines with concerns over the effects of these technologies on marine mammals. Are there any technologies being developed in the

Navy or DARPA S&T programs that may be able to replace active sonars as we search for enemy submarines?

Secretary WYNNE. DARPA has a development effort entitled Robust Passive Sonar (RPS) that is in its fourth year of a 5-year program. The goal of the RPS program is to significantly increase the performance of tactical towed sonar systems operating in littoral environments. This will be accomplished by canceling out the primary cause of interference, surface shipping noise and extending target detection and capability. The RPS program accomplishes surface shipping noise cancellation by innovative processing techniques coupled with multi-dimensional receive arrays and other external information. In addition, the program will extend target detection and tracking: (1) while the receive array is maneuvering by compensating for the acoustic array shape; and (2) in the forward direction by suppressing noise from the receiver tow platform. Net system performance gains against surface shipping noise are expected to be 10 decibels or greater, thereby providing an increased ability to detect quieter targets such as submarines. It is expected that this system will affect future array and acoustic sensor field designs. By extending the range of scenarios for which passive acoustic techniques are effective, RPS may reduce the range of scenarios for which active sonar is applied. The program plans to take the prototype RPS system to sea as part of a U.S. Navy exercise in fiscal year 2004. The exercise will be used to evaluate the technical performance and operational utility of the RPS processing system.

Admiral DYER. There is no "silver bullet" for Anti-Submarine Warfare (ASW). Effective ASW requires a mix of technologies, including active acoustics. One reason is that the marine environment very strongly affects any given technology. A particular technology may work well in one place at one time of the year and not in the same place another time of the year or in a different place the same time of the year. Another reason is that the way submarines operate affects any given technology. Fortunately, the mix of possible technologies complements each other to some degree. For example, acoustic technologies work well many places in the winter while non-acoustic technologies work well many of the same places in the summer. Active acoustic technology often works well against submarines operating deeply submerged while non-acoustic technology often works well against submarines operating near the surface. The Navy has not yet developed a full complement of technologies to effectively implement ASW in all places through out the year and under all operating conditions. Active acoustics is and will remain a necessary part of that complement.

8. Senator REED. Secretary Wynne and Admiral Dyer, how much are we investing in these efforts?

Secretary WYNNE. In fiscal year 2000 through 2004, DARPA is investing \$64 million for the RPS program.

Admiral DYER. The Office of Naval Research (ONR) is investigating more effective active sonar technology that the Navy hopes will reduce adverse effects on marine life through reduced source levels, alterations in signal characteristics, and focusing of emitted sonar beams. ONR research into the interactions of marine life and sonar sounds will help guide our search for reduced environmental impact from active sonar, while preserving and enhancing the effectiveness of this vital fleet protection asset. ONR is also exploring the development of non-acoustic capabilities, including magnetic and optical sensors, to complement existing active and passive sonar capabilities, with the goal of reducing reliance on active acoustics as a means of anti-submarine force protection. Annual investments in these two scientific program areas [sonar effects on marine mammals and new technologies (magnetic and optical sensors) to replace active sonar] are approximately \$3 million and \$10.5 million, respectively. Taken together, these programs should enable the U.S. Navy to keep up with the challenges posed by advancing foreign submarine technology while simultaneously reducing the potential risks to marine life from the active sonars.

9. Senator REED. Secretary Wynne and Admiral Dyer, what are the technical barriers to the eventual deployment of these systems?

Secretary WYNNE. The innovative processing techniques employed by the RPS program are computationally intensive. When these techniques are coupled with the use of multi-dimension receive arrays, the computational requirements exceed the sonar processing capability currently installed on submarines and surveillance vessels. During the life of this program, computer industry advances in processor speed and the increased availability of field-programmable gate arrays as commercial off-the-shelf hardware improve the likelihood that a real-time RPS system will be successfully deployed. Additionally, the RPS processing techniques are dependent on knowledge of the environmental characteristics of the area of interest. Currently, we

can only make direct measurements in the immediate vicinity of our own platforms, and estimate the environment in the vicinity of the target. Consequently, the RPS system relies on historical data bases to fill in those measurements which are not made directly. More complete environmental data bases will result in better RPS system performance and will facilitate widespread system deployment.

Admiral DYER. The current environmental technical challenge for active tracking of submarines centers on the interaction of sound from submarine tracking (ASW) sonars with marine life, particularly marine mammals (whales, dolphins, and seals). While no harmful reactions have been observed in connection with the Navy's SURTASS Low Frequency Active Sonar, there is some evidence that existing mid-frequency (2.5–10kHz) ASW sonars such as the AN/SQS–53C and AN/SQS–56 have the potential to cause beaked whales to beach and subsequently die as a result of the beaching. Minor physiological injuries found in the stranded whales have not been life threatening. The connection of these injuries to the sonar sound and the beaching behavior of the whales is not fully understood at this time.

The Navy has begun an investigative program on this topic. Investment totals over \$10 million annually, with approximately \$1–\$2 million specifically focused on beaked whales and the effects of ASW sonars on them. These programs have generated a compilation of beaked whale occurrence data worldwide, in an attempt to provide information about potential sites where sonar use may pose a greater than usual risk of interaction with beaked whales. The Navy is also investigating a number of technical solutions for improved detection of beaked whales and other marine animals in the vicinity of sonar operations, including radar, drone aircraft, and special whale detection sonars. These emerging capabilities should enable the Navy to operate both existing mid-frequency sonars and new low frequency sonars in a manner that is environmentally safe while also preserving the tactical effectiveness of the systems.

STRATEGIC ENVIRONMENTAL RESEARCH AND DEVELOPMENT PROGRAM

10. Senator REED. Secretary Wynne, I understand that the Department reduced the fiscal year 2004 budget for the Strategic Environmental Research and Development Program by \$13.0 million, or more than 20 percent, below the fiscal year 2003 requested level to fund other research and development priorities. This reduction means that the program has no money for new starts for significant new environmental research initiatives, including alternatives for ammonium perchlorate in DOD missile propulsion applications, advanced approaches to unexploded ordnance detection and discrimination, and marine mammal behavioral ecology and predictive modeling. What steps are you prepared to take to demonstrate the Department's commitment to these vital environmental research and development programs and to ensure that these cuts are not repeated in future years?

Secretary WYNNE. The Strategic Environmental Research and Development Program (SERDP) was reduced in fiscal year 2004. Budgetary constraints and competing priorities led to this one time reduction in the program. The Department continues to be strongly committed to the SERDP program. This technology program is critical to meeting our environmental obligations, preserving access to DOD ranges, and lowering the environmental costs across the Department. The Department is aware of the potentially large financial liability associated with unexploded ordnance and the continued use of ammonium perchlorate in weapons systems, as well as the fact that SERDP represents between 75 percent and 100 percent of the funding for research and development addressing these issues. Similarly, the Department is acutely aware of the potential impact of the presence of marine mammals in the vicinity of forces involved in at-sea operations. As stated in the President's budget, the Department is committed to SERDP in the future.

TOTAL INFORMATION AWARENESS

11. Senator REED. Secretary Wynne, please clarify for the record the organizations that are currently operating or testing technologies associated with the Total Information Awareness (TIA) program. What are future plans for operation or testing of these technologies?

Secretary WYNNE. A number of organizations in the counterterrorism community have shown great interest in working with the TIA program to test and evaluate technologies. The organizations already participating or planning to participate in the near future in TIA's spiral development and experiments include:

Currently Participating	Planning to Participate
U.S. Army Intelligence and Security Command (INSCOM)	National Security Agency (NSA)
Defense Intelligence Agency Joint Intelligence Task Force—Counter-Terrorism (DIA JITF-CT).	U.S. Strategic Command (STRATCOM)
Central Intelligence Agency (CIA)	Special Operations Command (SOCOM)
DOD's Counter-Intelligence Field Activity (CIFA)	
Joint Forces Command (JFCOM)	
Joint Warfare Analysis Center (JWAC)	

DARPA is providing these agencies and commands with a system/network infrastructure and concepts; software analytical tools; software installation; training; software performance evaluation; and integration and evaluation of user comments on modifications and additions to the software. The operational agencies and commands are providing facilities and personnel to conduct these experiments, scheduled to occur on a continuous basis at 3 to 4 month intervals over the duration of the TIA program, which concludes in 2007. They are using data currently available to them in accordance with existing laws, regulations, and policies applicable to each agency and command. DARPA is not providing any real data or providing any technical or other means to collect real data.

12. Senator REED. Secretary Wynne, what organizations will be involved?

Secretary WYNNE. Organizations already participating or planning to participate in the near future in TIA's spiral development and experiments include:

- U.S. Army Intelligence and Security Command (INSCOM)
- National Security Agency (NSA)
- Defense Intelligence Agency Joint Intelligence Task Force—Counter-Terrorism (DIA JITF-CT)
- Central Intelligence Agency (CIA)
- DOD's Counter-Intelligence Field Activity (CIFA)
- U.S. Strategic Command (STRATCOM)
- Special Operations Command (SOCOM)
- Joint Forces Command (JFCOM)
- Joint Warfare Analysis Center (JWAC)

13. Senator REED. Secretary Wynne, who is responsible for monitoring the use of these technologies during their development and testing by contractors?

Secretary WYNNE. These technologies are being developed and tested along two distinct paths. One path involves the development of analytical tools using synthetic unclassified data to ensure full compliance with privacy or data source policies. These activities take place in a pure research setting. Subject to the higher level monitoring described below, these efforts are monitored by DARPA program managers. The other development path is at the network level, within the framework of a series of experiments to test and evaluate components and their integration using real world data as permitted by existing laws and policies. These activities take place in the operational agencies and commands that are providing facilities and personnel to conduct these experiments. The user agency is responsible for monitoring the use of TIA technology in this setting; DARPA only provides the analytical tools and training to support user agency testing and experimentation. The agency is responsible for providing data that the agency determines may be used for this purpose.

Both development paths are subject to higher level monitoring in the form of two bodies created by the OSD, one internal to OSD and one external. The internal oversight board, chaired by the Under Secretary of Defense for Acquisition, Technology and Logistics will monitor how terrorist-tracking tools are transitioned for real-world use. It also will establish policies and procedures for internal DOD use of TIA-developed tools. The external board has been established as a Federal advisory committee to advise the Secretary of Defense on the policy and legal issues that are raised by the TIA program. Newton Minow, Director of the Annenberg Washington Program and the Annenberg Professor of Communications Law and Policy at Northwestern University, is chairman of the external board.

14. Senator REED. Secretary Wynne, what investments are being made towards the development of privacy protection technologies?

Secretary WYNNE. DARPA is spending \$3.9 million in the current fiscal year to develop privacy protection technologies. There is \$4.0 million and \$5.9 million budgeted in fiscal years 2004 and 2005 respectively.

CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM

15. Senator REED. Secretary Wynne, the Department has a joint Chemical and Biological Defense Program that is intended to provide our military forces with needed capabilities to defend and protect against chemical and biological weapons and agents, including the development and production of vaccines. Since the September 11 terrorist attacks and the anthrax attacks of October 2001, other Federal agencies have taken a keen interest in many of these same (or similar) technologies, capabilities, and vaccines. This could lead to lower emphasis or resources for the defense requirements and programs and significant duplication of effort by the other agencies. What is the Department doing to ensure that its needs for chemical and biological defense are being met while coordinating its programs and efforts with those of the Department of Homeland Security (DHS) and the NIH to avoid duplication or wasted resources?

Secretary WYNNE. The DOD continues to place a high emphasis on research, development, and acquisition of chemical and biological defense products. The Fiscal Year 2003 Supplemental Defense appropriation allocated additional funding to acquire chemical biological defense equipment. The Deputy Assistant to the Secretary of Defense (Chemical and Biological Defense) is working closely with the Joint Staff to address urgent operational requirements and ensure that the needs of the warfighter are addressed. The fiscal year 2004 President's budget outlines a significant program to provide chemical/biological (C/B) protection for 200 DOD installations, beginning with 15 in fiscal year 2004. This follows a pilot project initiated in fiscal year 2003 to provide C/B protection at nine installations in fiscal year 2003 and represents the Department's commitment to ensure that DOD installations are adequately protected from C/B threats.

The DHS will also sponsor research and development for countering chemical and biological weapons of mass destruction. The DOD's Chemical/Biological Defense Program (CBDP) has already begun the process of coordination with DHS by including a representative from DHS in the DOD CBDP's annual Technology Area Review and Assessment for the CBDP Science and Technology programs. As the programs within the Department of Homeland Security develop, the Assistant Secretary of Defense (Homeland Defense), in conjunction with the Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs) will work to expand that level of cooperation. DOD has been working with DHS on the BioWatch Program, a DHS effort to provide biological monitoring systems in America's cities, and to date has provided detectors for 10 U.S. cities.

In the case of vaccines, there was little interest in biodefense vaccine efforts outside the DOD prior to the anthrax attacks of fall 2001, but this has changed. Both the National Institutes of Health (NIH) and the Department of Health and Human Services (DHHS) now have active programs to address national needs for biological defense vaccines. The DOD is currently working with both the NIH and DHHS on vaccine or therapeutic efforts of joint interest. These include a next generation anthrax vaccine, a next generation smallpox vaccine, a tularemia vaccine, and botulinum antitoxin. In addition, the DOD is reexamining its vaccine efforts to identify which programs can be worked jointly in cooperation with the DHHS/NIH and which are DOD unique or which may not be part of the national program. It is possible that there may be some realignment of resources within the overall DOD CBDP as a result of this analysis. Wherever possible, the DOD will seek to prevent duplication of effort but still assure unique DOD vaccine and therapeutic needs are met.

COUNTERPROLIFERATION SUPPORT PROGRAM

16. Senator REED. Secretary Wynne, the Department participates in an inter-agency Counterproliferation Program Review Committee (CPRC) to determine the areas where counterproliferation capabilities most need to be improved. But there is not an overarching program within the Department to lead and support the efforts to research, develop, and field needed counterproliferation capabilities, and this appears to be a weakness in our counterproliferation efforts. Prior to 1998 the Department had a Counterproliferation Support Program (CPSP) that was very effective in leveraging relatively small sums of funding to develop and produce needed capabilities. Would you investigate whether reinstating the CPSP within OSD would improve the effectiveness of the Department's counterproliferation research and development programs and tell the committee of your views on this idea?

Secretary WYNNE. I have recently reviewed the past activities of the Counterproliferation Support Program and have asked the Assistant to the Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs to provide me with

a recommendation as to whether reinstating such a program within OSD would improve our abilities to lead, support, and coordinate research and develop efforts, and to expedite the fielding of needed counterproliferation capabilities to the warfighters.

FUTURE COMBAT SYSTEMS INDEPENDENT REVIEW

17. Senator REED. Secretary Wynne and General Kern, I understand that Secretary Rumsfeld has requested that retired Air Force General Larry Welch chair a review and assessment panel on the Army's Objective Force and the FCS initiatives, and provide that assessment to the Under Secretary of the Army. What is the status of that review?

Secretary WYNNE. General Welch will complete the review in early May and will brief the Under Secretary of the Army in mid-May on his findings and recommendations.

General KERN. The study panel chaired by retired Air Force General Larry Welch is ongoing. Senior Army leaders met with the panel 10–15 April 2003 to address topics related to FCS and Objective Force. The panel met with Army leaders again on 22 April 2003 to provide preliminary findings. A follow up session will be held before the report is provided to the Secretary of Defense in early May. Although the panel seems to have gone well, it is too early to say what the findings are and its impact to technology or other program decisions.

18. Senator REED. Secretary Wynne and General Kern, how will the outcome of this review affect the upcoming Milestone B decision on FCS technologies?

Secretary WYNNE. One of the Terms of Reference of the Independent Review required a review of the existing assessment of the critical technologies in FCS Increment #1 and a determination of the adequacy of these assessments to guide the program.

The Department will seriously consider the results of this determination in the reviews leading to the Milestone B decision.

General KERN. A Technology Readiness assessment was completed for the FCS Milestone B decision. Two members of the review and assessment panel chaired by retired Air Force General Larry Welch were on the FCS Technology Readiness Assessment (TRA) Independent Review Team (IRT). The FCS TRA IRT concluded the Technology Readiness Levels (TRLs) supported entry into System Development and Demonstration (SDD).

LABORATORY INFRASTRUCTURE

19. Senator REED. General Kern, General Lyles, and Admiral Dyer, the OSD-sponsored Naval Research Advisory Committee noted that DOD's lab infrastructure is in serious decline. This is partially due to underfunding of labs and test centers in Military Construction (MILCON) accounts. How are you planning to ensure that the lab facilities in DOD remain world class in terms of their equipment and infrastructure?

General KERN. In order to maintain our world-class facilities, we continually pursue opportunities to obtain the capital investments required to provide our researchers with the scientific and experimental infrastructure vital to the development and transition of the technologies required for Army Transformation. An example of our commitment is the significant laboratory MILCON put in place at Aberdeen Proving Ground (the Rodman Materials Research Laboratory) and Adelphi, MD (the Zahl Physical Science Laboratory) as a result of the last BRAC and the ongoing MILCON major facility upgrades at the Soldier and Biological Chemical Command (SBCCOM) and the Armaments Research, Development, and Engineering Center. We also compete for Major Construction, Army (MCA) projects. As a result of this competition, we were recently notified of an approval of \$4.1 million for a Food Engineering Lab expansion at the Natick Soldier Center. Additionally, the laboratories use special programs like Pollution Prevention in Facilities (P²IF) program when the upgrade involves an environmental issue.

Through our close association with the U.S. Army Training and Doctrine Command (TRADOC), we are identifying future core competencies needed in our laboratories. We have identified a future vision where products are modeled, designed, manufactured, and tested in virtual environments that are physics based, secure, and networked. To further enhance our capabilities, we have identified external partnerships to support core competencies along the lines of our University Affiliated Research Centers (UARCs) with MIT, USC, and UT-Austin with an additional

chemical/biological UARC planned at a yet to be determined university. We have formal partnership agreements and CRADAs that share both Federal and State government, industry, and academic facilities and core competencies in a networked environment. We are collaborating with customers to support investments in RDE infrastructure as an enterprise initiative focused on future customer requirements aligned to core competencies. We have developed a long-term vision and dedicated full time support to the MILCON process. We are participating in OSD initiatives such as Business Initiative Council (BIC) that enable legislation and rule changes that foster an environment where world-class lab and test facilities can be achieved at least possible taxpayer cost. In addition, we invest annually in laboratory equipment purchases from the Technical Director's central overhead funds and we compete for traditional and non-traditional sources of funds for upgrades.

General LYLES. The AFRL Infrastructure Planning process was established to identify those key facilities that should be world class. We have identified niche research areas that are essential for the warfighter but are not available in either universities or within defense industries. The Air Force has been able to maintain world-class research facilities in those identified high-priority research areas. Examples include the Sandia Optical Range, Dynamic Inferred Missile Evaluation facilities, Maui Space Surveillance System, and high power microwave effects facilities. In addition to maintaining world-class research facilities, there must also be world-class scientists and engineers to conduct the research. The Air Force has been successful in recruiting world-class scientists and engineers in those research areas that are of the highest priority to enable future warfighting capabilities.

Admiral DYER. As the Naval Research Advisory Committee panel noted in its report, "Science and Technology Community in Crisis," some headway has been made on this issue over the past decade thanks to congressional action. Section 2892 of the Fiscal Year 1996 National Defense Authorization Act raised the dollar limits for both Major MILCON and Unspecified Minor MILCON projects at the DOD laboratories and centers for fiscal years 1996 through 1998. This authority was extended through fiscal year 2003 by Section 2871 of the fiscal year 1999 National Defense Authorization Act, and we are hopeful that a further 5-year extension will be approved.

Our plan is to continue to use current authorities to ensure appropriate funding for equipment and infrastructure. Nevertheless, this is a difficult issue given DOD/DON priorities and fiscal constraints. Laboratory facilities generally cost significantly more per square foot to construct than more typical military structures. In addition, laboratory facilities often do not compete well for MILCON funds against other critical needs, such as piers, runways, and barracks. Finally, as has been noted numerous times in the past, MILCON funding levels have not been adequate to maintain much of the DOD infrastructure at an appropriate materiel condition. As needed, DON will consider and pursue other alternative solutions such as authorizing the construction and modification of laboratory facilities through some funding mechanism other than MILCON. Ultimately, new legislation may be requested.

FUTURE COMBAT SYSTEMS VALUE

20. Senator REED. General Kern, in your testimony you highlight the development of FCSs to give the Army a lighter, more lethal, and networked force. Can you give me a few examples of how FCSs technologies might change the way our ground forces are operating in Iraq today?

General KERN. There are several ways in which our ground forces would be operating differently in Iraq today using the FCS technologies: 1) The FCS family of systems and the Unit of Action (UA) organization would have enhanced the interoperability and connectivity to joint capabilities, significantly improving an already impressive choreographed joint operation; 2) The FCS family of systems would have required less fuel and less refueling, as well as a significantly reduced logistical footprint; 3) The UGVs and UAVs in the FCS family of systems would have provided a greatly increased capability for brigades, battalions, and small units (company and below) to see first, in adverse weather conditions increasing situational awareness and situational understanding; and 4) The FCS network would have improved the ability of leaders throughout the joint environment at all UA echelons to integrate and synchronize combat power, both organic and supporting.

21. Senator REED. General Kern, would we see significant enhancements of combat results?

General KERN. Although it is difficult to significantly improve on the combat results of our forces in Iraq, I believe that our increased connectivity, mobility, and surveillance capabilities would result in fewer coalition casualties, faster and more effective penetration into Iraqi positions, and significantly less cost associated with the entire operational effort.

SEISMIC RESEARCH PROGRAM TO SUPPORT NUCLEAR TEST MONITORING

22. Senator REED. General Lyles, your prepared statement notes that “the Seismic Research Program for detection of nuclear explosions has been transferred back to the Air Force from the Defense Threat Reduction Agency.” The Air Force managed this research program before 1997 and now has it again. This important program supports a national-level nuclear test monitoring requirement, and it deserves adequate resources and attention. Congress has repeatedly concluded that the Department had not provided adequate funding for this research program in the last 6 years, and added funds. Do you agree on the importance of this research program, and can you assure this subcommittee that the Air Force, through the Air Force Research Laboratory, will do its best to support this important mission adequately?

General LYLES. Yes, the Seismic Research Program is very important to the Air Force and we will do our best to adequately support this important mission within available resources. In this era of rogue nations, terrorism, and homeland defense, the importance of this national mission has grown, as has the supporting research program needed to advance the monitoring capability to meet the expanding requirements arising from today’s and tomorrow’s threats.

23. Senator REED. General Lyles, if additional resources were available for this research program, would it improve our ability to meet the national requirement for monitoring foreign nuclear tests and, if so, can you quantify an additional level of support?

General LYLES. Yes, additional funds could contribute to additional Seismic Research Program capabilities. However, current program funding of approximately \$6.5 million per year is sufficient to meet minimum seismic research monitoring needs. If additional funding became available, it could be used to accelerate the enhancement of nuclear monitoring analysis capabilities and to expand in geographical areas of interest around the world.

Like many areas in the Air Force, we could wisely invest additional funds in the Seismic Research Program, however, funding for this program must be considered within the context of the entire Air Force portfolio. The Air Force is currently reviewing the level of funding for seismic research in support of more stringent regional monitoring requirements.

24. Senator REED. General Lyles, will you keep the subcommittee informed on your progress in managing and resourcing this research program, and in its effectiveness in supporting the national monitoring requirement?

General LYLES. Yes, we will be happy to keep the subcommittee informed of our efforts in this area. In the past, Congress has directed the Secretary of Defense to submit a report on its management of and resources for nuclear explosion monitoring; the Air Force provided inputs to the most recent report submitted in March 2003 and will continue to do so as required in the future.

BEST PRACTICES DEMONSTRATION SYSTEM

25. Senator REED. Admiral Dyer, Secretary Wynne mentioned the development of a “Best Practices” approach to modifying the existing lab demonstration programs. I understand the description of this system has been published in the Federal Register. How will the implementation of this system as proposed change the ongoing demonstration at the Naval Warfare Center in Newport?

Admiral DYER. Final publication of the “Best Practices” (BP) demonstration will supersede the existing Federal Register postings that authorized prior DOD demonstration programs. The notice in the Federal Register says that although the amendment may be implemented as early as the date of the final notice, implementation strategies will be developed over time as appropriate. At this time, it is unclear what the implementation schedule will be. In addition, although the Naval Undersea Warfare Center (NUWC) has not completed a full assessment of the changes, it is felt that if they are required to transition to the new BP system, the current Newport demonstration project will be affected.

The current Demonstration at NUWC Newport is authorized as part of the Science and Technology Reinvention Laboratory Personnel Demonstration Project at the Naval Sea Systems Command Warfare Centers as published in the Federal Register on December 3, 1997. A key feature of the NAVSEA Warfare Center Demonstration project is that it provides maximum opportunity for local "tailoring" to meet the variety of requirements characteristic of the NAVSEA organization. NUWC Newport used this flexibility to establish a local system that satisfied many of the concerns of the union, which represents the majority of the workforce (Federal Union of Scientists and Engineers, NAGE R1-144). It is unlikely that the 1,700 employees represented by the union would have been enrolled in the demonstration without that flexibility. Based on our initial review, the BP demonstration does not appear to provide for local flexibility.

One feature of the BP demonstration project which provides some concern is the inclusion of the annual comparability increase in the BP pay-for-performance system. The current NAVSEA demonstrations do not include the annual comparability pay increase in pay-for-performance, and it is doubtful that the union would agree to participate in the BP demonstration with that modification. If the union were to elect to convert back to the General Schedule (GS) system rather than adopt the BP demonstration, NUWC Newport would lose at least 80 percent of its demonstration employees, leaving only managers and supervisors in the BP demonstration.

26. Senator REED. Admiral Dyer, will changes to the system require the approval of the local management and unions?

Admiral DYER. At NUWC Newport, participating organizations must fulfill any collective bargaining obligations and enter into an agreement before converting existing represented employees into the BP demonstration. The union could choose to "opt-out" of the demonstration and go back to the GS system if we cannot reach agreement on the BP demonstration. We are not aware that local management approval is required to transition to the BP demonstration, however changes to the currently implemented Demo system would require agreement by the unions.

QUESTIONS SUBMITTED BY SENATOR EDWARD M. KENNEDY

MINE COUNTERMEASURES

27. Senator KENNEDY. Admiral Dyer, how is the Navy coordinating with the Marine Corps to develop mine countermeasures?

Admiral DYER. The Navy and Marine Corps Mine Countermeasures (MCM) Requirements Offices (Expeditionary Warfare Division (OPNAV N75) and Marine Corps Combat Development Command (FWD)) and Headquarters, Marine Corps, are in daily contact for defining and resourcing MCM requirements. The result of this well-established working relationship is to provide the Navy/Marine Corps team with a requisite capability to defeat mines and obstacles in the littorals. Flag/General Officers, senior field grade officers, and representatives from those MCM Requirements Offices as well as applicable Service Acquisition Offices are members of numerous MCM-specific boards and chartered working groups.

An example of the close interaction between the Services is the inclusion of Navy and Marine Corps MCM representatives in the Mission Area Analysis (MAA) for Amphibious Operations in a Mined Environment. The mission of this MAA is to define operational capabilities required to perform amphibious MCM in the 2015 time frame; participation includes both Services at the 0-6 Oversight Board and Integrated Process Team (IPT) levels.

The recent approval of the Marine Corps Mine Countermeasures Working Group Charter by the Assistant Commandant of the Marine Corps is another example of the close coordination between the Services. A primary task of this particular working group is to examine the Marine Corps' interface with the Navy, particularly with respect to assuring the effective transition of MCM responsibilities and leveraging Navy MCM systems with Marine Corps ground MCM applicability. Accordingly, the Expeditionary Warfare Division (OPNAV N75) is a permanent member of this Marine Corps working group.

Through the continuous dialog and coordination, this mutually supporting association has significantly increased visibility of the overall littoral MCM requirement. Through coordinated efforts such as these and many others, the Navy/Marine Corps team will assuredly provide the capability required by naval amphibious forces to readily project essential combat power ashore.

28. Senator KENNEDY. Admiral Dyer, what programs is the Office of Naval Research pursuing to provide mine countermeasures to the operators?

Admiral DYER. Mine warfare S&T develops and transitions technologies that address critical gaps in the ability of naval forces to conduct successful operations in anti-access (mined) environments. The focus of these efforts is on: (1) enabling and developing the fielding of first generation organic MCM systems; (2) stand-off mine countermeasures from very shallow water through the beach to support Ship To Objective Maneuver (STOM); and (3) the development of cooperating, unmanned MCM systems (UUVs, USVs, UAVs).

The goal of S&T efforts is to reduce tactical timelines and eliminate the need for manned operations in minefields. The development of unmanned MCM systems emphasizes networked, cooperating systems which can be scaled, are easily deployed, and can be tailored to counter specific threats and within distinctive local environments.

The planned acquisition of a chartered High Speed Vessel (HSV) for MCM experimentation provides a significant opportunity to examine and accelerate development of unmanned systems for mine countermeasures. S&T investments are developing containerized mission packages (inexpensive AUVs for minehunting, USV mine-sweeping) for demonstration on HSV-X2. This builds on the rapid advance of AUV technologies and capabilities demonstrated on HSV-2 SWIFT during Fleet Battle Experiment-Juliet and during Operation Iraqi Freedom. The ONR is working with CNO, PEO LMW, COMINELARCOM and NWDC on an experimentation schedule. ONR intends to have the first AUV mission package ready when HSV-2 SWIFT becomes operational.

Additional AUV mission packages and the USV mine sweeping mission package will follow. Lessons learned from experimentation would be applied to the littoral combat ship and reduce risk to the definition of MCM mission package composition. Additionally, these AUV mission packages provide a contingency capability for operating forces and provide a readily deployable underwater search and survey capability that could be used for homeland defense.

Additionally, S&T investments provide technologies for stand-off mine countermeasures from very shallow water through the beach to support Ship To Objective Maneuver (STOM). Examples of S&T products are described below:

Very Shallow Water MCM: S&T investments in the development of a small, diver portable AUV system (REMUS) have transitioned to USSOCOM (Initial Operational Capability (IOC) fiscal year 2003). Additionally, two units have been acquired by the Naval Special Clearance Team ONE for use in current operations. This provides an initial stand-off capability for divers working in very shallow water and has been demonstrated in FBE-Hotel, Kernal Blitz 2001, FBE-Juliet, and Operation Iraqi Freedom to greatly reduce tactical timelines.

Littoral Remote Sensing: S&T investments have focused on the development of algorithms to exploit NTM for environmental products (e.g. near shore bathymetry in denied areas), detection of mine like objects and beach defenses. Algorithms for bathymetry have transitioned to the Warfighter Support Center (WSC) at NAVO and will first be exercised as an operational system in fiscal year 2003.

Assault Breaching: S&T investments in assault breaching are focused on the development of mine and obstacle defeat warheads that can be employed from existing precision-guided munitions. In the near term, S&T efforts are directed at characterizing the lethality and effectiveness of existing precision-guided bombs (JDAM) for assault breaching. Fielding of near term capability is expected by 2006.

Computer Aided Detection/Classification: S&T investments in computer aided detection/classification (CAD/CAC) are transitioning to both the AQS-20 and Remote Minehunting System (RMS) program. The approach taken uses at least three different classification algorithms which are fused to greatly reduce the number of false alarms.

Synthetic Aperture Sonar: This technology was recently demonstrated to produce very high resolution imagery at long ranges (approx. 400 meters) and has transitioned to the Long Term Mine Reconnaissance System (LMRS). This will greatly improve the ability of LMRS to manage clutter by providing it with near identification acoustic imagery.

Rapid Airborne Mine Clearance System (RAMICS). S&T transitioned this technology in fiscal year 2001 after a successful RAMICS ATD demonstration of a full up system from a Cobra gunship.

Mine Sweeping/Jamming: Minesweeping is perhaps the most significant challenge posed by porting airborne MCM capabilities from dedicated MH-53s to the organic MH-60 airframe. S&T investments in minesweeping are directed at the development and demonstration of magnetic/acoustic mine sweeping from unmanned surface vehicles. Additionally, S&T efforts have demonstrated technical feasibility of

using own ship degaussing coils for mine jamming during a fiscal year 2002 NATO exercise. Current S&T efforts are directed at applying these techniques to steel hull combatants.

Mine Identification: Laser line scan technology and streak tube imaging LIDAR technology have transitioned from S&T to the AQS-14 and AQS-20 programs, respectively. This technology provides fleet systems with the capability to rapidly identify mine like contacts. S&T investments continue to support these acquisition programs through the development of computer-aided identification and the development of mine identification tactical decision aids.

Airborne Laser Mine Detection: Streak tube imaging LIDAR technology has transitioned from S&T to the Airborne Laser Mine Detection System (ALMDS) acquisition program. S&T investments focus on the development of compact, high rep rate lasers and the development of a 3D camera. The latter technology is a P3I to ALMDS. These investments enable the development of a UAV based LIDAR mine detection system.

Mine warfare near-term S&T investments are focused on enabling an organic mine countermeasures capability, will provide mission packages for experimentation on HSV-X2, and provide technologies for stand-off mine countermeasures from very shallow water through the beach to support STOM. Longer term S&T investments focus on the development of networked, cooperating, autonomous systems which can be scaled, are easily deployed, and can be tailored to counter specific threats and within distinctive local environments. Fleet involvement is a critical part of the mine warfare S&T program.

29. Senator KENNEDY. General Kern, what programs is the Army research lab pursuing to provide mine countermeasures to the soldiers in the field?

General KERN. Senator Kennedy, the Army's leadership has focused current and future countermine science and technology investments to address the most pressing needs of Army transformation. We are pursuing programs to solve critical capability shortfalls for our dismounted and mounted forces.

For our dismounted warfighter, we have initiated a program investigating multiple sensor technologies mounted on robotic platforms to provide safer standoff distances when detection of individual anti-tank and anti-personnel mines is necessary. Such capabilities are critical when operating in close terrain, when stealthy operations are planned, and when other specialized equipment is not available. Lightweight, high performance technology from this dismounted warfighter initiative will augment current capabilities afforded by the recent procurement and limited fielding of 210 new Handheld Standoff Mine Detection Systems (HSTAMIDS) being produced by Cyterra, Inc. of Waltham, MA. Full rate production is scheduled for fiscal year 2004. HSTAMIDS is a state-of-the-art mine detector that combines ground penetrating radar with sophisticated metal detection and advanced signal processing to reliably detect low metal content as well as high metal content anti-tank and anti-personnel lines.

Remote detection of minefields is essential for mission planning and execution. The timely knowledge of minefield locations is critical to the commander's decision to breach, avoid, or bypass the mine obstacle. Knowing minefield locations generally supports rapid rates of advance which is a key transformation imperative and is necessary to preclude blundering into mined areas unknowingly and suffering avoidable losses. In the near term, a minefield detection system based on electro-optic and infrared sensor technology is planned for use with tactical level unmanned aerial vehicles. In the longer term, we are investing in airborne ground penetrating radar and hyperspectral infrared sensor technologies to provide more rapid and broader search capabilities operating at higher, more survivable altitudes on larger unmanned or manned aircraft. To further increase the rates of advance along routes and provide usable capability for the transformation, we are exploiting advances in unmanned ground and small air vehicles as well as technical breakthroughs in mine detection sensors. We have initiated a program to digitally link a small UAV with an UGV. Both the UAV and UGV have integrated on-board mine detection sensors. The small UAV with on-board mine detection sensor proceeds first along a route and nominates regions of interest where anti-tank mines are likely buried. The UGV based system will follow and thoroughly analyze each region. By reducing the search area of the UGV based mine detection sensor system, this concept increases mine detection rates of advance to approximately 13 kilometers per hour and provides a significant increase in speed when compared to the UGV performing alone. The mine detection sensor on the small UAV uses lightweight, uncooled infrared operating at discrete frequencies in the long wave region that, when combined with minimal signal processing, can identify recent mining activity in roads. The mine detection sensor for the UGV is a close-in, ultra-wideband ground penetrating radar

that reliably detects plastic and metallic cased anti-tank mines without excessive false alarms. Recent technical breakthroughs have produced this new ground penetrating radar that for the first time has the potential to provide the warfighter with a high confidence tool for tactical on-road mine detection. In addition to these technologies and concepts of operation to detect traditional mines buried in a roadway, we are aggressively pursuing a program to protect vehicles against the effects of side attack mines and improvised explosive devices that are not deployed in the roadway.

For a longer-term solution, we have begun to research forward looking mine detection technologies that can be integrated directly with the manned vehicles envisioned for the transformation. Forward looking technologies have the potential to replace the linked UAV and UGV concept described above with a less complex solution for on-route mine detection. Initial analyses and component experiments indicate that multi-sensor approaches will be required to "see" far enough ahead of the vehicle to permit stopping or swerving to avoid encountering the suspect area and to meet other performance goals. Forward looking, ground penetrating, synthetic aperture radar, advanced infrared, and acoustic technologies are currently under investigation.

Finally, we will be starting a new research initiative during fiscal year 2004 directed toward mine detection sensor technologies with potential of detecting buried mines that are deployed along unimproved avenues of approach, i.e., cross country. While the sensor technology is the critical component to any mine or minefield detection system, state-of-the-art sensors alone are not sufficient to enable the Army transformation. Imbedded within each of the mine or minefield detection systems outlined previously is sophisticated signal processing and target detection algorithms that automate the detection process and permit the warfighter to concentrate on other tasks. University researchers and small businesses from across the country have contributed their intellectual capital to take advantage of the mine detection sensor breakthroughs with new mathematical routines and data analysis processes.

While a majority of the countermine investment has focused on mine and minefield detection, the Army is keenly aware of the need to enhance our neutralization and breaching capabilities. To meet the needs of the transformation, we have shifted focus in the S&T arena from breaching lanes through minefields to point neutralization of individual mines. A key benefit of this shift in focus is reduced logistical demand. We are moving from the paradigm of large, heavy explosive or mechanical breaching systems to smaller, more compact individual mine neutralization capabilities. S&T initiatives are underway in point neutralization to exploit mine detection advances that produces fewer false targets and provides smaller location error associated with individual mine locations. The Army has initiated S&T investments in close-in techniques to kill individual mines. We are currently monitoring U.S. Navy investments in techniques to neutralize minefields using remotely delivered, precision-guided weapons.

The progress in countermine science and technology is and has been closely monitored by all affected parties within the U.S. Army. We have more than doubled the 6.2 investments starting in fiscal year 2004 with funding levels of approximately \$18 million through the Future Year Defense Program (FYDP). The Training and Doctrine Command has established a countermine General Officer Steering Committee that meets semi-annually. I personally review countermine material status quarterly. Every effort is being made to address this difficult and technically challenging area.

30. Senator KENNEDY. General Kern, what types of programs are you pursuing to uncover mines and unexploded ordnance?

General KERN. While the Army's leadership has focused a substantial percentage of its countermine science and technology resources to addressing its transformation needs, we do recognize that mine clearance is an important requirement. Mine clearance is defined as the removal of mines or unexploded ordnance from an area of operation post combat. In fiscal year 2000, we proposed a new Joint Area Clearance (JAC) Advanced Concept Technology Demonstration (ACTD) to the Office of the Secretary of Defense to evaluate the military utility of equipment developed by the Department of State's Humanitarian Demining Research and Development Program. Approved the following fiscal year, we are currently executing the third year of this 4 year Joint Forces Command (JFCOM) sponsored program jointly with the U.S. Air Force and U.S. Marine Corps.

The JAC ACTD is focused on two mine clearance missions. The first mission is administrative clearance of small areas for military needs such as establishment of logistics bases or field hospitals. The second mission is maintaining clear logistics routes once the fighting force has moved forward. For both missions, we are keenly

interested in removing all mines and unexploded ordnance and preventing remining of cleared areas.

For area clearance, we are evaluating the military utility of four different systems. The four systems are a floating mine blade, a mine clearing cultivator, a mine sifter, and a full width mine flail. All of these systems are large, requiring a D-7 class bulldozer as the prime mover, and generally modify the top layer of soil to remove the mines or unexploded ordnance. The first three systems have been assessed and used by the international humanitarian demining community. Additionally, the floating mine blade was used to proof the cleared U.S. minefields at Guantanamo Bay, Cuba.

For route clearance, we are evaluating full width mine rollers to rapidly traverse and clear a route. A prototype full width roller system has been designed for the M113 and is currently under evaluation. A version of this roller system is in the design phase for the U.S. Marine Corps Lightweight Armored Vehicle (LAV) 25.

VISA DELAYS

31. Senator KENNEDY. Secretary Wynne, General Kern, General Lyles, and Admiral Dyer, the State Department's Visa Mantas program requires that foreign scientists and students participating in sensitive research undergo careful screening before they are admitted to the U.S. The areas covered by this program are numerous, including nuclear technology, rocket systems technology, chemical, biotechnology, and biomedical engineering, remote sensing, imaging and reconnaissance, and laser and directed energy systems technology. Last year universities, defense labs, and research institutions employing these foreign scientists experienced extensive delays—of 8–10 months—in obtaining the security clearances and visas needed before the scientists could travel the U.S. These delays adversely impacted the universities and defense labs, which had to put critical programs on hold. I understand that universities remain concerned that similar delays could ensue again this year. Are we seeing the delays this year that we saw last year?

Secretary WYNNE. The delays are getting shorter. In 2000, I understand that about 1,000 visa cases were reviewed by the State Department and other agencies under the Mantis program. In 2002 the number was closer to 14,000. That increase, along with other new visa clearance requirements instituted after the terrorist attacks of September 11, 2001, overwhelmed the resources of the agencies reviewing the cases. The result was the long delays observed last year. Since then, the agencies have decreased the time required for processing a majority of cases through better use of automation and additional staff. Now, at anyone time, there are approximately 1,000 Mantis cases in the review process. The delays are not nearly as long as they were last year.

General KERN. The Directors of the Army Laboratories (LABs) and Research Development and Engineering Centers (RDECs) were surveyed in April 2003 with regard to the visa delay question. All Directors except the Director of the Aviation and Missile RDEC (AMRDEC) reported they were not experiencing visa delay problems that had impact on either sensitive or non-sensitive research programs. The Director AMRDEC identified one instance that required 4–6 months to complete. The Director did not consider this processing time excessive. AMRDEC Director also reported that the center had started a process to query their contractors on this issue and report back to the Army Materiel Command (AMC) in 2 weeks. Approximately half of AMRDEC work is accomplished under contract.

General LYLES. The Air Force S&T program has not been affected by visa and security delays in any measurable way with respect to foreign scientists or students. Increased national security has sometimes resulted in increased processing times for visas and security clearances, but we anticipate long lead-times and plan accordingly. Many times, we are aware of upcoming visits in advance and can begin the required scheduling and paperwork prior to the actual visits. As for security clearances, delays are fairly common even for U.S. citizens.

While the Air Force is primarily involved with foreign scientists in conjunction with the Air Force Research Laboratory, there are also many foreign students working on Air Force funded research programs within the university community. The baseline document that the Air Force uses to provide policy and direction for foreign scientists and students in funded research programs is the National Security Decision Directive (NSDD)–189, entitled “National Policy on the Transfer of Scientific, Technical, and Engineering Information.”

This directive establishes national policy for controlling the flow of science, technology, and engineering information produced in conjunction with Federally-funded fundamental research at colleges, universities, and laboratories. Basically, the

NSDD-189 policy, to the maximum extent possible, is that the products of fundamental research remain unrestricted. If it is determined prior to conducting the research that there will likely be national security issues involved, the mechanism to control information will be by classification. Fundamentally, no restrictions may be placed upon the conduct or reporting of Federally-funded fundamental research that has not received national security classification, except as provided in applicable U.S. statutes. To ensure this guidance is implemented consistently across the laboratory, the Air Force relies on the Scientific and Technical Information Program and on its classification program managers to determine if Federally-funded work is sensitive and should be appropriately controlled by national security guidelines.

Admiral DYER. We have not experienced systemic problems with obtaining visas for the placement of foreign scientists in our Navy facilities.

32. Senator KENNEDY. Secretary Wynne, General Kern, General Lyles, and Admiral Dyer, how are you addressing these delays?

Secretary WYNNE. We are cooperating with the Department of State so that officials can more quickly identify sensitive courses of study and identify problematic applicants. An example of our cooperation is our consistent participation in deliberations concerning the proposed Interagency Panel on Advanced Science and Security (IPASS).

General KERN. The April 2003 survey of Army LABs and RDECs revealed that they were not experiencing any visa delay problems. The AMRDEC reported they used management attention to facilitate the one identified situation. The Deputy Director of the Weapon Sciences Directorate facilitated the clearance process with the Aviation and Missile Command's (AMCOM) Intelligence and Security Directorate to ensure that all applicable policies and procedures were followed.

General LYLES. The Air Force recognizes that increased national security sometimes results in increased processing times for visas and security clearances. In fact, in the case of security clearances, delays are fairly common even for U.S. citizens. The Air Force addresses these possible delays by planning accordingly for anticipated long lead-times. When notified of upcoming visits, we begin the required scheduling and paperwork prior to the actual visits.

Admiral DYER. We have not experienced systemic problems with obtaining visas for the placement of foreign scientists in our Navy facilities.

33. Senator KENNEDY. Secretary Wynne, General Kern, General Lyles, and Admiral Dyer, are these delays causing any disruptions in programs?

Secretary WYNNE. I am not aware of disruptions to our research programs. Given the need for a different kind of homeland security that was thrust upon us in 2001, a small number of transient disruptions would be acceptable.

General KERN. The Directors of Army LABs and RDECs reported, in the April 2003 survey, that no programs have experienced any known disruptions due to delays in the processing of security clearances or visas for foreign scientists or engineers.

General LYLES. The Air Force S&T program has not seen an adverse impact of security delays in any measurable way with respect to foreign scientists and students.

Admiral DYER. There was one isolated event that involved a Russian Gromov delegation (Russian Research Institute), which resulted in a 6-month delay. This was an unclassified visit to the Patuxent River Naval Air Station to continue an ongoing NAVAIR/Gromov flight research institute technical exchange.

NATICK SOLDIER CENTER

34. Senator KENNEDY. General Kern, I understand that the Army has established a nanotechnology research institute at MIT to develop new technologies for the soldier. How does that new institute work with the Natick Soldier Center, the Army's premier center for the development of soldier technologies?

General KERN. The Natick Soldier Center (NSC) works with the Institute for Soldier Nanotechnologies (ISN) in several ways. First, the Director, NSC, is a member of the Executive Steering Board of the ISN and, as such, is involved in determining the overall direction of the ISN and in assessing its performance for the soldier. In addition, the NSC Director also stays in regular communication with Professor E.L. (Ned) Thomas, Director of the ISN.

There are also a number of subject matter experts from NSC who are assigned to participate in reviewing the ISN program as part of the Army's Capability Area Review Teams (CART) technical oversight process. The objective here is to make

sure that the Army's technical community is represented, and that the accumulated knowledge residing in that community is used as input to decisions made on the ISN program.

To maintain regular communication as the work is performed, technical staff members from the NSC and the ISN meet as needed informally to exchange information on Army research directions, soldier needs, and ISN research. Recently, scientists at the NSC and the ISN co-organized a highly successful meeting of the Fiber Society, including a well-attended session on electrospinning and nanofibers. In addition, the Army is instituting an annual technical review of the ISN program at which NSC personnel will be present.

To ensure that we remain focused on the Institute's primary purpose of developing nanotechnology to meet needs of the individual soldier, we have also assigned a military member of the NSC staff to work at the ISN. This individual is an O-5 (Lieutenant Colonel) on active duty, a graduate of both West Point and MIT, and a career infantryman. His role is to assure that the lines of communication between the NSC, the Army Research Laboratory (ARL), and the ISN are open and clear, and his focus is on assuring that ISN science is directed toward the needs of the future soldier.

In addition, MIT faculty members who participate in the ISN are already initiating collaborations with Natick subject matter experts in various areas. To date these have not been under the umbrella of the ISN. This is the first year of the ISN effort and its facility will not open until late May. We are getting to know each other better in anticipation of additional collaboration in the future.

35. Senator KENNEDY. General Kern, what role will Natick play in ensuring that the new nanotechnologies are quickly turned into real warfighting capabilities?

General KERN. The role of NSC in ensuring that new nanotechnologies can be turned into real warfighting capabilities is multi-fold. In addition to working with the ISN to transition its technology, NSC has an active in-house research program augmented by external contracts and collaborations with individuals in academia, industry, and other Government laboratories.

The focus of the ISN is on basic research in nanotechnology that can lead to revolutionary advances and very significant payoff to the Army. Because this is basic research, it is likely that most of these payoffs, even if they are major, will be realized in the longer-term. Nevertheless, some of these may be ready for transition to the field sooner. Natick will be carefully following progress at the ISN in order to identify technology that is rapidly maturing. As they are identified, we may need to provide the NSC with additional resources to help mature the technology so that it can transition from the ISN and its partners to our Program Managers for further development and fielding. The spiral development approach, in which technology is inserted as it becomes available, is expected to facilitate this process.

The NSC has maintained an active program in the area of nanotechnology for the soldier involving several thrusts. For example, NSC scientists have been active in research on flexible photovoltaic materials involving the use of nanoscale materials and processing for generating power from sunlight, with the potential to supply much of the power requirements of the warfighter. Technology that has been jointly developed with the University of Massachusetts at Lowell has now been licensed to Konarka, a venture-capital funded firm that is working to producing flexible solar cells in a roll-to-roll process. If successful, these may provide an early implementation of nanotechnology for the warrior.

The NSC has been working on combining the technology of electrospinning, in which nonwoven mats of fibers having diameters of approximately 100 nm can be produced using a variety of polymers, with nanoparticles, and other materials having the potential to decontaminate chemical or biological agents. This work could lead to clothing having a layer that is both an agent barrier and is self-decontaminating, thereby providing enhanced protection for tomorrow's warfighter against these threats. Physical Sciences, Inc. has worked with NSC on developing nanofiber protective liners for future chemical protective clothing systems.

Working in-house and with industrial firms such as Triton Systems, NSC has also been examining the potential of nanocomposites that employ natural clay materials in conjunction with polymers for various applications. One example is in packaging for DOD combat rations, where polymer films made from these materials offer the potential to protect foods over longer periods, thereby increasing shelf life and reducing spoilage.

NSC has also been working with scientists from Boston College to examine the interaction of electromagnetic radiation with ordered arrays of carbon nanotubes. These materials share many things in common with photonic band gap materials and offer promise as filters, waveguides, and other components for optical modula-

tion and switching in soldier-borne equipment. NSC, Boston College, and UMass-Boston are also working together to combine the carbon nanotube arrays with dyes for agile laser eye protection and vision devices.

NSC has also been working with the Army Research Laboratory in directly supporting my initiative to meet with academia and industry to identify "low-hanging fruit" in nanotechnology that could be harvested and moved forward into Army applications sooner rather than later.

Finally, while there is significant potential for nanotechnology to enhance the soldier's real warfighting capabilities, there are many existing demands on the Army budget. One challenge is to meet the needs we have already identified as necessary for transforming the Army even as we accelerate progress in nanotechnology and ready it for insertion. To speed the transition of nanotechnology and realize its benefits, we may need to provide NSC with the resources to accelerate technology development so it can be moved forward into Army systems more rapidly.

BRAC PROCESS

36. Senator KENNEDY. General Kern, General Lyles, and Admiral Dyer, in your roles as heads of the Services' systems commands, you play an important role in protecting and promoting the tech-base and ensuring military transformation. As we face the 2005 BRAC round, what role will you play in developing the criteria and conducting the analysis?

General KERN. The Army Materiel Command will be thoroughly involved with both the Army and Joint Cross Service Groups in a collaborative effort to develop recommendations for consideration that enhance Army and DOD Transformation and the capability of our labs and research, development, and engineering centers to deliver technology to the soldier.

General LYLES. Both Congress and DOD recognize military value must be the primary consideration in reducing or restructuring U.S. military bases. All military installations will be reviewed equally, and all recommendations will be based on approved, published selection criteria, infrastructure inventory, and a future force structure plan. The criteria to be used by all Services are being developed by the OSD's Infrastructure Executive Group and Infrastructure Steering Group. I have input to both of these groups through the Secretary of the Air Force and Air Force Chief of Staff. These two groups will also conduct the analysis of the data collected by the appropriate cross-service working groups. I will ensure that the data collected within my command is true and accurate as required by the internal control plan.

Admiral DYER. I am not directly involved in development of the selection criteria or conducting the analysis, however my understanding is the Department of Defense, with all of its components, will work as a team to develop the BRAC 2005 selection criteria. Military value will be the primary consideration. Through this process DOD will not only eliminate excess physical capacity; the operation, sustainment, and recapitalization of which diverts scarce physical resources from defense capability, but also hopes to reconfigure current infrastructure into one in which operational capacity maximizes both warfighting capability and efficiency.

37. Senator KENNEDY. General Kern, General Lyles, and Admiral Dyer, do you know if the Services will recommend the same criteria as in the 1995 BRAC round?

General KERN. The Secretary of Defense has not yet proposed the criteria he will use in making closure and realignment recommendations for the 2005 BRAC round, but will do so not later than December 31, 2003, as required by the BRAC Statute. Therefore, I cannot provide a definitive response to your question. However, my understanding is that, unlike prior BRAC rounds, for the 2005 BRAC round Congress has specified a number of issues that, at a minimum, the 2005 criteria must address. For that reason I don't anticipate that the 2005 criteria will be identical to those utilized by the Department in 1995. I expect the Department and Services to work together to develop the BRAC 2005 selection criteria over the summer and fall of 2003, and the Army Materiel Command will participate in that effort.

General LYLES. Both Congress and DOD recognize military value must be the primary consideration in reducing or restructuring U.S. military bases. The criteria, which will be used by all Services, are being developed by the OSD's Infrastructure Executive Group and Infrastructure Steering Group. A draft of the criteria will be provided for a 30-day comment period not later than 31 December 2003. Final section criteria will be published by 16 February 2004.

Admiral DYER. My understanding is the Department along with the Services will ensure that the proposed selection criteria meet all of the requirements of the ena-

bling legislation, retain the best of what has worked in the past, and incorporate changes that might be needed to accommodate changing military missions in the future. DOD intends to meet all legislatively mandated deadlines regarding selection criteria, e.g., publishing the proposed selection criteria in the Federal Register not later than 31 December 2003.

38. Senator KENNEDY. General Kern, General Lyles, and Admiral Dyer, if you are not involved in the development of the criteria or the analysis, how will you ensure that the senior leadership of your Services know the importance of the systems commands, the defense labs, and product centers in the 2005 BRAC round?

General KERN. I believe that the senior leadership of the Army is well aware of the importance of the systems commands in both the near term readiness of the service and delivery of technology to the soldier, and in Army Transformation. The Army Materiel Command will be thoroughly involved in BRAC 2005 with both the Army and Joint Cross Service Groups in a collaborative effort to develop recommendations for consideration that enhance Army and DOD Transformation.

General LYLES. Through the BRAC process, we will ensure that the United States continues to field the best prepared and be equipped military in the world. I have continual contact with the Air Force headquarters members of the OSD Infrastructure Executive Group and Infrastructure Steering Group. I have nominated several of most knowledgeable senior leaders as members and functional experts to the technical, industrial, and supply and storage joint cross-service working groups.

Admiral DYER. In my normal course of business, I ensure that the senior leadership is well aware of and recognizes the importance of the systems commands, the defense labs, and product centers. As mentioned before, the Department of Defense, with all of its components, will work as one team on BRAC 2005. Each Service will provide experienced people to all levels of the cross-service BRAC working groups. The law requires that the published selection criteria, ensures that military value is the primary consideration. I anticipate that both current and future aspects of those functions and missions will be identified and considered as a part of the installation military value assessments during the BRAC 2005 process.

39. Senator KENNEDY. Secretary Wynne, what role will you play in developing criteria and conducting the analysis for the 2005 BRAC round?

Secretary WYNNE. Secretary Rumsfeld released a memo on November 15, 2002 which summarized the procedures the Department will use for the 2005 BRAC. He established two senior groups. The Infrastructure Executive Council (IEC) will make policy and oversee the entire process. The IEC is chaired by the Deputy Secretary; the Under Secretary of Defense (Acquisition, Technology and Logistics) (USD(AT&L)) is a member.

The subordinate Infrastructure Steering Group (ISG) will be chaired by USD(AT&L). The ISG will oversee joint cross-service analysis of common business functions and ensure integration of the process with the military departments and defense agencies. USD(AT&L) will issue the policies and direction to conduct BRAC 2005 analysis. Towards those ends I will carry out the policies and follow the directions issued by the USD(AT&L).

The ISG established six joint cross-service groups (JCSG) to conduct the analysis of common business oriented support functions: Industrial, Supply and Storage, Technical, Education and Training, Administration, and Medical. I chair the Industrial JCSG that will be responsible for developing closure and realignment recommendations regarding the Department's industrial functions. The Industrial JCSG has as its members senior Service and Joint Staff experts in the Industrial field.

COMMISSION TO REVIEW LAB FUNCTIONS

40. Senator KENNEDY. Secretary Wynne, last October you signed a memo recommending the establishment of a commission to review laboratory functions. You stated that your conclusion is that "... labs are out of favor and no longer have a constituency within parent organizations. Their budgets are cut, people are discouraged, and their overall utility is in question." Do you agree with this statement?

Secretary WYNNE. My opinions since that 29 October memo have been altered significantly. Updates from the Services, and from the Deputy Director, Defense Research and Engineering, who also serves as the Deputy Under Secretary of Defense for Laboratories and Basic Sciences, have been most encouraging. My suggestion to organize a commission is no longer valid. I have learned that the defense labs are, in fact, not out of favor. I am pleased to report that they have been successfully

working toward a stronger constituency within their parent organizations. As Senator Roberts implied, the memo was intended as a wake-up call. Its intent was to spur action. As I stated in my testimony, their response in working to improve the laboratories' connection to the Services has been fantastic.

41. Senator KENNEDY. Secretary Wynne, how are you working to improve that constituency within parent organizations?

Secretary WYNNE. DOD laboratories have a solid constituency within parent organizations that is being strengthened through numerous DOD initiatives.

In the Army, a new two-star command was created to centralize S&T development and enhance research and development oversight and direction.

In the Air Force, the Chief Staff of the Air Force (CSAF) and the Secretary of the Air Force (SECAF) have taken personal action. Within the past 3 years, the Air Force held three four-star S&T summits, hosted by the CSAF and SECAF, which reviewed the quality and relevancy of the Air Force S&T program. The AFRL earned positive feedback, from the highest levels of the Air Force.

The Assistant Secretary of the Navy reorganized his staff in the fall of 2002. As part of that reorganization he established and recently filled a new Senior Executive Service level position to coordinate with the Office of Naval Research, the Warfare Centers, and Program Managers to facilitate moving highly sophisticated and complex technological systems into the fleet.

At the DOD level, we have increased the budget request for S&T by nearly 25 percent in just 2 years. In addition, we have increased the investment in demonstrations, primarily through the ACTDs, by almost 50 percent over the last 2 years.

Personally, I am supporting the Deputy Under Secretary of Defense for Laboratories and Basic Sciences (DUSD(LABS)), who is working very closely with the labs through the Laboratory Quality Enhancement Program (LQEP) to develop compendia of exemplary practices that the labs themselves can use as tools for further enhancement of laboratory quality.

42. Senator KENNEDY. General Kern, General Lyles, and Admiral Dyer, as sponsors of the parent organizations, could you address the current utility of the labs?

General KERN. The U.S. Army depends heavily on its labs to provide the needed stimulus for the next generation of Army weapon systems. In areas where there is little or no outside interest for investing in research and development, such as munitions, missiles, certain areas of medicine, and certain areas of building construction, among others, a very dedicated Army investment is required. To take more complete advantage of the Army's investment in R&D, the Army Materiel Command has reorganized its lab functions into a new command.

The U.S. Army Research, Development, and Engineering Command (RDECOM), within the AMC, represents a major shift in the organization of Army labs within the AMC. There are three main objectives for the RDECOM:

1. Integrate Research, Development, and Engineering across all areas of the Army
2. Get the products of technology to the soldier faster
3. Demonstrate the agility to take advantage of opportunities no matter where they may arise.

Achieving these objectives will require new and innovative approaches to all aspects of development of technology for the soldier. The Commander of the RDE is empowered to test and experiment with new processes to achieve these objectives. The creation of the RDE Command will help the Army further enhance its ability to sustain peace and wage war when directed.

There are several examples of how the Army labs have been involved in projects that have resulted in our ability to fulfill our mission. The food our soldiers, sailors, airmen, and marines eat, the Meals Ready to Eat (MRE), are a product of the NSC, an Army lab. In conjunction with the food industry, we have developed and fielded an entire menu of food stuffs that represent dramatic improvements over just 20 years ago. During Operation Iraqi Freedom, a number of Abrams tanks were disabled as a result of being shot in the engine grill doors by rocket-propelled grenades. As a result of these incidents, the Army Research laboratory undertook a project to quickly develop a defeat mechanism. The results were welded grills that bolt on over the existing Abrams grill doors. These welded grills are crew installable with initial sets already in theater. The fact that the Army "owns the night" is a direct result of the R&D done by the Army Night Vision and Electronic Sensors Directorate at Ft. Belvoir. Here, Army scientists and engineers continue to develop and improve the Army's ability to see and operate in darkness. Many of these items have commercial applications as well, such as the MRE and night vision goggles that have found their way into the market place.

The Army labs are a vital part of our ability to sustain the peace and wage war. They represent a very talented and diverse portfolio of scientists and engineers that help the nation maintain its preeminent position throughout the world.

General LYLES. The AFRL provides the foundation for the Air Force S&T program, which contains the technology development essential for the Air Force vision of an Expeditionary Air and Space Force. Our S&T programs focus of providing cutting edge performance, flexible, and affordable technologies to the warfighter. Years of continued technology investments have resulted in unequivocal returns as evidenced by our superior military capabilities, as recently demonstrated in Operation Iraqi Freedom. These technologies, many of which are currently being deployed around the world, enable our troops to be more lethal, more informed, and more aware. The S&T program relies not only upon the wise foresight of our leaders, but upon their faith as well. AFRL is where tangible and unimaginable ideas transform into superior technological innovations. It takes imagination, innovation, and persistence to foresee today what defenses to prepare for the possibilities of tomorrow. Air Force S&T is the key to addressing tomorrow's emerging threats—both traditional and asymmetrical.

Admiral DYER. Navy centers and laboratories are best able to translate between technological opportunities and the warfighters' needs, integrate technologies across life cycles and generations of equipment, respond rapidly to DOD needs, provide special facilities, and offer the necessary technical support to the services to make them smart buyers and users of technology. For example, Navy centers and laboratories:

- Infuse the art of the possible into military planning.
- Act as principal agents in maintaining the technology base.
- Avoid technological surprise and ensure technological innovation.
- Support the acquisition process.
- Provide special-purpose facilities not practical for the private sector.
- Respond rapidly in time of urgent need or national crisis.
- Be a constructive adviser for Department directions and programs based on technical expertise.
- Support the user in the application of emerging technology and introduction of new systems.
- Translate user needs into technology requirements for industry.
- Serve as a S&T training ground for civilian and military acquisition personnel.

43. Senator KENNEDY. Secretary Wynne, what can we do to ensure that the labs and product centers remain a vibrant incubator for transformational technologies?

Secretary WYNNE. As you are aware, our laboratories and product centers are world-class institutions. Besides an increase in our S&T budget, we also plan higher investment in technology demonstration efforts. These actions provide the resources required to sustain our technological advantage and accelerate transition of critical technologies to our warfighters.

Additionally, we must begin now to incorporate long term strategies and guide investments that reshape the scientists and engineers (S&E) supply chain, assuring a quality pipeline of personnel resources. Also through LQEP, the DUSD(LABS) is working to ensure that the defense laboratories, in a collective sense, are appropriately aligned for the long term with respect to the major S&T-based transformation initiatives identified within DDR&E and within the Services.

44. Senator KENNEDY. Secretary Wynne, has the commission provided any recommendations?

Secretary WYNNE. No. My suggestion to organize a commission is no longer valid. (see supporting Answer to Question #40)

QUESTIONS SUBMITTED BY SENATOR JOSEPH I. LIEBERMAN

LAB WORKFORCE

45. Senator LIEBERMAN. Secretary Wynne, in recent years, the Department of Defense has been given numerous authorities by Congress for personnel demonstration projects to encourage employment and retention of top scientific talent, such as Section 342 of the National Defense Authorization Act for Fiscal Year 1995, Section 246 of the National Defense Authorization Act for Fiscal Year 1999 and Section 245 of the National Defense Authorization Act for Fiscal Year 2000. A preliminary study by GAO has found that very few of the requests by the labs for personnel dem-

onstration projects and flexible hiring authority have been implemented by the Department. How many requests have been made to the Department for personnel demonstration projects and flexible hiring authority under the sections listed above, and how many of these requests have been implemented by the Department?

Secretary WYNNE.

Authority	Requests	Implemented
Section 342	11	8 ¹
Section 246	10	0 ²
Section 245	7	0 ²

¹ Of the three new proposed projects not implemented, one was withdrawn by the sponsor and the other two were deferred pending the outcome of the Best Practices Initiative.

² These requests could not be approved because sections 245 and 246 did not provide the Secretary of Defense with any additional civilian personnel authorities. Nonetheless, in June 2001, DOD waived certain hiring policies, procedures, and regulations for the laboratories and centers participating in the section 245 and 246 pilot programs, in order to remove any existing DOD policies that impeded the exercise of expedited hiring authority. Further, the Secretaries of the Military Departments were requested to identify and waive those policies, procedures, practices, and regulations within the Departments not specifically required by law that restrict or otherwise impede the ability of those laboratories and centers to exercise expedited hiring authority for personnel within their organizations.

46. Senator LIEBERMAN. Secretary Wynne, how does the Department intend to use the provision for personnel demonstration projects and flexible hiring authority, and why have so few of the laboratory requests been implemented thus far?

Secretary WYNNE. Section 342 of the National Defense Authorization Act for fiscal year 1995, as amended, has been widely used. Eight personnel demonstration projects were created under this authority, which resulted in many positive personnel related benefits for the participating laboratories and centers. Examples of such innovations include:

- Relaxed rules for details and temporary hires and promotion
- Increased new hire probationary period to 3 years
- Used performance focused reductions-in-force
- Implemented pay banding
- Implemented pay-for-performance system

The Department recently proposed legislation for expanding these and other flexibilities to all Defense laboratories.

NATIONAL SECURITY PERSONNEL SYSTEM

47. Senator LIEBERMAN. Secretary Wynne, it is my understanding that Congress will be reviewing a National Security Personnel System (NSPS). Before this system is implemented, there is the concern for the present difficulties in attracting and retaining top scientific and engineering talent in the DOD labs. What steps is the Department currently taking to assure that top scientific and engineering talent are retained, before the NSPS is implemented?

Secretary WYNNE. Working within the framework of merit principles and veterans' preference, DOD has developed two innovative hiring flexibilities that, when combined, will greatly expand the hiring authorities of laboratory commanders. The first flexibility, on-the-spot hiring, effectively gives laboratory commanders direct-appointment authority for shortage categories. The second flexibility, scholastic achievement appointment authority, will provide direct-appointment authority to laboratory commanders for college graduates. Candidates must meet an overall grade point average (GPA) of 3.0 or better on a 4.0 scale (or the equivalent on a different scale); or either: (1) a 3.5 or better cumulative GPA on a 4.0 scale (or the equivalent on a different scale) in the field of study qualifying for the occupation or (2) a ranking in the upper 10 percent of a student's class of the major college or subdivision attended. We believe that these features, used in combination, will provide laboratory commanders with greater hiring flexibility. These hiring flexibilities are included in the Best Practices Personnel Demonstration Project and will be available to the laboratory commanders as soon as this demonstration project clears the final Federal Register process.

In addition to enhancing the science and engineering (S&E) human resource system, we are implementing key programs that will help attract top talent. These programs are focused on transforming the defense laboratory system; improving the overall basic research programs; and reshaping the S&E supply chain.

48. Senator LIEBERMAN. Secretary Wynne, how will the implementation of the NSPS affect the hiring and retention of top scientific and engineering workforce?

Secretary WYNNE. The NSPS proposed by the administration includes a provision that would allow DOD to hire professionals, including scientists and engineers, and to prescribe the appropriate compensation program. It is based on the authority currently available to DARPA and the military departments. This proposal provides for increased salaries and bonuses. Professionals hired under this authority may be paid at least 120 percent of the minimum rate of basic pay for GS-15, up to the rate of basic pay for Executive Schedule (EX) level IV, with basic pay and locality pay not to exceed EX-III (currently, \$142,500 annually). In addition, these employees would be eligible each year for additional payments of up to \$50,000 of one-half of their rate of basic pay, whichever is less.

We anticipate that it will greatly assist in recruiting and retaining key scientists and engineers. The NSPS, as proposed by the administration, would also enable increased flexibility in hiring and pay for performance.

BROADBAND/SPECTRUM

49. Senator LIEBERMAN. General Kern, General Lyles, and Admiral Dyer, as the Armed Services transform to a "network-centric" force, access to high-speed data communications will be vital to the military. Crucial technologies will need to be developed and subsequently deployed into the field to resolve the problem of high-speed communication to the warfighter in remote locations, to bridge the "last-mile to the soldier" gap using wireless communications. What areas of research and development are currently underway in the Department to overcome the problems of the "last-mile" communications?

General KERN. The Army fully understands the need to provide high-speed connectivity to bridge the "last mile to the soldier." To address this we are working several different technology areas: mobile networking, waveforms, airborne communication, and antenna technologies. Allow me to expand on each of these areas.

Mobile Networking: Our challenge is to provide an assured, wireless network that works in diverse, complex terrain. With wireless technologies, we can allow the warfighter steady, uninterrupted wireless on the move communications. Currently it takes hours to set up and initialize a large wireless network. Our MOSAIC program is developing solutions for a mobile communications infrastructure through the development of Ad-hoc networking protocols (software) that will allow the network to self-configure and self-heal within a matter of minutes. In addition Internet Protocol (IP) QoS that will dynamically allocate bandwidth based on precedence, priority, and/or reservation in this mobile ad-hoc environment is being pursued. QoS is a key component to making wireless networks work for the military. Even as we are adding wideband networking waveforms we must be able to dynamically set priorities to allow the critical traffic to get through the network. This will happen at the expense of low priority traffic but will ensure that the network supports the critical battlefield information.

Waveform: Current mobile radio communications networking technology uses narrowband waveforms. Narrowband waveforms limit the amount of data we can transfer in a timely manner. We are working on developing wideband waveforms in two specific areas which will provide the capability of high data rate connectivity between a large number of ground and air, mounted and dismounted, and manned and unmanned mobile assets. First, the JTRS is one of the core technologies that will change communications in the tactical environment. It will provide increased capacity and, more importantly, network services that will tie all our forces together into an inter-network allowing communications from and between all Service deployed elements, to include people, platforms, and command centers. Key to this development is the Wideband Networking Waveform (WNW) being developed under the JTRS program for which the Army is the lead service. Second, we are working on the Soldier-Level Integrated Communications Environment (SLICE) project, for example, focuses on maturing the DARPA Small Unit of Operation (SUO) Situational Awareness (SAS) waveform and making it compliant with the JTRS software communication architecture. It will leverage the many technology "pieces" from several Government and Industry R&D efforts and combine them into one advanced highly power efficient wideband waveform geared towards the soldier for the use of transferring large amounts of data in a timely manner. Power efficiency is the key to allow for battery operation.

Airborne Communication: We have found that in order to support high speed wireless data in dispersed environments in all terrain it is essential that airborne communications nodes as well as satellite communications be part of that architecture. We demonstrated this need at the Communications-Electronics Command Research, Development and Engineering Center's Command, Control, Communica-

tions, Computers, Intelligence, Surveillance and Reconnaissance (C⁴ISR) testbed. In a relatively flat terrain with some terrain features, along with foliage, we showed that an airborne relay is critical for battlefield connectivity. To address this we have partnered with DARPA and the Air Force on the Adaptive Joint C⁴ISR Node Advanced Concept Technology Demonstration (AJCN ACTD). This program is addressing multi-mission airborne technologies both for communications as well as Signals Intelligence (SIGINT) and Information Operations.

Antenna Technologies: We are conducting research in many areas of antenna technologies with emphasis on high efficiency and practicality (affordability, reduced visual signature, safety, etc.). Our mission is to develop antennas that can sustain robust, high data rate communications, offer greater agility for on-the-move operations, have low profiles for reduced platform visual signatures, can be integrated within soldiers' clothing for improved mobility and survivability, and are functional with the JTRS multi-band radio. Our Advanced Antenna program, for example, is developing various antenna technologies for applications including ground vehicle reconfigurable band switching antennas, multi-band on-the-move vehicular antennas, soldier/body borne antennas, low profile ground/rotary wing aviation antennas, and phased array antennas. In addition, DOD Teleports provide last mile extension of terrestrial DOD IF, voice, and video services via satellite communication to deployed tactical warfighters. At any of six global Teleport locations, the users can access high speed communications networks via UHF, L-band, C, X, KU, and KA frequencies. Mobile SATCOM terminals are required and become the "hub", in theater, for soldier radio access to global DOD networks.

General LYLES. The "last mile" of the Global Information Grid (GIG) is critical because it can operate under some of the most severe and adversarial conditions that exist. Information assurance, security, electronic protection, and covertness are of paramount concern when new systems are developed or applied in this portion of the GIG. At the same time, there is a need to leverage low-cost, yet highly capable commercial off-the-shelf (COTS) technology—not only because of its lower acquisition cost, but because it is interoperable with the rest of the developing GIG, which is also largely COTS-based. Thus, our main technology development mission is to find ways which commercial technology can be leveraged without erasing cost benefits.

Admiral DYER. The Department of the Navy is pursuing the development of numerous technologies to bridge the last mile of the soldier gap using wireless communications. These efforts include basic research and development programs funded by the ONR, programs funded to industry, and a set of experiments and/or planned experiments to validate the effectiveness of these efforts and highlight shortcomings to allow continued development. One example includes the Joint Task Force Wide Area Relay Network (JTF WARNET) program that is currently deploying an Operational Prototype in WESTPAC. This system includes a network radio that is being used as a surrogate for the JTRS Wideband Networking Waveform (WNW). The 41 radios will be used between Services, as well as within Services, to augment existing Single Channel Ground and Airborne Radio System (SINCGARS) and Enhanced Position Location and Reporting System (EPLRS) radios. The experiment will validate the effectiveness of the proposed WNW. JTF WARNET is an Advanced Concept Technology Demonstration (ACTD) program. Transition targets are the U.S. Army and the JTRS Program Office.

In addition, a number of ONR S&T efforts are addressing this issue:

1. **Highly Mobile Tactical Communications:** This project will integrate the existing Iridium satellite communication system as an Iridium Tactical Communication Overlay (ITCO) to the current Marine Corps tactical communication architecture (SINCGARS/EPLRS radios) in order to provide over-the-horizon (OTH) communications. This will enable a Marine Corps Expeditionary Maneuvering Warfare (EMW) capability using current, available, secure communications technology at reasonable cost without imposing the constraint of fixed sites with directional antennas that impede mobile forces.

2. **Dragon Warrior Communications Relay:** This project is developing an unmanned airborne communications relay capability for the Dragon Warrior small vertical takeoff and landing (VTOL) UAV that will provide a high data rate network radio relay for expeditionary warfare wireless networks. The Communication Relay uses the existing commercial AN/VRC-99(A) network radio, which serves as the near-term stand-in for the JTRS Wideband Networking Waveform. The DW Communication Relay will give deployed marines an enhanced capability to transmit and receive data, voice, and video throughout the battlespace network. Integration and testing of the communication payload and platform are scheduled for 4Q fiscal year 2003.

3. Submarine SATCOM Medium Access Protocol: This effort is conducting modeling and simulation to address the Medium Access Control (MAC) problem for submarine satellite communications in order to allow multiple submarines in a single Area of Operation to efficiently share a single satellite communications channel. With limited bandwidth available to submarines, and with increasing traffic requirements, it is critical that submarines make the most efficient use of their bandwidth.

4. Tactical Phased Array Networking: This project is developing a network control system (protocols) for a mobile, ad-hoc, wireless tactical network that employs agile-beam directional antennas, such as phased arrays. The use of highly-directional antennas requires coordination across the network of when and where to point each antenna. This technology could be used for either mobile user battlefield communications at high data rates or an airborne UAV network that would provide the internet in the sky and OTH capability to reach the last-mile users and provide high capacity via directional antennas.

5. Mobility Management for Heterogeneous Networks: This project is developing dynamic routing protocols for mobile users and includes the design and implementation of an enhanced 802.11 subnet in which the access points are entirely mobile and interconnected using multi-hop, wireless routes. Modeling and simulation of this protocol has been done and a 10-node field demonstration using WLAN 802.11 radios was also completed. The technology being developed could be used to provide highly mobile, automated, wireless communication for: (a) Marine Corps Expeditionary Maneuvering Warfare; and (b) Navy, Marine Corps, and Allied Coalition littoral operations.

6. Asymmetric Secure Network Access for Vulnerable Assets: This project is developing an asymmetric secure link to provide network access to vulnerable assets (last-mile user) such as reconnaissance teams, special operations users, submarines and sensors. This bidirectional link will have low data rate and long range on the uplink (from the vulnerable asset to the airborne network node) and high data rate and long range on the downlink (from the airborne node to the vulnerable asset). This technology will be most useful to the Marine Corps in terms of disadvantaged user access and providing LP/D links for deep reconnaissance missions.

50. Senator LIEBERMAN. General Kern, General Lyles, and Admiral Dyer, how does the Department plan on leveraging off of civilian technologies to maximize cost-efficient wireless communications systems?

General KERN. The Army will continue to leverage commercial technologies to the maximum extent possible across the board and this is especially true in the area of communications, including wireless communications. The commercial marketplace has made significant investments in communications technologies and it is a key part of the Army's strategy to leverage these investments. It is also important to point out that often these technologies need some adaptation before they can be applied to the tactical battlefield environment, which involves more than ruggedization. The basic philosophy we employ in regards to communications technologies is an approach we refer to as adopt, adapt, develop. Our goal is to adopt commercial technologies as is, whenever we can, that is use as is. More often the case exists that we will adapt these technologies to work in the tactical environment. Finally we develop technologies on our own when commercial technologies do not meet our needs.

There are key differences between the commercial and military tactical environment. The largest of these is the use of a fixed infrastructure. Commercial wireless technologies rely on a fixed infrastructure whether it be cell towers for phone connectivity or wired backbone for wireless Personal Data Assistants (PDAs), Wireless Local Area Networks (WLANs), etc. Commercial systems provide end user mobility. The warfighter on the battlefield requires complete network mobility. In other words, there is no fixed ground infrastructure, everything is mobile. Even with that difference we have had significant advances in adapting these technologies and leveraging these technologies.

For example, to achieve this totally mobile network that is dynamic, ad-hoc, self-forming, self-healing while providing QoS features to ensure critical information gets through the network we are using commercial standards from the Internet Protocol (IP) and build upon them to address our needs. We have a S&T program called MOSAIC that is maturing these technologies and is resulting in a commercially interoperable solution that both meets our needs and is cost effective. We have partnered with both military and non-military industry on many of these programs where industry is also making an investment (or cost share) on these efforts. Finally in order to make this S&T investment worthwhile we are transitioning these technologies to the JTRS and Warfighter Information Network—Tactical (WIN-T) pro-

grams and working standards bodies with the goal to make such features mainstream in commercial products.

There are many other examples of leveraging commercial technologies from Personal Communications Systems, the use of commercial WLAN, to antenna technologies that are becoming integral to our Network Centric concept for the future.

General LYLES. Civilian technology provides the Air Force with the opportunity to acquire advanced technology at affordable prices. Civilian wireless communication systems or technologies are evaluated for adoption, where possible, and adaptation or modification to meet specific requirements when necessary. Development of new items is done only as a last resort. For instance, we are already leveraging the commercial market for wireless local area network technology and supplementing this with military-unique features that the civilian marketplace has not yet demanded and, therefore, have not been provided. This has resulted in the availability of robust information techniques such as Type-1 security. In the area of tactical radio, software-defined radio technology will facilitate the inclusion of commercial products that meet government needs. Leveraging commercial technology and adding a military edge can be more effective than simply paying for the use of proposed civilian assets. The Air Force is assisting commercial developers in understanding the growing need for military-like robustness in the wireless area. The Air Force is also supporting advances in the commercial community through programs such as Small Business Innovation Research and Dual-Use Science and Technology.

Admiral DYER. The Navy and DOD have placed a significant emphasis on leveraging commercial technology where applicable. All of the DOD IP networking is based on the open standards developed and approved by the consensus of the Internet Engineering Task Force (IETF). Navy representatives participate in the IETF as working members with industry and academia to develop future standards that meet both commercial and military needs. In the area of Multicast Dissemination, Navy engineers recognized a shortcoming in the existing IETF Requests for Comments (RFCs) and worked as the leaders to develop a new RFC that has been placed before the IETF as a recognized extension to the standards. In those areas where military needs may be significantly different than the private sectors, focused research and development is being, or has been, performed to augment the commercial standards to meet those unique needs. In addition the ONR S&T program is addressing the issue through the following projects:

1. Highly Mobile Tactical Communications: This project will integrate the existing Iridium satellite communication system as an Iridium Tactical Communication Overlay (ITCO) to the current Marine Corps tactical communication architecture (SINCGARS/EPLRS radios) in order to provide OTH communications. This will enable a Marine Corps Expeditionary Maneuvering Warfare (EMW) capability using current, available, secure communications technology at reasonable cost without imposing the constraint of fixed sites with directional antennas that impede mobile forces.

2. Dragon Warrior Communications Relay: This project is developing an unmanned airborne communications relay capability for the Dragon Warrior VTOL UAV that will provide a high data rate network radio relay for expeditionary warfare wireless networks. The Communication Relay uses the existing commercial AN/VRC-99(A) network radio, which serves as the near-term stand-in for the JTRS Wideband Networking Waveform. The DW Communication Relay will give deployed marines an enhanced capability to transmit and receive data, voice, and video throughout the battlespace network. Integration and testing of the communication payload and platform are scheduled for 4Q fiscal year 2003.

3. Bandwidth Efficient Advanced Modulation Line-of-Sight Technology (BLT): This project is developing a UHF Line Of Sight (LOS) waveform that provides both bandwidth efficiency (100 Kbps in a 25 KHz channel) and power efficiency. Industry is developing a joint iterative demodulation and decoding scheme for achieving this 4:1 bandwidth efficiency over a LOS channel. In addition, they will develop an equalizer to mitigate LOS multipath and the latencies associated with joint iterative demodulation and decoding. This project leverages off the past commercial industry work on turbo coding. The impact of this technology development will be to serve as a combat system multiplier for the warfighter by increasing data rates (within an existing 25 KHz channel bandwidth) four-fold over current LOS technology. The targeted product line for transition is the AN/ARC-210 radio and the waveform will also be considered for the JTRS radio program.

4. Multicast Dissemination Protocol: This project developed a Multicast Dissemination Protocol (MDP), which provides an IP compliant reliable group data dissemination capability. Previous network technologies for group communications were unreliable and the design of MDP provided reliable group delivery for a broad set of applications and scenarios. Significant research gains were made in the areas of pro-

TOCOL scalability, robustness, and information theoretic repairing mechanisms. This technology was fed into the IETF, the primary Internet standards body, for civilian use and widespread application. MDP is being used, integrated, and leveraged into numerous Navy, DOD, and industry organizations including: U.S. Navy Information Screening and Delivery System (ISDS) to provide efficient and reliable dissemination to the submarine community; U.S. Army's first digitized brigade is equipped with MDP which includes the 4th Infantry Division; joint coalition network experiments are using MDP-based applications for improved situational awareness data dissemination, e-mail, and other data traffic; U.S. Postal Service (USPS) has adopted MDP for daily large scale network operations (thousands of sites) with resulting large performance gains in satellite data dissemination; NASA is using MDP in experiments for improved spaceborne network communications; and the IETF is transitioning related MDP work into a new specification for NACK-oriented reliable multicast (NORM).

5. 802.11 WLAN Technology: This low-cost, short range, commercial radio technology has been adopted in several projects in order to test and demonstrate adaptive routing and beam scheduling protocols in mobile environments. This technology could be used for either mobile user battlefield communications at high data rates or an airborne UAV network that would provide an internet in the sky and OTH communications capability. These commercial WLAN radios typically cost about 1–2 percent of what one would have to pay for a militarized radio, which has substantially more communications range capability. Hence, many projects have leveraged this civilian WLAN technology to test cost-effective wireless communication and networking capabilities.

51. Senator LIEBERMAN. General Kern, General Lyles, and Admiral Dyer, as the military forces are under increasing pressure to share spectrum with industry and government, how is the Department developing technologies that can tolerate interference?

General KERN. The DOD has undertaken quite a few programs that address the need to increase the communication reliability by reducing interference and developing new spectrum efficient technologies. The Army is also investing in this area as well as leveraging DARPA and the other Services.

In the Army we have a S&T Objective for Advanced Antennas with one of the focuses being on antenna co-site interference. This program is developing multi-band, re-configurable and band switched antenna technologies that will substantially reduce susceptibility to co-site interference (e.g., indiscriminately receiving and coupling unwanted interference energy from a nearby transmitter into the radio receiver) by increasing the antenna's ability to reject non-desired, out-of-band interference signals. These technologies will also provide greater antenna gain and efficiency resulting in more robust communication links and extended ranges. These technologies will not only increase the reliability of the communication but will also increase spectrum efficiency by providing broadband transmission.

The Army is leveraging the DARPA Next Generation (XG) program investment in spectrum efficient technology. Under this program DARPA is developing a protocol where radios can transmit suitable frequency (over a wide frequency range) by sensing the local environment and on a non-interfering basis share the spectrum much more efficiently. This technology will not only use spectrum more efficiently, but will also be able to tolerate higher level noise threshold, thus increasing the communication efficiency by a factor of 10 to 20 times. This revolutionary concept challenges the spectrum scarcity in the communication world; instead it avails the opportunity of utilizing the unused spectrum on a real time and space basis.

The Army will also leverage the DARPA Future Combat Systems—Communications (FCS-C) program. This effort uses directional antennas and networking programs to allow frequency reuse to include power management such that you only use the amount of power to close the link. This utilizes the available spectrum more efficiently and with the directionality, less interference. The Army is now building a program to mature this DARPA effort to transition these technologies to the field.

General LYLES. The increase in pressure to share spectrum may mean the military owns less and we realize that new emphasis must be given to treating the Electromagnetic Spectrum as a precious limited resource. Although Air Force requirements for spectrum access must continue to be carefully planned and retained, new advances in modulation and coding technology enable us to transmit more digital information in the limited amount of spectrum. We continue to research and field better methods of interference excision. Recent breakthroughs will allow more users to operate successfully in a limited frequency band. We are also developing techniques for better use of the lower-frequency (tactical) bands that have been under-

utilized until now. Software-defined radios, such as the JTRS will let us implement these and future techniques much more easily.

We continue to research, develop, demonstrate, and field advanced technologies. Improvements in antenna technology can support more users by covering broader ranges of frequencies and can support the reuse of frequencies by better controlling the direction of transmitted and received signals. Other specific areas that will mitigate potential interference excision techniques, higher-order modulation, advanced coding methods, enhanced networking, new or modified network (mobile ad hoc) protocols, QoS techniques, diversity (in time, frequency, space, polarization, and coding), improved radio frequency and receiver components, and signaling agility.

Admiral DYER. The increasing pressure to share spectrum, coupled with an increased need for bandwidth by the military, is forcing the development of techniques that can tolerate or mitigate interference. These programs will allow the Department of Defense to more effectively utilize the available spectrum through the use of a wide variety of techniques, such as adaptive routing, directional or narrow beam antennas, better filtering, and improved spectrum spreading and correlation techniques. ONR funded S&T programs to attack interference mitigation and to more efficiently use the spectrum that is available include the following:

1. Adaptive Routing: Interference in networks can be mitigated by having multiple communication paths to get to an end user. The Mobility Management for Heterogeneous Networks project is developing dynamic routing protocols for mobile users that are interconnected using multi-hop, wireless routes. Such an approach provides for very robust operation and tends to mitigate interference via multiple paths for transmission.

2. Narrow Beam Antennas: The use of highly directional antennas provides for interference reduction or elimination in some cases because of the narrow antenna beamwidth. ONR research in this area includes extensive development of phased array antennas as well as methods of forming networks using directional antennas across the spectrum from UHF (100s of MHz) to Q-band (on the order of 40 GHz). However, the use of highly directional antennas introduces another problem for networks and particularly for mobile networks in that one must keep track of the positions of all the platforms and the directions of all of the antennas. Thus the Tactical Phased Array Networking project is developing the network protocols to allow such a mobile, ad-hoc, wireless tactical network to operate with agile-beam directional antennas. The use of highly-directional antennas requires coordination across the network of when and where to point each antenna. This technology could be used for either mobile user battlefield communications at high data rates or an airborne UAV network that would provide the internet in the sky and OTH capability to reach the last-mile users and provide high capacity via directional antennas.

3. Optical Domain Tunable Microwave Filtering For Multifunction Antennas: This effort is investigating and developing novel photonic link based microwave filtering techniques suitable for mitigating detrimental electrical isolation and co-site interference effects associated with broadband multifunction antenna apertures. Optical domain microwave filtering potentially offers larger operating bandwidth and more practical filter reconfiguration capabilities than presently available using conventional electronic filtering approaches. In this project, photonic links with embedded broadband tunable microwave filters for adaptively improving out-of-band signal rejection will be demonstrated.

4. Multi-function Digital Receiver Demonstration for JTRS-Compliant Communication System: This effort will demonstrate that superconducting digital electronics can strongly reduce the problem of co-site interference among co-located RF systems. It will also define a development path toward fully software reconfigurable, multi-simultaneous signal hardware that offers much better utilization of bandwidth than is possible today. The proposed approach involves using the highly inherent sample speed and superior accuracy and sensitivity of superconducting analog to digital converters to produce programmable, digital matched filters (cross-correlators) operating on raw RF signals. Up to an additional 40 dB of signal correlation gain is expected prior to decoding of the signal. The receiver front end to be constructed will focus on communications signals in the UHF band (225–400 MHz), but its design concept is generic to all RF signals.

5. Studies of Spread Spectrum Communication Systems with Very High Interference Immunity: This 6.1 research effort investigates multiple access interference (MAI) suppression techniques for direct sequence (DS) code division multiple access (CDMA) systems for ship-to-ship and ship-to-shore links using satellite communications. Signal processing techniques such as multi-user detection and interference cancellation will be applied to suppress the MAI. Multiple access interference suppression techniques will be designed to combat the near-far interference problem associated with DS CDMA.

6. Communications and Sensor Networks: Interference Mitigation and Cross-Layer Design: This 6.1 research project will develop and analyze interference mitigation techniques for multi-user communication systems. Techniques such as channel estimation, channel decoding, equalization and synchronization will be investigated in order to provide an iterative, interference mitigation technique. It is anticipated that the techniques developed will have applicability to both military and commercial wireless communication systems. The effort will also examine methods for generating side information about the interference environment in order to assist the more conventional methods of combined narrow band interference suppression and multi-user detection.

7. Maximal Exploitation of Space-Time Dimensions for Communication in Highly Dynamic Scenarios: This 6.1 research project addresses maximal exploitation of space-time dimensions for communication in highly dynamic scenarios. The emphasis is on reliable and seamless wireless connectivity in a variety of environments exhibiting harsh characteristics such as multipath fading, interference and rapid temporal variations. Space-time processing will be useful with antenna arrays to maximize the capacity of the wireless channel.

8. Nonlinear Adaptive Equalizer Applied to UHF Submarine Communications for Minimizing Effects of Multipath Interference: This planned 6.2 new start in fiscal year 2004 will develop a nonlinear adaptive equalizer for improved UHF communications. Currently, submarine UHF communications are degraded by multipath distortion and other interference. One of the least invasive methods to improve UHF communications would be the adoption of a software filter that could significantly reduce the bit error rate and thus improve the data throughput. To date, the use of an equalizer for improved UHF submarine communications has not been explored. This research would develop a nonlinear adaptive equalizer to improve data rates by reducing the effects of multi-path interference. The equalizer will be adaptive to compensate for the non-stationary communications channel, and will be nonlinear for improved filtering performance through dynamic filter weight behavior.

9. JTRS Maritime Spectrum Awareness and Spectrum Adaptive Waveform: This planned 6.2 new start in fiscal year 2004 will focus on Spectrum Awareness (SA) and spectrum adaptive technology for Navy communication platforms, including the JTRS Maritime radio systems. Two major elements of this development include: Spectrum Adaptive Waveforms, including Discontiguous Direct Sequence Spread Spectrum (DSSS) Waveform for Maritime JTRS, and a Maritime Spectrum Awareness and Interference Decomposition on future Software Defined Radios tuned to frequency bands currently above the JTRS frequency band. The resulting spectrum awareness when combined with tunable filtering technology should enable interference mitigation.

10. Bandwidth Efficient Advanced Modulation LOS Technology (BLT): This project is developing a UHF LOS waveform that provides both bandwidth efficiency (100 Kbps in a 25 KHz channel) and power efficiency. Industry is developing a joint iterative demodulation and decoding scheme for achieving this 4:1 bandwidth efficiency over a LOS channel. In addition, they will develop an equalizer to mitigate LOS multipath and the latencies associated with joint iterative demodulation and decoding. This project leverages off the past commercial industry work on turbo coding. The impact of this technology development will be to serve as a combat system multiplier for the warfighter by increasing data rates (within an existing 25 KHz channel bandwidth) four-fold over current LOS technology. The targeted product line for transition is the AN/ARC-210 radio and the waveform will also be considered for the JTRS radio program.

11. Tactical Phased Array Networking: This project is developing a network control system (protocols) for a mobile, ad-hoc, wireless tactical network that employs agile-beam directional antennas, such as phased arrays. The use of highly-directional antennas requires coordination across the network of when and where to point each antenna. This technology could be used for either mobile user battlefield communications at high data rates or an airborne UAV network that would provide the internet in the sky and OTH capability to reach the last-mile users and provide high capacity via directional antennas.

SEMICONDUCTOR CAPABILITIES

52. Senator LIEBERMAN. Secretary Wynne, there is currently a serious concern about the loss to the U.S. economy of the high-end semiconductor chip-manufacturing sector to East Asian countries, the likely subsequent loss of the semiconductor research and design sectors, and the grave national security implications that this would entail. What does the Department plan to do to ensure the retention of do-

mestic semiconductor chip manufacturing capabilities, as well as research and design capability?

Secretary WYNNE. The Department recognizes this as a critical problem. We are continuing to assess the impact of this trend on important Defense systems. As capabilities move offshore, the U.S. can lose access to the most advanced technologies (i.e., commercial and foreign host security needs will be met first), reliability for delivery and performance is arbitrarily compromised, and the vulnerability for malicious engineering is greatly increased. We have already identified the most critical Defense elements that are being threatened by the migration of foundries to offshore locales and have moved to mitigate the impact. For information assurance and intelligence missions, the Department (including elements of OSD, ASD(C³I), and AT&L) is working with the National Security Agency and U.S. semiconductor firms to explore arrangements that would maintain trusted domestic capabilities in a manner mutually beneficial to all parties. We believe the Department will be able to address adequately its most pressing microelectronics needs through such arrangements. However, should economic conditions continue to force moves offshore, the Department will be faced with a more severe problem in the future. Note that we are currently addressing only those critical programs for which requirements have been identified. More broadly, the Department and the entire USG must continue to deepen its partnership with the industry in investing in the next generation of U.S. microelectronic components (i.e., photonic, superconductors, etc.) as the U.S. industry cannot fulfill this task on their own.

53. Senator LIEBERMAN. Secretary Wynne, does the Department feel that it may be possible to address some of these issues by exploring such avenues as increasing funds for research and development, supporting cooperative government-industry research programs, adjusting U.S. trade policies, or developing joint production agreements and other innovative partnership arrangements with the semiconductor industry?

Secretary WYNNE. The ensuring answer is “all of the above”. Trade policy needs to be explored with the objective of level playing field, world-wide. Simply increasing the cost of DOD parts is not a long term solution for ensuring a robust capability in the U.S. In areas where there is weak commercial S&T investment, Federal research funding should be increased. Other innovative arrangements with semiconductor firms should be explored on a functional basis. The arrangements between DOD (to include DARPA), NSA, and commercial semiconductor vendors for the most critical integrated circuits is one such example of a transformational and innovative arrangement where all parties come away with increased capabilities while simultaneously lowering costs. Nonetheless, a comprehensive, longer-term solution involving economic, technological, and political components may be needed.

54. Senator LIEBERMAN. Secretary Wynne, does the Department have plans to maintain the critical semiconductor equipment industry (i.e. lithography, photomasks) in the U.S., either through a government-industry consortium or through more direct intervention?

Secretary WYNNE. The design and fabrication of semiconductor equipment is highly specialized and requires a very expensive and lengthy product development cycle. Given the offshore relocation of semiconductor foundries, domestic equipment manufacturers have become less willing to make the U.S. based investment required to fabricate new tools. The purchase of foreign process tools could, indeed, threaten domestic chip foundries, trusted or otherwise. The fact that foreign suppliers would be in a position to impose export restrictions and at least temporarily make the few U.S. based fabrication lines technically substandard is a very real threat. Addressing this threat would come at some considerable expense. Basically, we would need to develop U.S. process tools as an “insurance policy”. If we instead focus on developing economic mechanisms that would keep the semiconductor industry on-shore, the equipment manufacturers would likely maintain both their presence and leadership role. Consequently, if we can solve the offshore migration issue, we also solve the semiconductor equipment issue. However, DOD’s needs are out of synchronization with the commercial sources. To address the problem, DOD is also looking at alternative and transformational strategies and technologies. Such approaches include exploring advanced techniques such as “maskless lithography” to allow the production of the most advanced microelectronic features in a small scale production situation to address critical needs. In this area, the needs of the DOD and the commercial semiconductor industry may become divergent.

DARPA STRATEGIC PLAN

55. Senator LIEBERMAN. Secretary Wynne, DARPA recently released their strategic plan in February 2003, and although it is an excellent description of DARPA's major focus areas, including what the agency has done for the Department in the past and what the current programs are, it does not appear to be a proper strategic plan. A strategic plan would have elements such as a list of goal statements, a series of objectives that support each of the goal statements, and a series of strategies and tactics required to achieve each objective. Finally, a comprehensive plan must be developed to describe how and when the strategies and tactics would achieve the objectives, and thus the overall goals. Does DARPA intend to develop a true strategic plan in accordance with the items listed above?

Secretary WYNNE. DARPA has an excellent strategy to promote radical innovation for our national security; its strategic plan clearly states that strategy. The plan describes DARPA's role and mission, how it operates, its major strategic thrusts, and how they have been shaped by our national security environment, and other research DARPA supports because of its proven value to the DOD. What is more, the plan is concise and readable—just what is needed to communicate DARPA's strategy. In addition to the strategic plan, DARPA makes an enormous amount of detailed information on its program plans available through its web site, the "DARPA Fact File," and, most importantly, the 400+ pages of its budget request. (The Fact File will be updated and restructured this spring to correspond to the elements of the strategic plan.) DARPA's strategy is well aligned with DOD's transformation and well managed, and detailed information on DARPA's programs is widely available, so I think the current strategic plan is very appropriate.

56. Senator LIEBERMAN. Secretary Wynne, as a good strategic plan would also be a "rolling plan" (i.e. one that is often reviewed and changed as individual strategies and tactics succeed and fail), does the Department intend to periodically review DARPA's strategic plan so as to assess the level of accomplishment in terms of the goals, objectives, and strategies?

Secretary WYNNE. You're quite right that strategy needs to be reviewed and adjusted periodically in light of new developments. That's what makes it strategy. DARPA's strategy is reviewed every year as part of the budget formulation process, and, given the interest in transformation, DARPA receives a great deal of attention. In reality, with all the high profile things DARPA is involved in, its strategy gets attention more often than that. I believe that the eight strategic thrusts DARPA has at the moment are well chosen and are proceeding apace.

 QUESTIONS SUBMITTED BY SENATOR BILL NELSON

JOINT SIMULATION SYSTEM

57. Senator BILL NELSON. Secretary Wynne and General Kern, the budget request for fiscal year 2004 cancels the Joint Simulation System (JSIMS) program in fiscal year 2004 and through the FYDP. My understanding is that the Under Secretary of Defense for Personnel and Readiness has protested the decision as "premature." I also understand that Admiral Giambastiani, Commander Joint Forces Command, shares my concerns over the elimination of this program. In previous years, JSIMS was described as the flagship modeling and simulation program for the Department, and highlighted as a shining example of joint technology development that addressed a critical warfighter need. What analysis (program management, operational requirements, etc.) informs and justifies this cancellation decision?

Secretary WYNNE and General KERN. The Department added significant resources on three occasions to provide full funding for the JSIMS program and keep it on schedule. In August 1999, \$7.9 million was reprogrammed to ensure an Initial Operational Capability (IOC) of April 2001. In August 2000, an additional \$265.5 million was allocated for fiscal year 2002–2007 to support an IOC of March 2002. Several months later, during the budget review, a further \$7.4 million increase was approved for fiscal year 2001–2002, to address shortfalls identified late in the process by the program office.

Several changes also were made to the management structure in an attempt to improve program performance and keep development on track. In December 1999, the program was given an Acquisition Category-1D (ACAT-1D) designation to increase management oversight. In January 2000, the Army was directed to appoint a full-time program manager. At the same time, the program office was instructed to produce a cost estimate, split JSIMS development into blocks, and develop appro-

appropriate acquisition documents. Although some of these measures were adopted, problems persisted. By December 2002, the official IOC date had slid to March 2005.

In addition to standard ACAT-1D oversight, there were at least four other reviews to assist program management, two of which were led by former Directors of Defense Research and Engineering. In December 1999, the Senior Review Board directed the program office to reconfigure its development plan around the Department's High-Level Architecture standard. Then, in 2001, an independent panel led by Dr. Anita Jones concluded that JSIMS needed to establish sound performance-prediction capabilities and improve its integration with its major partners, like the Army's Warfighter Simulation program. That same year, an audit conducted by the Army Material Command concluded that current engineering practices would not resolve performance issues within cost and schedule constraints. Finally, in December 2002, another independent review team, this time headed by Dr. Dolores Etter, recommended looking externally for commercial technologies and strategies that support scalability in order to facilitate spiral development for future JSIMS blocks. Dr. Etter's team also recommended an independent outside assessment of the JSIMS architecture. All of these reviews, in addition to numerous ACAT-1D assessments, highlighted serious concerns about the technical and performance standards for JSIMS. The decision to conduct an analysis of alternatives (AoA) before proceeding with further development is consistent with the results of these reviews.

58. Senator BILL NELSON. Secretary Wynne, General Kern, General Lyles, and Admiral Dyer, Congress appropriated significant resources for JSIMS and its related Service programs in fiscal year 2003. How will that funding be used now that the JSIMS program has been terminated in the fiscal year 2004 request and FYDP?

Secretary WYNNE and General KERN. All fiscal year 2003 funds remained with the program to ensure delivery of Block I software in accordance with program office estimates. The JSIMS Software Support Facility was funded at \$14 million in fiscal year 2004, using monies originally planned for the JSIMS Program Office. The remaining \$168.6 million in fiscal year 2004 funding proposed in the fiscal year 2003 President's budget was allocated to other priorities.

General LYLES. Consistent with OSD direction, all remaining Air Force fiscal year 2003 research and development funds supporting the JSIMS program will be expended in the direct support of completing the JSIMS Block 1 System Verification and Validation Test currently in progress by the JSIMS Alliance under HQ Joint Forces Command authority.

Admiral DYER. For the Navy, the resources allocated for JSIMS will be spent on existing model and simulation (M&S) programs in order to ensure they continue meeting Navy's training requirements. These systems include, but are not limited to, the Virtual At-Sea Training/Deployable Prototype Integrated Maritime Portable Acoustic Scoring and Simulator (VAST-DP IMPASS), the Battle Force Tactical Trainer (BFTT), the Enhanced Naval Wargaming System (ENWGS), the Battle Group Inport Exercises (BGIE), the JSAF (Joint Semi-Automated Forces), and the Fleet Aviation Simulator Training (FAST) Plan.

59. Senator BILL NELSON. Secretary Wynne, the termination of the JSIMS program unhinges a valuable 'center of gravity' in modeling and simulation research, development, and acquisition based upon the synergy of a tightly organized and interdependent network of industry, academia, and military services and agencies that has existed and excelled over a number of years. How will DOD ensure that this network is sustained, energized, and leveraged in fiscal year 2003 and fiscal year 2004 while alternatives to JSIMS and its related programs are evaluated for the outyears?

Secretary WYNNE. The intent is to take delivery of Block I software at the Joint Warfighting Center, where a software support facility will be established to maintain JSIMS products. This action, in conjunction with moving the hardware and cataloging documentation, will preserve our software investment for future use, should a decision be made to resume the program. JSIMS is only one of many modeling and simulation programs being conducted in Orlando, Florida. While many engineers will no longer work directly on JSIMS, their expertise will transfer readily to these other programs, thereby keeping their modeling and simulation skills current. Should the analysis of alternatives recommend a continuation of the program, we would seek to reassemble the best of the team and restart the program, using the Block I software maintained at the Software Support Facility.

60. Senator BILL NELSON. General Kern, General Lyles, and Admiral Dyer, given the termination of the JSIMS program, please highlight your current investments in modeling and simulation and how they support your Service missions.

General KERN. The Army continues to work with Office of the Secretary of Defense and Joint Forces Command to support joint training. A new joint simulation is not funded in the fiscal year 2004 budget. An AoA has been initiated and is scheduled for completion in fiscal year 2004 which will identify the most cost-effective approach for meeting joint and service training requirements. Until the AoA is complete, we cannot say whether a new program ultimately might be needed.

The President's budget for fiscal year 2004 has funding to continue limited development of constructive simulation in support of the Army Title 10 training mission.

General LYLES. With the termination of Air Force funding associated with the JSIMS program, the Air Force Modeling and Simulation Support Program will require funding adjustments to maintain and improve legacy systems currently used for service and joint readiness training, wargaming, and experimentation. We are working with the Air Staff to reallocate funds to critical efforts, and where necessary, increase outyear funding to compensate for the JSIMS program decision. Our investment strategy seeks to incorporate critical models and simulations into the C⁴ISR systems architecture, in a fully integrated battlespace environment. Within this architecture, modeling and simulation will directly support Air Force and Joint commanders conducting distributed mission operations worldwide and provide the inherent capability to conduct distributed mission training and rehearsal from home base, minimizing the stress of family separation and disruption. This strategy remains consistent with current and previous work in the JSIMS program and we will continue to work with OSD and other services/agencies to achieve cost-effective solutions to meet these critical operational requirements.

Admiral DYER. The Navy currently uses the following M&S programs:

- Virtual At-Sea Training/Deployable Prototype Integrated Maritime Portable Acoustic Sensor and Simulator (VAST-DP/IMPASS) is a portable, deployable buoy array for Naval gunfire training.
- Battle Force Tactical Trainer (BFTT) is a shipboard combat system capability providing realistic team training in all warfare areas. BFTT stimulates shipboard sensors via onboard trainers to provide simulation of non-shipboard forces such as friendly, neutral, and enemy aircraft and submarines. BFTT also links systems on board ships located in different homeports for coordinated training using distributed interactive simulation protocols.
- Battle Group Inport Exercise (BGIE) is a graduated proficiency exercise series conducted throughout the interdeployment training cycle maximizing use of shore-based trainers and ship imbedded M&S systems built on a BFTT architecture. BGIE provides tactical training at the Battle Group/Amphibious Ready Group Staff level from a single warfare area to more complex multi-warfare exercises.
- Enhanced Naval Wargaming System (ENWGS) is a computer gaming engine to support real-time tactical training to Battle Group staffs. ENWGS is a computer-based model that provides man-in-the-loop interaction and graphic depiction of friendly, neutral and enemy forces.
- Joint Semi Automated Forces (JSAF) is a computer simulation system that generates entity level platforms such as infantrymen, tanks, ships, airplanes, munitions, buildings, and sensors, that interact at the individual level in a robust synthetic natural environment. The individual entities are task organized into appropriate units for a given mission and can be controlled as units or single entities. The environment is a representation of real world terrain, oceans, and weather conditions that affect the behaviors and capabilities of the synthetic force.
- Fleet Aviation Simulator Training (FAST) plan is a program currently under development intended to replace aging aviation simulators with high fidelity versions to support training at a variety of aviation concentration areas. High fidelity aviation simulators have the potential to enhance a range of skill sets necessary to successfully employ an aircraft in combat. Individual simulators can be used to assist in developing and maintaining air-to-air and air-to-ground engagement skills, and several integrated simulators can develop team skills.

JOINT NATIONAL TRAINING CAPABILITY

61. Senator BILL NELSON. Secretary Wynne, what is the current state of analysis and planning leading to creation of a Joint National Training Capability (JNTC)?

Secretary WYNNE. The Department is making significant progress in creating the JNTC. The JNTC program has an approved budget. JFCOM is setting up the JNTC

Joint Management Office, which is now staffing its implementation plan to define JNTC certification and accreditation. Fiscal year 2003 activities include establishing and testing technical support requirements, determining opposing force capabilities, developing and testing data collection methods, and establishing and testing the exercise-control architecture. JFCOM is also leading the planning for JNTC events in fiscal year 2004 and beyond with resources programmed in the President's fiscal year 2004 budget now before Congress.

62. Senator BILL NELSON. Secretary Wynne, how does cancellation of the JSIMS and related Service simulation programs contribute to the challenge or facilitate the creation of a JNTC?

Secretary WYNNE. As the Secretary has said to this committee, the Department has not cancelled the program as implied in the question. Current systems and the JNTC, when it is available, will meet the Department's immediate training needs. JSIMS and JNTC are independent of each other, although JSIMS could be used by JNTC if it met JNTC requirements. Without JSIMS, JNTC will use legacy systems, complemented if necessary by new systems, to meet its objectives. The overarching challenge is to create a solution with a high-level architecture that provides for the rapid implementation of live, virtual, and constructive components so that trainees are immersed in a seamless, combat-like environment without realizing that some aspects are virtual or constructive.

ARMY INSTITUTE FOR COLLABORATIVE BIOTECHNOLOGIES

63. Senator BILL NELSON. General Kern, I am concerned that the Army's effort to establish an Institute of Collaborative Biotechnologies has been undermined by the appearance of an unfair and closed competition designed and executed to advantage pre-selected universities. This concern has been raised to Congress by some universities and other members of the academic community. What actions are you taking to reestablish the confidence of the many biotechnology research universities across the nation that this will be a free, fair, and open competition?

General KERN. The Army has identified a critical need for this R&D effort and only a university has the diversity of basic research capabilities and programs that can provide the breakthrough technologies that will satisfy the Army's requirements. A number of research universities have strong programs in biotechnology applicable to Army systems that could host this University Affiliated Research Center (UARC). Research universities by their nature are multidisciplinary and capable of providing the range of research required. Therefore, the Army has proposed a limited competition amongst these research universities from which a single research university will be selected to host the UARC. The host university will enlist the support of other research universities through subcontract to complement the host and to ensure all aspects of the Army's biotechnology program can be addressed.

The authority that will be used in the establishment of the UARC is 10 USC 2304(c)(3)(B) as implemented by Federal Acquisition Regulation 6.302-3(ii). This is an authority that is used for this type of competitive process. Since the Army decided to hold a competition, it publicized notices of proposed contract actions through the Government-wide point of entry for such public notices, the Federal Acquisition Computer Network.

The ICB had three such postings on January 3, 2003, the announcement of the Army's intent and the anticipation of informational meetings one on the east coast and one on the west coast. On January 31, 2003, the Army again announced the intent to create an Institute for Collaborative Biotechnologies, announced the dates and locations for the informational meetings, and identified to the public the web site for registration of the informational meetings. On February 21, 2003, the Army announced to the public the Final Broad Agency Announcement (BAA). This announcement stated to the public that the final BAA takes precedence over previously posted draft BAAs and contains the most current and accurate information regarding the Government's requirements and stated the proposal due date of 4:00 pm local time, on April 7, 2003.

The Army is using a competition limited to Research Universities for this UARC award as a means to identify a single university that could host the UARC.

64. Senator BILL NELSON. General Kern, why not design a system that continually taps into the many universities doing this research rather than limit the Army to just one, two, or three universities?

General KERN. The intent of the ICB is to develop and maintain a critical mass of researchers and to provide them with the necessary resources to conduct research

in a highly focused area of biotechnology (sensors, electronics, and information processing). The ICB will form long term collaborative relationships with Army laboratory scientists and engineers and industrial partners to continuously transition the ICB research products to application as rapidly as possible.

The plan is for other universities to collaborate with the ICB. Section 3.2.3, UARC Research Management of the Broad Agency Announcement states "It is likely that no single university has the internal expertise to adequately fulfill the Army's expectations for the ICB in its entirety. An individual university offeror, serving as the lead university, will enlist through subcontract the complementary research expertise of other universities, and that lead university will be designated as the UARC host for the Institute. The lead university will provide a fully networked mechanism whereby 40 percent of the Army ICB funded amount will be available for subcontracting purposes.

65. Senator BILL NELSON. General Kern, please provide examples of collaboration between your existing UARC and outside universities, including the amount of research funds that have been made available to those outside universities through the UARCs.

General KERN. The Army Materiel Command currently supports three UARCs, the Institute for Advanced Technology (IAT) at the University of Texas-Austin, the Institute for Creative Technologies at the University of Southern California (USC), and the Institute for Soldier Nanotechnologies (ISN) at the MIT. The contract to establish the ISN was awarded last year. ISN has begun its outreach efforts and has attracted additional industry partners, but to date no outside universities have established collaborative relationships with that UARC.

The following universities collaborate with IAT-Texas Tech University (\$489,250), Cameron University (\$10,000), four different University of Texas at Austin departments and centers, University of Texas-Southwest Medical Center at Dallas, University of Texas-Medical Branch at Galveston, and the University of Texas at San Antonio. The total funding provided to the University of Texas system-wide (not including IAT) was \$2,508,000. The combined total amount provided to universities collaborating with IAT over the past 5 years is \$3.0 million.

The following universities collaborate with ICT-University of Michigan (\$179,000), University of Pennsylvania (\$73,000), University of California-Los Angeles (collaboration only), MIT (under discussion, no funding to date). The total funding provided to other University of Southern California departments (not including ICT) was \$9.6 million. The combined total amount provided to universities collaborating with ICT is \$9.9 million.

QUESTIONS SUBMITTED BY SENATOR HILLARY RODHAM CLINTON

WATERVLIET ARSENAL

66. Senator CLINTON. General Kern, I understand that you recently visited Watervliet Arsenal and Benet Laboratories in New York. Since 1813, Watervliet Arsenal has played a vital role in arming our military and supporting our Nation and is our Nation's only manufacturing facility for large caliber cannon in volume. Benet Labs performs scientific and engineering activities that range from basic research through design for production, and engineering support for the production of its design items. The co-location of the Arsenal and Benet Labs allows for complete lifecycle management from idea through research and engineering, into prototyping and testing, and finally, into full-scale production. The labs are located in several buildings on the Watervliet property. No other arsenal in the United States can boast of this type of resource.

As I have said before, I believe that maintaining Watervliet's manufacturing ability is critical for our Nation's national security. Last month, I visited Watervliet Arsenal and Benet Labs and was greatly impressed by the leadership and the workforce that I met.

I was also greatly impressed by the vision of the future that I saw at the Watervliet Arsenal and Benet Labs which could greatly benefit the U.S. Army and the Nation. Research institutions and the private sector in the capital region of New York State are engaged in innovative research regarding cutting-edge technologies including nanotechnology. By partnering with these institutions, Benet Labs could become a designer of a wide variety of products built around the critical skills embedded in the region. Watervliet Arsenal would then be a flexible manufacturer of these innovative new products to the Army's and the Nation's benefit. What is your vision for the future of Watervliet Arsenal?

General KERN. The Army recognizes and appreciates the significance of Watervliet Arsenal's role in supporting the warfighter and its historic role as the Nation's provider of large caliber systems. Watervliet is included in our Ground Systems Industrial Enterprise initiative, a major step in the transformation of the Army's industrial base.

We will continue to enhance partnerships with the private sector as well as aggressively institutionalize lean manufacturing processes and other initiatives to improve efficiencies in the arsenal's core capabilities to meet current and future requirements.

AIR FORCE RESEARCH LABORATORIES

67. Senator CLINTON. General Lyles, the Information Directorate of the AFRL develops systems, concepts, and technologies to enhance the Air Force's capability to successfully meet the challenges of the information age. I was disappointed that your testimony did not include a discussion of your vision for the AFRL in Rome, New York. Can you give a description of the role that Rome Labs will play in the AFRL's future?

General LYLES. The laboratory facilities and personnel at Rome, New York, have been prime contributors to the Air Force's Command, Control, Communications, Computing, and Intelligence (C⁴I) technology development for many years. The Rome Research Site is a recognized leader in the development and fielding of information technology and executes almost \$100 million of core Air Force S&T funding and an additional \$500 million of customer funding annually. The Air Force has focused this funding to ensure it has produced increased capability for our Nation's warfighter's as shown by the C⁴I technology used in Kosovo, Operation Desert Storm, Afghanistan, and Operation Iraqi Freedom. The importance of C⁴I cannot be underestimated—the enemy's C⁴I is our first target during any conflict. In this high technology military world where information technology is increasingly being recognized as the force multiplier that it is, the Rome Research Site plays a crucial role in the future of the Air Force.

LABS WORKFORCE ISSUES

68. Senator CLINTON. General Lyles, how will the best practices system described by Secretary Wynne and the NSPS being proposed by DOD affect the ongoing lab workforce demonstration programs at Rome Labs?

General LYLES. The Air Force is still assessing the effect of the proposed NSPS and the related best practices demonstration project at the Rome Research Site. For the Air Force to move forward in the coming century, we need the ability to use all the flexibilities proposed in the best practices demonstration project, not only for the laboratory workforce, but across all Air Force functions.

69. Senator CLINTON. General Lyles, will they improve the labs' ability to accomplish its mission?

General LYLES. The Air Force is still assessing the effect of the proposed NSPS and the related best practices demonstration project on ongoing personnel demonstration projects. It is too early to tell if changes implemented will improve the Air Force Research Laboratory's ability to accomplish its mission.

70. Senator CLINTON. General Lyles, will they reduce or modify any of the personnel authorities currently delegated to the lab director?

General LYLES. The Air Force is still assessing the effect of the proposed NSPS and the related best practices demonstration project on ongoing personnel demonstration projects. It is too early to tell if changes implemented will reduce or modify any of the personnel authorities currently delegated to the laboratory director.

71. Senator CLINTON. General Lyles, will the modifications of this system save the Air Force money?

General LYLES. The Air Force is still assessing the effect of the proposed NSPS and the related best practices demonstration project on ongoing personnel demonstration projects. It is too early to tell if changes implemented will save the Air Force money.

SMALL BUSINESS INNOVATIVE RESEARCH PROGRAM

72. Senator CLINTON. Secretary Wynne, recently the Small Business Innovative Research (SBIR) program had great difficulty handling electronic submissions to a recent Broad Agency Announcement. In the fiscal year 2004 budget request, how much money is being invested in new technologies and procedures to ensure that these problems do not reoccur?

Secretary WYNNE. DOD is taking two complimentary steps to avoid future problems. First, additional computing processing power is being applied to address the additional volume of electronic traffic. It is anticipated that this additional hardware will cost no more than \$100,000 in fiscal year 2004. Second, DOD is considering adjusting its procedures for the entire DOD SBIR solicitation process and is exploring several options to increase the efficiency of its existing framework. It is anticipated that new procedures will be in place beginning in fiscal year 2005.

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

HYBRID ENGINE TECHNOLOGY

73. Senator LEVIN. Secretary Wynne and General Kern, the subcommittee has strongly supported efforts by DOD to develop hybrid engine vehicle technologies and fuel cells to reduce fuel costs and support defense missions. What advantages do you see hybrid vehicles having for the military?

Secretary WYNNE. Hybrid electric propulsion for future vehicles has the potential to reduce fuel consumption of ground vehicles—this will vary depending on the weight class, specific application, and driving cycle. Providing diesel fuel to operate our fleet of tactical and combat vehicles comprises the largest portion of the logistics burden, especially for the Army. Even if the reduction in fuel consumption proves to be more modest than current indications, we should be able to reduce significantly the costs associated with the logistics and sustainment tail associated with fuel on the battlefield. However, this is an emerging technology and we still have much to learn before implementing it and making a long-term commitment—especially in terms of reliability, maintenance, and lifecycle costs. In addition, we must continue to work toward making the component technologies smaller, lighter, and more affordable, if we are to realize the full potential of hybrid electric power systems as an on-board source of power for mobile radars, electric weapons, missiles, communications, computers and complex survivability systems.

General KERN. The main advantage of hybrid electric vehicles is the reduction of the logistical footprint. This is accomplished by using the onboard power generation rather than towing external power generators, increasing fuel economy, silent watch, stealth mode, improved acceleration, modular design and creating a more reliable propulsion system. For combat vehicles the propulsion system can be packaged to maximize the useable under armor volume, and the propulsion system can be tailored to the individual variant.

74. Senator LEVIN. Secretary Wynne and General Kern, what are your plans for the development, procurement, and deployment of these hybrid vehicles?

Secretary WYNNE. For the non-tactical fleet, Public Law 107–107, section 318, establishes a requirement concerning the acquisition of hybrid light duty trucks for the Department starting in fiscal year 2005. We are updating our motor vehicle directive and regulation to address this requirement. However, the limited availability of commercial hybrid vehicles will inhibit the Department's acquisition of Original Equipment Manufacturer hybrid vehicles in the near term. Currently, Toyota and Honda have only commercial hybrid sedans. Ford expects to offer the hybrid Escape Sports Utility Vehicle to fleets this fall. Other manufacturers have also indicated they will offer hybrids at some point in the future.

The General Services Administration (GSA) is a key player in the Department's ability to acquire hybrid vehicles as we lease/purchase the majority of our non-tactical vehicles through GSA. We have discussed our needs with the GSA Fleet Acquisition Division and they plan to offer hybrid light duty trucks next year. We also requested GSA to provide hybrids through their lease programs to help mitigate the higher unit cost for these vehicles. As the appropriate vehicles become available through the GSA purchase and lease programs, they will be acquired for DOD.

General KERN. The Army has been working with the our Defense vehicle suppliers as well as the U.S. automotive industry and component manufacturers to mature the technology needed within the Army for more fuel efficient and cleaner power trains.

The Japanese auto industry's hybrid propulsion technology is sufficiently matured to be offered to the general public for light passenger use. The U.S. auto industry will have matured its hybrid technology sufficiently this year to be able to offer it up for light passenger cars in 2004. Hundreds of thousands of these light passenger vehicles will be on the roads within the next few years. The fuel economy gains have been substantial in the currently available vehicles.

The Army currently has several R&D programs to hybridize several types of our military vehicles. These vehicles are currently being evaluated by our testing community and by our soldiers in the field. Our emerging test results are promising, but an operational assessment needs to occur before the Army commits to any specific technology and/or solution. Passenger cars don't have to operate in the severe climatic and environmental extremes as do our troop's vehicles. The emerging technologies for use in the military will have to be hardened significantly to survive our deployments.

We are confident the Army will be able to move into a procurement phase for vehicles that will incorporate much of this technology. Our current HMMWV program is projected to incorporate hybrid electric technology into some of its production platforms in 2006.

POST-U.S.S. *COLE* TECHNOLOGY DEVELOPMENT

75. Senator LEVIN. Admiral Dyer, since the attack on the U.S.S. *Cole*, what technologies has the Navy developed or is the Navy trying to develop in order to prevent this type of tragedy from being repeated?

Admiral DYER. The Office of Naval Research has developed several technologies to help provide force protection to U.S. ships including:

- Flare launcher on a 50-caliber machine gun mount to send warning shots at small boats.
- Running Gear Entanglement System to provide a 100m perimeter around a ship at anchor.
- Rapidly developed empirically validated models demonstrate new solutions for ship survivability. Model shows that use of stainless steel for hull material helps to reduce blast penetration.
- 360-degree periscope and related software.
- Microwave powered warning system which deters intruders by heating their skin.
- Nuclear Quadrupole Resonance System for the detection of bulk explosives (RDX, PETN) in packages, mail pouches, or on personnel (manual scanning).

In addition, NAVSEA has initiated a program called Integrated Radar Optical Surveillance and Sighting System (IROS³) to address asymmetric surface threats. IROS³ will integrate sensor information and communications for ship forces to maintain 24 hour situational awareness at pier side, at anchorage, and in restricted waterways. IROS³ will also provide semi-automated engagement of small close-in surface threats.

76. Senator LEVIN. Admiral Dyer, what technology advances are being made to allow us to detect conventional explosives (like the ones used in this attack) at standoff ranges? For example, what technologies are being developed to detect conventional explosives in vehicles (boats and trucks) at standoff ranges?

Admiral DYER. This is a challenging problem for which no good technical solution has yet been identified. ONR hosted a conference on standoff detection of conventional explosives that concluded that no stand-off (defined as >1Km) off-the-shelf detection technologies could be exploited within the next 18 months.

Planning for technology investment in this area is underway. ONR is collaborating with Air Force, Army, Navy Explosive Ordnance Disposal and NAVSEA Indian Head experts (both government and contractor) to identify and exploit emerging technologies that may potentially be stand-off quality detectors. Additional proposals are being continually received and reviewed for merit. Much work is underway in detectors suitable for shorter range, including joint Navy/DARPA work in the nuclear quadrupole resonance technology especially in combination with other stand-off techniques.

[Whereupon, at 3:51 p.m., the subcommittee adjourned.]

**DEPARTMENT OF DEFENSE AUTHORIZATION
FOR APPROPRIATIONS FOR FISCAL YEAR
2004**

WEDNESDAY, APRIL 9, 2003

U.S. SENATE,
SUBCOMMITTEE ON EMERGING THREATS
AND CAPABILITIES,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

U.S. SPECIAL OPERATIONS COMMAND

The subcommittee met, pursuant to notice, at 10:04 a.m. in room SR-222, Russell Senate Office Building, Senator Pat Roberts (chairman of the subcommittee) presiding.

Committee members present: Senators Roberts, Kennedy, and Reed.

Majority staff members present: Charles W. Alsup, professional staff member; and Carolyn M. Hanna, professional staff member.

Minority staff members present: Evelyn N. Farkas, professional staff member; Richard W. Fieldhouse, professional staff member; and Arun A. Seraphin, professional staff member.

Staff assistants present: Leah C. Brewer and Nicholas W. West.

Committee members' assistants present: James Beauchamp, assistant to Senator Roberts; Clyde A. Taylor IV, assistant to Senator Chambliss; Henry J. Steenstra and Christine O. Hill, assistants to Senator Dole; Mieke Y. Eoyang, assistant to Senator Kennedy; Elizabeth King, assistant to Senator Reed; William K. Sutey, assistant to Senator Bill Nelson; Todd Rosenblum, assistant to Senator Bayh; and Andrew Shapiro, assistant to Senator Clinton.

OPENING STATEMENT OF SENATOR PAT ROBERTS, CHAIRMAN

Senator ROBERTS. The subcommittee meets today to receive testimony on the posture and readiness of the U.S. Special Operations Command (USSOCOM) in review of the fiscal year 2004 defense authorization request and future years defense program. I welcome our witness, Lieutenant General Doug Brown, who is the Deputy Commander of USSOCOM. I see that you have two very distinguished gentlemen accompanying you. Please introduce them to the subcommittee if you will.

General BROWN. Okay, sir. To my left is Harry Schulte, the Command's Acquisition Executive and the man responsible for all Special Operations research, development, acquisition, and procurement; and to my right is Command Master Chief Rick Rogers, a

Navy Sea, Air, and Land (SEAL) and the senior enlisted adviser to the commander.

Senator ROBERTS. We certainly want to welcome you, gentlemen, and thank you for what you do for our country.

I do want to take a moment to recognize the extraordinary bravery and professionalism that we have witnessed by the United States and our Coalition Forces. They are conducting this campaign with precision and remarkable discipline. Regrettably, there have been casualties. Our thoughts and prayers go out to the families and loved ones of those killed, missing, and of those who we know are captive. We share their pain and we will not forget. As always, our forces are committed to leaving no one behind.

War is never a pleasant thing. That is why it should be the last resort.

Our Special Operations Forces (SOF), active and Reserve component, have also sacrificed. It was four Rangers who were killed in Iraq when a plain-looking civilian car with a pregnant female passenger pulled up to their checkpoint guarding a dam and exploded. Our Army Special Forces, Navy SEALs, and Air Force special operators led the initial efforts in Afghanistan, and they have lost over 20 fallen comrades. Ten of our special operators died tragically in the Philippines supporting our ally in their effort to free themselves from the terror of the al Qaeda-linked Abu Sayyaf Group. Countless others do essential things to defend our Nation that are seldom well known or recognized.

We are fortunate as a Nation to have these remarkable special operators. We are deeply saddened by these losses.

We have all been thankful for the success of our armed forces in Iraq, Afghanistan, and around the world in this global war against terrorism. While much will be debated for sure in the months and years ahead about the relative value of air power, sea power, and ground operations in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF), one thing is clear. The quiet warriors of Special Operations air, sea, and ground were trained, ready, and have performed magnificently. General Brown, you and your colleagues deserve a lot of credit for this high level of readiness.

Fifteen years ago, Members of Congress recognized that our capabilities in the area of unconventional warfare, low-intensity conflict, and special operations were not where they should be and convinced our colleagues to create a new Special Operations Command as part of a larger Department of Defense organization. The increasingly successful and sophisticated joint operations our armed forces are able to conduct, including the seamless inclusion of special operations, is a tribute to the joint warfighting concepts that were envisioned by the architects of the Goldwater-Nichols Act of 1986.

The world has been amazed at pictures and stories of the special operators directing the 21st century weapons with devastating precision, leading and advising the forces of freedom, and silhouettes of parachutes descending on distant airfields. This is the face of special operations. This is our first line of defense that has been quietly fighting terrorism around the world for years. These are the forces on which we will increasingly depend to confront the emerging unexpected and unconventional threats of the future.

Speaking for myself, I have been amazed at the pace our Special Operations Forces have maintained. While operations in Iraq and Afghanistan have been most visible, SOCOM has also continued to perform very critical missions all around the world, including in Colombia, the Philippines, and the Balkans, and military training missions elsewhere. Commando Solo, a flying broadcast studio manned by the Pennsylvania Air National Guard, has been beaming messages of freedom all over the world. Elements of the 20th Special Forces Group have been an integral part of operations in several active areas of operation. The same is true for Reserve components of our air and naval SOF components.

Most of our civil affairs capabilities, much of our psychological operations (PSYOP) are in the Reserve components. They are all doing extraordinary essential things, but often at great personal sacrifice. General Brown, your thoughts on the effect of these very demanding operations on the total SOF would be appreciated.

The nature of warfare may be fundamentally changing. Actually, it is fundamentally changing. Asymmetric, unconventional warfare seems to be coming the norm. If that is the case, our conventional forces have to be transformed to confront these increasingly conventional threats. What then is the face of future unconventional warfare? What skills and capabilities will our future Special Operations Forces need? How do we ensure our Special Operations Forces remain special, focused on the most unconventional emerging threats?

The decision by the Secretary of Defense to give USSOCOM an expanded role as a supported combatant command, in addition to your traditional role as a supporting command to other combatant commanders with your special capabilities, is a decision I support. We must be able to respond to these global emerging threats in a timely and a unified manner.

I do want to make sure, however, that we work closely together to ensure USSOCOM evolves in a manner that preserves your real agility, your uniqueness, invests in the right capabilities, and keeps you on the tip of the spear. We look forward to working with you, General Brown and USSOCOM, to ensure that our Special Operations Forces continue to be the very best in the world.

I thank you again for being here today and for what you and your command do every day in defending our National security and our friends at home and abroad.

Senator Reed.

Senator REED. Thank you very much, Mr. Chairman.

Let me welcome General Brown and Master Chief Rogers and Mr. Schulte here and echo the chairman's comments with respect to not only the extraordinary success of our special operators, but also the fact that in the course of these battles we have lost special operators, and we send out condolences to their families and we join everyone in expression of our great respect for what they do and what their comrades continue to do.

I was speaking with General Brown just before the hearing and one of my colleagues, General Del Dailey, is deeply involved in special operations in the theater of war today. He is an extraordinary soldier and representative of all the special operators I have had the pleasure to know in my career and my professional life.

We understand also that as the battle is concluded the special operators will be key in the next phase, which is the stabilization operation, which offers different challenges, maybe even more daunting challenges. I think that is something that we should be very much aware of. As we understand, today in Afghanistan special operators remain some of the key elements of our policy, just as they will remain in Iraq after cessation of the conventional hostilities has taken place.

As we go forward, too, I think we also want to recognize and understand the needs for the Special Operations Command to revitalize and restore its equipment, its personnel, to bring back its soldiers and sailors and airmen, retrain them, re-equip them. That is going to be a significant cost and I think we would like to begin at this hearing to understand the dimensions of that cost as we go forward and whether those costs have been recognized in your budget going forward, General Brown.

We are all here today to say to you: Well done; an extraordinary act of courage and professional skill on behalf of the Nation and the world. I thank you for that.

Mr. Chairman, I have a more formal statement which I would like to include in the record.

[The prepared statement of Senator Reed follows:]

PREPARED STATEMENT BY SENATOR JACK REED

I join Senator Roberts in welcoming our witness, General Doug Brown, Commander of the Special Operations Command, as well as Command Master Chief Richard Rogers, and Harry Schulte, SOCOM's Acquisition Executive.

I would like to highlight some recent SOF accomplishments just in the war on Iraq: securing Iraq's SCUD sites to prevent the launching of missile against Israel; securing airfields, and a dam on the Euphrates River; searching for weapons of mass destruction; seizing Saddam's palaces—and seizing our imaginations—by rescuing Private First Class Jessica Lynch from Iraqi captivity.

Meanwhile, special operators are heavily engaged in the global war on terrorism. Army Special Forces are training the nucleus of a new Afghan military, and civil affairs units are working on projects in Afghanistan and the Philippines. Special Operations Forces including Navy SEALs and Air Force aviators, are on assignment in places like Colombia, Yemen, and Central Asia. For all their successes Special Operations Forces have also paid a price. Since September 11, 2001, 42 special operators have been killed in action or in support of Operation Enduring Freedom, and 150 have been wounded.

General Brown let me also express the condolences of this committee for the losses that your men and their families have suffered, and please accept our thanks for their continued outstanding work.

This committee has a long tradition of interest in special operations. In 1986, the Nunn-Cohen amendment to the Goldwater-Nichols Defense Reorganization Act established the Special Operations Command and, within the Department of Defense, the position of Assistant Secretary of Defense for Special Operations and Low Intensity Conflict. Unfortunately, the position of Assistant Secretary for Special Operations and Low Intensity Conflict has remained vacant for 2 years. I join those members, including the Chairman, who have urged Secretary Rumsfeld to fill this critical position. I hope, General Brown, that you take our concerns back to the Department.

The purpose of today's hearing is to examine special operations missions, operational requirements, and the command's 2004 fiscal year budget request.

Unlike conventional military forces, who are charged with countering a wide range of military threats, Special Operations Forces are organized, trained and equipped for narrowly focused military operations. We have seen how Special Operations Forces have utilized their special capabilities, and how their successes have spawned new missions all over the world. Indeed, the Special Operations Command, has been directed by Secretary Rumsfeld to take the lead in planning and prosecuting the global war on terrorism as a fully-supported command.

Today's hearing will focus on SOCOM's roadmap for the future. I look forward to learning more about how SOCOM will organize to conduct the priority missions of combating terrorism and preventing proliferation, as well as critical traditional missions including training foreign militaries.

In addition, I hope to learn about ongoing and new research programs to support the special operator. With small, but significant investments in research and development in the past SOCOM is now able to provide its operators with more precise weapons, better night vision gear, and lighter and more capable radio and communications equipment. Indeed, in some cases the services have later procured this same equipment. I note that the budget request for research and development is \$440.4 million, as compared to the \$1.97 billion procurement request, and am interested in hearing from the command regarding the rationale for the level of funding for research and development for 2004 and beyond.

Finally, I also hope that we will hear about the SOF requirements for the next fiscal year and beyond, should operations in Iraq and elsewhere continue at the current level for your forces. My understanding is that the cost of replenishing stocks for 1 year is at least \$300 million; I'd be interested to hear more about what you might need in future supplementals.

Thank you, Mr. Chairman.

Senator ROBERTS. Without objection, and thank you, Jack, for a very fine statement.

General Brown.

STATEMENT OF LT. GEN. BRYAN D. BROWN, USA, DEPUTY COMMANDER, U.S. SPECIAL OPERATIONS COMMAND; ACCOMPANIED BY HARRY E. SCHULTE, ACQUISITION EXECUTIVE AND SENIOR PROCUREMENT EXECUTIVE, U.S. SPECIAL OPERATIONS COMMAND; AND COMMAND MASTER CHIEF RICHARD M. ROGERS, USN, U.S. SPECIAL OPERATIONS COMMAND, SENIOR ENLISTED ADVISOR

General BROWN. Thank you, sir. Mr. Chairman, Senator Reed: It is a privilege to come before you this morning to speak about the United States Special Operations Command, or SOCOM, and the men and women that make up our command. I have a few points I would like to highlight at this time, but with your permission I would ask to enter my longer prepared statement into the record.

Senator ROBERTS. Without objection.

General BROWN. Sir, you have already met Mr. Schulte and Command Master Chief Rick Rogers to my left and my right here, and with the subcommittee's permission I would like to invite these gentlemen to contribute in the forthcoming discussion as applicable.

Senator ROBERTS. Certainly.

General BROWN. Mr. Chairman, your United States military is on the offensive against terrorism around the globe. The Special Operations Forces are the tip of the spear. Last year over 7,000 special operators were deployed to more than 150 countries, providing regional commanders with a force unsurpassed in both agility and lethality. Today, in what is undoubtedly the most robust use of Special Operations Forces in the history of our military, we have significantly more than that number deployed in support of operations in Iraq.

The recent successes achieved by our men and women during Operation Enduring Freedom and now during Operation Iraqi Freedom have given the world a much clearer insight into the skills and the dedication of American Special Operations Forces. Through your support, we continue to get even better.

The United States Special Operations Command will now transform from being primarily a force provider to geographic commands to become a warfighting command with the additional mission of planning and execution of combat operations against terrorist organizations. I would stress, Mr. Chairman, that this expanded role as a supported commander is not meant to replace or otherwise marginalize the special operations organizations assigned to the regional combatant commanders. In fact, it is designed to dramatically increase the efficiencies of our operations by ensuring that we are totally synchronized and focused on the global war on terror wherever it breeds.

With this additional added responsibility, comes additional resource requirements that will allow us to be better positioned around the world, have more responsive forces, ensure collaboration with our regional combatant commanders and the intelligence agencies, increase the needed planners at the theater Special Operations Commands (SOC) and at our own headquarters in Tampa, alleviate some of the high demand, low density issues, and overall give us more agility and flexibility around the world.

At the Special Operations Command, we have built a Special Operations Joint Inter-Agency Collaboration Center to ensure there is no seam between our intelligence agencies and our planning and execution efforts. We have built a world-class Joint Operations Center. While in a temporary facility, it provides the needed connectivity to our forces currently around the world.

Mr. Chairman, I am happy to report that the Department of Defense has worked very hard to ensure Special Operations Forces at every level have what they need to get the job done. While we have focused on the war on terror, we have not lost any momentum in our extremely important ability to rapidly design, build, acquire, and field the best equipment possible for our operators on the ground, in the air, and at sea.

Congress empowered the command to develop and acquire special operations-peculiar equipment, material, and services. We have implemented streamlined and cost-effective processes to provide our SOF soldiers, sailors, and airmen with the technology and equipment they need to execute their myriad of warfighting and peacetime missions.

Our fundamental philosophy within the command is to expedite an 80 percent solution to our troops while working with the warfighters and industry to address the remaining 20 percent of the requirement. We leverage the Services, other agencies, and their development programs to look for technology to apply to our special operations needs. At the end of the day, the warfighter has the tools necessary to fight the most committed enemy across the spectrum of conflict.

The President's new budget will increase the command's annual funding approximately \$1.5 billion to a total of \$6.7 billion in fiscal year 2004. This additional funding will allow us to increase procurement and research, development, test, and evaluation (RDT&E) in the programs vital for the success of our force. These include CV-22, the MH-47G, the AC-130U gunships, and a myriad of command, control, communications, computers, and intelligence (C⁴I) initiatives and operator equipment.

Mr. Chairman, the current state of SOF capabilities is strong, but to meet the evolving capabilities of potential adversaries we must invest now to ensure reliable support for the defense strategy. Our people are certainly our most important asset. We will not forget that. But maintaining and improving materiel capabilities remains one of the command's most difficult challenges. Special Operations Forces must keep its equipment up-to-date while keeping the costs for sustaining its warfighting systems under control.

We depend on leading edge technologies to provide critical advantage and to support participation in the growing number of technologically complex missions and operations. On the horizon, we see promising technology maturing that will help to keep our forces on the cutting edge. SOCOM is working closely with industry, the national labs, with academia, to insert these technology thrust areas for the future. These thrust areas address the gaps we see in technology and offer the command the greatest opportunity for technological payback.

They will include signature reduction, high bandwidth reachback communications, underwater communications, unmanned systems, battery and fuel cells, remote sensing, advanced training systems, bioengineering, and directed energy weapons. Additionally, the command will be able to meet its critical force structure requirements that will support the increased effort to defeat terrorism around the globe.

The Department's recognition and support for our manpower requirements will result in an end strength increase of almost 4,000 people over the next 5 years. I believe it is worthy of mentioning that SOCOM has also worked closely with the Department of Defense to find funding for the much-needed state-of-the-art warfighting center to be located at our headquarters in Tampa, Florida, a facility that will afford us the highest level of efficiency and integration as we plan the war on terrorism.

Finally, Mr. Chairman, I would like to mention the special operators who have made the ultimate sacrifice since September 11th, 2001. Daily the press reports just a small sample of the amazing missions being done in OEF and OIF. Our people are engaged on the battlefield nightly performing the full spectrum of missions that mark special operations. They are working at a level of intensity, sophistication, and commitment never before seen in the history of special operations and, quite frankly, they are amazing.

These men and women, several who have been wounded, and all the special operators who put their lives on the line around the world are some of America's truest heroes. I would therefore like to close by acknowledging the great support that you and the other committee members have given our soldiers, sailors, airmen, marines, and our civilians, and thank you for the opportunity to be here today. I look forward to addressing your questions.

[The prepared statement of General Brown follows:]

PREPARED STATEMENT BY LT. GEN. BRYAN D. BROWN, USA

Mr. Chairman and distinguished members of the subcommittee, it is an honor and privilege to report to you on the state of the United States Special Operations Command (USSOCOM) and Special Operations Forces (SOF). I am pleased to report that SOF remain the most capable and ready force in the world today.

We have seen great change in our Nation as America takes action against terrorism. USSOCOM has been a key player in that response. I will report to you on how we are facing two critical challenges and provide an overview of our fiscal year 2004 budget request. The two challenges addressed are fighting terrorism on a global scale and transformation.

Let me first address the war against terrorism on a global scale. USSOCOM has been at the forefront of this fight since initiation of combat operations following the September 11 attacks. Given the character of this war and the stakes involved, SOF is on the offensive. The aspect of today's international terrorist is far different than in the past, as terrorists now have global reach, infrastructure, and significant resources. The attacks on our Nation on September 11, 2001, clearly demonstrated that determined terrorists will go to any lengths to inflict catastrophic losses on Americans, regardless whether they are civilians or military personnel. Of greater importance is the fact that these terrorists have chemical, biological, nuclear, and high-yield explosive weapons and the desire to kill as many Americans as possible and undermine our Nation's interests and influence around the world.

SOF play a vital role in combating and defeating global terrorism, by disrupting terrorist organizations and bringing their members and supporters to justice . . . or by taking justice directly to them. The mission of USSOCOM is expanding to planning direct combat missions against terrorist organizations around the world and executing those missions as the supported command, while maintaining the role of force provider and supporter to the geographic combatant commanders. To meet this challenge, USSOCOM must establish command and control infrastructures which complement the geographic combatant commanders and invest in programs and systems improving SOF's speed, agility, precision, lethality, stealth, survivability, and sustainability. USSOCOM must also be forward-deployed for rapid response. The requirement to plan, synchronize, and execute operations on a global scale necessitate a globally capable SOF ready for full spectrum integrated operations.

Full spectrum integrated SOF are the refinements that must occur to tailor SOF capabilities for the war on terrorism. These SOF capabilities will ensure greater operational agility, flexibility and mobility, sufficient global command and control, focused intelligence, signature reduction, and a collaborative planning environment that facilitates simultaneous multi-echelon planning. Additionally, SOF capabilities must continue to address other national and military strategies, including homeland defense and forward deterrence, swiftly defeating the efforts of adversaries and decisively winning lesser contingencies.

All personnel of USSOCOM—active duty, Reserve component, and civilians, are engaged in this multi-front global war on terrorism (GWOT). The battlefield successes in this campaign have proven again and again the foresight of Congress in the creation of USSOCOM. Our organizational flexibility and streamlined acquisition and resourcing authorities continue to allow unequalled response to the needs of our operators. The capability of conducting joint operations is enhanced by synchronizing SOF, which include Army Special Operations Aviation, Special Forces, Rangers, Civil Affairs, and Psychological Operations forces; Air Force Special Operations Aviators and Special Tactics Squadrons; and Navy Sea, Air, and Land (SEAL), SEAL Delivery Vehicle Teams, and Special Boat Teams.

The continuing action in Afghanistan is a great example of how joint warfighting has evolved from the Goldwater-Nichols legislation as a powerful and precise tool to support our Nation's vital interests. Daily Civil Affairs teams and other SOF continue to play an active role in Afghanistan to ensure we win the peace. Our activities in Operation Enduring Freedom have given the world a much clearer insight into the skills, dedication, and power across the spectrum of America's SOF, specifically as part of a larger joint and interagency team—each bringing their specific skills and capabilities to the team. The ability to win across the spectrum of military operations requires seamless joint teamwork and USSOCOM is privileged to team with the Services to create the best warfighting capability the world has seen.

Our other opportunity is transformation. The hallmark of SOF is that they are always open to change and "out of the box" thinking. Transformation embodies our SOF core values . . . integrity, courage, competence, and creativity. The success of change and transformation is the ability to maintain the goodness of the past, while taking calculated risks that promise competitive advantages on the battlefield for our future forces. We must change to ensure that we have maximized the ability of the human to think and problem solve, while taking advantage of the rapid pace of technology. Transformation is not about equipment, it is about a holistic approach producing sweeping advances for the individual, to the organization structure, to the appropriate application of technology to build the right capability at the right time to defeat any threat ensuring the safety of our Nation now and into the future.

Transformation of SOF is a journey, not a destination and there is no mark on the wall that will indicate we are finished transforming.

While SOF activities remain constant, the context of how and the manner in which they are executed has changed significantly. Traditionally, SOF were employed as a force multiplier to wage war against other nation states. Traditional warfare focused on the destruction of large massed armies, navies and air forces. Supporting intelligence communities developed capabilities to locate and track these large enemy combat elements. In traditional conflicts, the main effort was expended on the physical destruction of the enemy's military capability during large battles. USSOCOM is transforming intelligence and interagency capabilities not to locate and destroy large enemy combat elements, but to locate and track individual terrorists across the globe and conduct small surgical operations with minimal risk to the employed force.

In addition to the war on terrorism, our forces are still committed to the geographic combatant commander's theater security cooperation plans. These include the European Command (EUCOM)-led campaign in Bosnia and Kosovo, the Pacific Command's (PACOM) support to combating terrorism in the Philippines and exercises with our allies in the Republic of Korea, Southern Command's (SOUTHCOM) narco-terrorism programs, providing crucial SOF for Central Command's (CENTCOM) combat operations including Operation Enduring Freedom, as well as cooperative efforts with Joint Forces Command (JFCOM) and the newly established Northern Command (NORTHCOM).

STRATEGY

Our broad, yet unique, mission areas and capabilities allow us to make a number of important contributions to the National Security Strategy, especially in the war on terrorism. Although SOF cannot address every crisis, we provide policymakers an expanded set of options for rapidly resolving strategic crises with relatively limited resources, fanfare, and risk. Our ubiquitous presence as "Global Scouts" serves to assure our allies and friends of the United States' resolve. SOF's selective and integrated participation in support of Theater Security Cooperation Plans (TSCP) to include: Joint Combined Exchange Training (JCET), Humanitarian Demining (HD), Humanitarian Assistance (HA), Narco-Terrorism (NT), and Foreign Internal Defense (FID) programs which provide tangible benefits in support of war on terrorism objectives and geographic combatant command strategies while building rapport with our friends and allies.

The global presence of SOF and our unique capabilities dissuade potential adversaries by disrupting their planning, while providing the President and Secretary of Defense a wider array of options for dealing with potential adversaries. Forces organized, trained, and equipped to execute the SOF principal missions of combating terrorism and counterproliferation of weapons of mass destruction also provide critical deterrence against adversaries that might contemplate producing or employing these weapons against the homeland or our friends and allies. SOF can deter threats and counter coercion through the deployment and employment of forces specially tailored to counter adversaries' capabilities through direct and surrogate means.

By operating "in the seam" between peace and war, SOF can address transnational and asymmetric threats through direct military means or concerted action with conventional military forces or other government agencies. SOF help shape the pre-conflict environment, setting the conditions so they are favorable to U.S. objectives and provide a strategic economy of force in areas of the world left uncovered by the commitment of conventional forces to other priorities.

EXPANDED ROLE OF USSOCOM

While our Nation is at war, we realize this war is unlike any other ever fought. It is a war without formal declaration, concrete resolution, nation state boundaries, and against adversaries willing and able to strike directly against our homeland or our citizens abroad. It is a potentially interminable war in which our adversaries are likely to use weapons designed to cause catastrophic injury to our citizens and our way of life.

The nexus of the Department of Defense's counterterrorism global war on terrorism effort is at USSOCOM. Our strategy encompasses the entire spectrum of special operations missions, capabilities and methods; then incorporates conventional capabilities, as necessary, for mission success. USSOCOM's nine legislated activities remain relevant in determining our missions and activities in the fight against terrorism. Our overarching strategy is focused initially on disrupting, defeating, and destroying al Qaida. The main effort is directed against the al Qaida operational cen-

ter of gravity, their senior leadership. To accomplish this strategy, USSOCOM is employing SOF simultaneously worldwide through focused deployments to priority regions in order to prepare the battlespace, both physically and psychologically, and set the conditions for global war on terrorism operations. As the situation develops and terrorist targets are located, operations are conducted to further identify and acquire the target, followed by combat operations. The overall intent is to seize and maintain the initiative through constant pressure against known or suspected terrorist organizations and infrastructure.

As USSOCOM's role expands, this will generate changes in our manpower, organizational structure, facilities, equipment, and special programs relating to the expanded responsibilities. As we assess the specific changes needed to meet these expanded operational requirements, we will continue to collaborate with the other combatant commands and interagency partners that have key information operations (IO) supporting responsibilities in order to accomplish our changing mission in a responsible, coordinated manner.

COMMAND RELATIONSHIPS

Our headquarters organization and activities are changing dramatically to fight the war on terrorism. As the lead supported commander for planning the Department's global war against terrorist organizations, USSOCOM will plan and selectively execute combat missions against terrorists and terrorist organizations around the world. In order to most effectively enhance our ability to respond as both a supported and supporting command, we are formulating the integration of our intelligence, operations and planning, and analysis divisions into a single facility. The effect will be a synergy of talent into a single entity which will significantly enhance and focus our unique warfighting capabilities.

Our planning efforts will focus on the development of recommended courses of action to the Secretary of Defense and the Chairman, Joint Chiefs of Staff. Our focus is campaign planning, prioritization of targets and missions, development and tasking intelligence collection planning, and employment of SOF and conventional forces. As the supported command for planning and possibly execution, we conduct planning and determine forces, tactics, methods, procedures, and communications for employment. We are also developing the processes and organizations required to collaboratively draft, coordinate, and globally synchronize plans and operations. These forces could include any of our Special Operations Forces or part of the Theater Special Operations Command (TSOC), but may also include conventional forces, as necessary.

During the execution phase, USSOCOM will conduct detailed planning and execute the approved courses of action using the TSOC or a Joint Task Force or Joint Special Operations Task Force as our operational and tactical coordinator. This is a significant and transformational change in strategic military command and control and will require a major adaptation of USSOCOM headquarters and the geographic combatant commanders' TSOCs.

The geographic combatant commander's area of responsibility in which the operation is to be executed supports our request for forces by providing operational control of the forward deployed forces necessary to execute the approved courses of action, in accordance with the Department's deployment order. USSOCOM will be prepared to conduct follow-on operations based upon exploitable intelligence and operational opportunity.

We have formed a collaborative planning environment through the geographic combatant commands' staff and interagency liaisons. The collaborative planning identifies interagency requirements, issues planning guidance as appropriate, reviews, validates, and submits plans with recommended delegation of command relationships for execution for Departmental approval. This command relationship recommendation may not always recommend USSOCOM as the supported command, but may in fact, recommend the geographic combatant commander as the supported command and USSOCOM will remain in its traditional role as supporting command. In that instance, during planning, the geographic combatant commands' staff (designated as the supported command for execution) determines the forces, tactics, methods, procedures, and communications for employment. During execution, the geographic combatant command's staff executes the approved courses of action, collaborates with USSOCOM, and provides post-operation assessments. The geographic combatant command will be prepared to conduct follow-on operations based upon exploitable actionable intelligence and operational opportunity.

USSOCOM's traditional role of a "supporting" command; responsible for providing trained and equipped SOF to the geographic combatant commanders is thus a "supported command for planning" and, when necessary, "supported command for execu-

tion” within the geographic combatant commands’ areas of responsibility. Under these circumstances—supporting or supported for execution—a flexible command relationship structure that exploits the command and control capabilities already present in the geographic combatant commanders’ staff. This will enable us to prosecute missions supporting the war on terrorism will allow USSOCOM to focus our energies toward the execution of only the most critical counterterrorist operations as the supported commander for execution.

TRANSITION AND SHARING OF SOF EMPLOYMENT TASKINGS

SOF are traditionally small, highly trained, specifically organized, and uniquely equipped to perform missions conventional forces are not trained, organized, or equipped to perform. To better focus our efforts in the war on terrorism, the Department and USSOCOM are conducting reviews of the SOF principal missions and collateral activities in order to identify the mission employment taskings currently performed by SOF that could be transitioned or shared with our conventional force partners or other governmental agencies. Our measuring stick is those missions, tasks, and activities as they pertain to access, intelligence development, and operational preparation to prosecute combat operations in the war on terrorism. SOF routinely consider leveraging conventional forces and interagency partners to perform certain missions. However, if a mission task does not align directly or indirectly with the war on terrorism, or provide access to a significant area or objective, SOF have the ability to transition or load-share these tasks with conventional forces. Examples of this load-sharing are the Georgia Train and Equip missions and personal security detail for Afghanistan’s President Karzai, which were transitioned to conventional forces or other government agencies—seamlessly. Future SOF deployments should identify at the time of deployment a conventional force to be prepared to assume the mission taskings as they are identified and when the unique capabilities of SOF are no longer required, both operational and support. The transition of SOF employment taskings to a conventional force, while prioritizing and focusing all SOF deployments, in coordination with geographic combatant commanders, is essential to our continued success in planning and executing the war on terrorism.

STRATEGIC CHALLENGES AND RISK

We know that current terrorist networks are linked with non-state actors with very different local strategies but mutually self-supporting goals. These nodes operate across international boundaries, spanning and circumventing current geographic constructs. The imprecise nature of terrorist goals and the ambiguous international environment have nullified traditional responses. This dangerous mix catapults the need for an extremely sophisticated joint, interagency, combined and coalition strategy to unparallelled levels, which currently challenge our Nation to unprecedented levels.

Global access is vital to the preservation of U.S. national security and SOF must have the ability to access and operate anywhere in the world, in any mission environment, from benign to hostile. SOF maintain access and an understanding of local issues through geographic orientation, cultural acuity, and continued forward presence and security cooperation. Although theater security cooperation events provide SOF access to most parts of the world, SOF must retain the ability to operate where U.S. forces may be unwelcomed or opposed through unconventional warfare methods. Potential adversaries are acquiring weapons and developing asymmetric capabilities to deny United States forces access to critical theaters of operations in a crisis. As first responders—global scouts, pathfinders, and door openers—SOF set the stage for follow on forces.

The risks facing USSOCOM include Operational Risk during preparation of the battlespace encompassing Force Management Risk, and Future Challenges Risk. Operational Risk is the ability of a force to achieve military objectives in a near-term conflict or other contingency. Force Management Risk is the ability to recruit, train, retain, and equip sufficient numbers of quality personnel and sustain the readiness of the force while accomplishing its many operational tasks. Lastly, Future Challenges Risk, refers to the ability to invest in new capabilities and develop new operational concepts needed to dissuade or defeat mid- to long-term military challenges.

Like the Services, SOF have reduced operational risk by reallocating resources from its modernization and recapitalization accounts to fund current readiness. Nevertheless, SOF will require significant enhancements in capability, capacity and speed of response enhancements to meet all priorities. SOF may have to accept operational risk in some areas in order to build new operational capabilities. Some

key issues associated with operational risk include: sizing the force to conduct effective operations, optimizing basing to support strategic objectives, and improving SOF strike and mobility capabilities.

In many respects force management risk is the most critical problem facing SOF. The special operations community must retain its experienced and seasoned personnel to gain the significant return on investments made in the areas of assessment, selection, training, and education. For example, today's Green Beret is the only operational specialty that requires a foreign language for qualification—a critical skill that must be retained as we posture for future operations. Some key issues associated with force management risk include: retention of mid- and senior-grade personnel and growing the force to meet current as well as emerging operational requirements.

Dealing with future challenges will require force transformation—where these challenges can be overcome by using fundamentally different organizations, tactics, techniques and procedures than those used by today's forces. Some key issues associated with Future Challenge Risk include improving trans-regional information capabilities to support global operations; building a linguistically, culturally and ethnically diverse force; improving capabilities to operate for extended periods in anti-access environments; providing force protection in adverse environments; improving ground-directed fire support; and improving capabilities to operate in urban environments.

TRANSFORMATION AND REORGANIZATION

SOF must continue to operate effectively in joint, combined, and interagency environments while also fusing capabilities that reflect U.S. political, military, economic, intellectual, technical, and cultural strengths into a comprehensive approach to future challenges. USSOCOM, therefore, embraces the process of transformation in a disciplined manner that allows the command to move towards its goal of full-spectrum, integrated SOF. Our use of full-spectrum, integrated SOF will allow us to tap into diverse areas, such as commercial information technologies, utilization of space, biomedicine, environmental science, organizational design and commercial research and development. All aspects of SOF—the organization, force structure, platforms, equipment, doctrine, tactics, techniques, procedures, and missions—must continuously transform to meet the needs of the Nation and seize the opportunities manifested by change.

As we develop the tools to conduct our expanded mission in the fight against terrorism, we must transform our headquarters into one that includes the traditional train, organize, and equip mission with the capability to plan and execute the warfight against terrorism. Our component commands face this same challenge. Some areas already being addressed include the growth in our warfighting staff to build an organization oriented on the expanded mission of an operational headquarters without degrading the necessary work of our resourcing and acquisition headquarters. We have also developed a 24-hour joint operations center with the connectivity to work with the geographic combatant commanders and the TSOCs and a Campaign Support Group from a myriad of commands and interagency partners. In the near future we will see these activities consolidated into a “state of the art” warfighting center.

The 21st century SOF warrior—selectively recruited and assessed, mature, superbly trained and led—will remain the key to success in special operations. These warriors must be capable of conducting strategic operations in all tactical environments—combining a warrior ethos with language proficiency, cultural awareness, political sensitivity, and the ability to maximize information age technology. We must also have the intellectual agility to conceptualize creative, yet useful, solutions to ambiguous problems, and provide a coherent set of choices to the combatant commands or Joint Force Commander.

People will always remain the most important component of SOF capability. However, future SOF will use technological advances more effectively. Technology improvements will allow commanders to track and communicate discretely with SOF in the field. Improvements in unmanned vehicle technologies will provide better precision fire, force protection, personnel recovery, and logistics support. SOF must develop new competencies and enhance existing ones in support of critical national requirements, including the ability to locate, tag, and track mobile targets and support trans-regional information operations.

USSOCOM is focused on providing the most accurate and complete intelligence support to our tactical commanders and deployed forces. We do this by leveraging national, theater, and Service intelligence resources with our SOF-peculiar systems and intelligence professionals. USSOCOM's commitment to transformation is dem-

onstrated by the Special Operations Joint Interagency Collaboration Center (SOJICC) in the Special Operations Joint Intelligence Center. Established in 2001 to assure consistent and cohesive collaboration with national efforts, our SOJICC is a dynamic interagency, collaborative, network-centric environment that uses advanced computing capabilities and nodal analysis to rapidly process, fuse, and visualize all-source intelligence to support decisionmaking. USSOCOM is committed to discovering other ways to exploit and build upon our country's intelligence, surveillance, and reconnaissance advantages and to utilize the latest technologies to provide enhanced intelligence support to our deployed SOF in our expanded strategic role.

USSOCOM continues to transform our PSYOP force structure and capabilities to improve our support to geographic combatant commander's influence initiatives, and ongoing military operations. Lessons learned from multiple contingency operations, including Operation Enduring Freedom, identified a requirement to increase our PSYOP force structure to meet the demands of the geographic combatant commanders. The Department of the Army agreed to crosswalk the necessary manpower in order to activate two additional active duty and four Reserve Geographic PSYOP Companies. To modernize our PSYOP force we are proposing an Advanced Concept Technology Demonstration (ACTD) that will explore emerging technologies to increase the dissemination range of our PSYOP products into denied areas and develop state of the art PSYOP analytical planning tools. We are also modernizing our PSYOP EC-130E Commando Solo television and radio broadcast aircraft by cross-decking the EC-130E into the newer EC-130J model.

We have also developed a new construct in joint warfighting with the fusion of a Marine Corps USSOCOM Detachment into one of our Naval Special Warfare Squadrons. Naval Special Warfare Command (NSWC) continues to pioneer U.S. Navy warfighting capabilities to support special operations in the war on terrorism. NSWC is the lead agent on the establishment of the SOF module on the Littoral Combat Ship (LCS) and evaluating SOF modifications for U.S. Navy rotary wing programs. In addition, NSWC's transformation efforts include unprecedented experimentation in the new SSGN conversion effort. Our Naval Special Warfare component is also collaborating with the Department of the Navy to pursue technologies and concepts in unmanned undersea and air reconnaissance vehicles and sensors for persistent intelligence, surveillance, and reconnaissance (ISR), and courses of action required for enhancing asymmetric operations to find, fix, and finish non-state threats such as the global war on terrorism.

USSOCOM and the Marines have signed an agreement to establish the initial Marine Corps force contribution to SOF, which will jointly train and deploy with naval special warfare in the spring of 2004.

Finally, and most important, the improvement of SOF training, education, and experience contributes to the development of SOF's capability. Doctrine, organization, and materiel factors have additive value to the force; leadership and personnel factors, however, exponentially multiply investments in doctrine, organization, and materiel. As training, education, and experience influence the quality and effectiveness of leadership, these variables have the greatest long-term effect on SOF capabilities. In order to maintain strategic flexibility and maximize the likelihood of operational success, SOF will increase their commitment to "train for certainty, educate for uncertainty."

USSOCOM's expanded mission and organizational changes constitute a new vector that will require a continual effort to refine our Transformation Roadmap based on this new azimuth. USSOCOM will be a hybrid of the geographic combatant commanders and a specified command for Special Operations support. More than ever, our transformation is truly a process, not a destination.

BUDGET AND ACQUISITION

One of the strengths of the command, thanks to the wisdom of Congress, was the establishment of a separate Major Force Program (MFP), MFP-11, for SOF along with the requisite acquisition and research, development, test and evaluation (RDT&E) authority. It is a powerful tool that allows us to quickly meet the soldier, sailor, or airman's equipment needs. This is accomplished by a world class acquisition center at Tampa, made up of folks who live by some very specific and exacting acquisition principles. Our fundamental acquisition strategy is to rapidly field the 80 percent solution while working with the warfighters and industry to continue to address the last 20 percent.

Our expanded role in the war on terrorism has resulted in expanded resources as the Department recognized the challenges confronting SOF and the Nation. Our fiscal year 2004 budget request is \$6,735 million, 1.8 percent of the Department of

Defense budget. A summary and some highlights of SOF's fiscal year 2004 request is provided below.

Military Personnel

Today, the relative health of the special operations community remains strong. The long-term stabilization of our health depends upon continued efforts to ensure our people experience a quality of life commensurate with their hard work and their dedication to duty. Increased pay and allowances and special pays are crucial to the continued health of our community. It is imperative that we continue to improve military pay and allowances and fund the Reserve component military pay for additional schools as well as training days necessary for Reserve component SOF Military Personnel (MILPERS) requirements. Congressional support is a powerful signal to our deserving men and women and will have a tremendous impact on our future health and readiness.

The total SOF end strength for fiscal year 2004 will grow to 49,848 manpower resources with about one-third of our military manpower in Reserve component units. Thanks to the Department's recognition of a need for more SOF, and the Services' cross-walking end strength to SOF, we will see an end strength increase of 3,869 over the next 5 years.

This end strength growth primarily supports the manning requirements to wage the global war on terrorism. The increases are focused on fixed and rotary-wing aviation, SEAL teams, Civil Affairs (CA), PSYOP, TSOCs, and support to USSOCOM as the supported combatant commander in the war on terrorism. While USSOCOM budgets for SOF personnel, the Services execute the funds. For fiscal year 2004 our MILPAY request totals \$2,210.8 million.

Operation and Maintenance (O&M)

Operation and Maintenance (O&M) is the heart of maintaining SOF operational readiness. O&M includes the day-to-day costs of SOF unit mission activities, such as civilian pay, travel, airlift, special operations-peculiar equipment, equipment maintenance, minor construction, fuel, consumable supplies, spares and repair parts for weapons and equipment, as well as the headquarters functions of USSOCOM and its Service components. Our fiscal year 2004 O&M request is \$1,994.1 million. An additional \$12 million supports SOF from MFP-3 (command, control, communications, and intelligence [C⁴I]) O&M funds.

Operating forces include the necessary resources for SOF tactical units and organizations, including costs directly associated with unit training, deployments, and participation in contingency operations. Resources support civilian and military manpower, SOF peculiar and support equipment, fielding of SOF equipment, routine operating expenses, and necessary facilities.

Procurement

Along with the authority to budget and program for SOF activities, USSOCOM also has the authority to develop and acquire Special Operations peculiar equipment to prepare SOF to carry out their assigned missions. This provides the warfighter with the tools necessary to fight not only the most committed industrial age power, but also the means to fight entities that would and could wield influence through terror by any means. USSOCOM's fiscal year 2004 procurement request is \$1,978.3 million, an increase of over \$1 billion over the amount appropriated in fiscal year 2003. Speaking of fiscal year 2003, we would like to thank Congress for the procurement increases received—over \$137 million—including the transfer of funds from the Defense Emergency Response Fund.

The current state of SOF capabilities is strong, but to meet the evolving capabilities of potential adversaries, we must invest now to ensure reliable support for the Defense Strategy. USSOCOM's aim in pursuing technological transformation is to guarantee our forces remain relevant to any fight, and ensure we minimize risk to our Nation's vital interests.

To enhance our force projection capabilities, we must continue to invest in programs to improve strategic mobility, force protection, research and development, and information dominance.

Our Air Force Special Operations rotary-wing capabilities must remain safe, sustainable and relevant. We are working to ensure the airworthiness and defensive system capabilities of our MH-53 helicopters to allow them to fly in the threat environments they face on the battlefield.

The heart of our future rotary wing capability as we transform Air Force special operations to the CV-22 is the rotary-wing upgrades and sustainment funding provided for critical improvements to our Army special operations aircraft. These aircraft must be capable of operating at extended ranges under adverse weather conditions to infiltrate, reinforce, and extract SOF. The fiscal year 2004 budget provides

ongoing survivability, reliability, maintainability, and operational upgrades as well as procurement and sustainment costs for fielded rotary wing aircraft and sub-systems to include forward-basing of MH-47 helicopters. In fiscal year 2004, the Department made a concerted effort to mitigate our most pressing problems associated with SOF low density/high demand rotary wing assets. In particular, the MH-47 inventory was increased by 16 aircraft in fiscal year 2004 by diverting CH-47D aircraft from the Army's service life extension program (SLEP) production line to the SOF MH-47G production line to help alleviate USSOCOM's critical vertical lift shortfall due to battle damages. We are grateful to the Army for their support. The MH-60 fleet begins a major program in fiscal year 2004 to extend its useful life, which will significantly upgrade our MH-60 fleet. Improvements to both fleets will enhance SOF's ability to conduct both medium and long range penetration into denied or sensitive areas. These programs will keep our Army rotary wing relevant well past 2020.

The command is committed to the CV-22 aircraft and its unique capabilities. We will continue to assure the CV-22 is safe, reliable, and maintainable for SOF. The long-range, high speed, vertical lift CV-22 fills a long-standing SOF mission requirement not met by any other existing fixed or rotary wing platform. The Navy is the lead Service for the joint V-22 program and is responsible for managing and funding the development of the baseline V-22, Osprey. The Air Force will procure and provide the fielding of 50 CV-22 aircraft and purchase service common support equipment for USSOCOM. Initial Operational Test and Evaluation will be conducted as soon as practical, after Developmental Test is complete. The support we have received from the Department for an additional test aircraft will significantly reduce the technical and schedule risk for this "flagship" program. USSOCOM will continue to fund the procurement of SOF peculiar systems for the CV-22 such as the terrain following/terrain avoidance radar, and electronic and infrared warfare suites.

The fiscal year 2004 AC-130U Gunship program continues modification of four additional C-130Hs into the gunship inventory. C-130 modification programs provide for numerous survivability and capability modifications to our C-130 fleet. The Department accelerated the MC-130H Combat Talon II aerial refueling modifications to fiscal year 2004 because this capability is crucial to the war on terrorism. In addition, the Air Force is providing USSOCOM 10 additional C-130Hs to convert to MC-130Hs. This increased capability will make up for attrition losses, enable SOF to forward-station additional rapid mobility assets, and allow us to assure our allies through increased forward presence. In fiscal year 2004, we will continue programs including the Directed Infrared Counter Measure (DIRCM) Laser and several modifications to our Commando Solo fleet.

The Advanced SEAL Delivery System (ASDS) is a specially designed combatant submarine that will provide clandestine undersea mobility for SOF personnel and their mission support equipment. The ASDS is capable of operating in a wide range of threat environments and environmental extremes, providing increased range, payload, communications, loiter capability and protection of SOF personnel from the elements during transit. The ASDS provides a quantum leap in our undersea mobility capability. ASDS boat #1's Initial Operational Capability is planned for third-quarter, fiscal year 2003. In fiscal year 2004, program activities for the ASDS will continue to focus on procurement of long lead material items to support ASDS boat #2 fabrications and the development of technology improvements in the areas of sensors, cameras and communications. The ASDS is the only capability of its kind in the world.

In addition to the ASDS, USSOCOM remains committed to the Navy's SSGN program, converting four *Ohio* Class Ballistic Missile Submarines into dual role Strike/SOF platforms that will provide SOF with unprecedented worldwide access for both the ASDS and the SEAL Delivery Vehicle. The transformational changes incorporated into the SSGN will allow SOF to deploy a larger and more flexible force package than has ever been possible. Additionally, the command, control and communications capabilities designed into these platforms will permit SOF to operate independent from, or in conjunction with, any land or sea-based Joint Task Force.

Research, Development, Test and Evaluation (RDT&E)

We must continue to invest in making our SOF more capable in all environments. Our Research and Development (R&D) activities focus on exploiting technologies to improve SOF Command, Control, Communications, Computers, and Intelligence (C⁴I), mobility, weapons, and survivability. Our R&D program, while modest, is producing great capability enhancement products. USSOCOM's fiscal year 2004 RDT&E request is \$440.4 million, as compared to \$512.5 million in fiscal year 2003.

Two examples of capability enhancement products are our National Systems Support to SOF and our Advanced Tactical Laser (ATL) Advanced Concept Technology Demonstration programs.

The National Systems Support to SOF project is successfully integrating national intelligence systems capabilities into the SOF structure. For example, the project is rapidly transitioning Blue Force Tracking equipment from development to operational use by SOF deployed in Operation Enduring Freedom. These systems enable command and control elements, as well as combat search and rescue elements, to identify and track friendly forces. They also significantly increase our capability to execute surgical strike missions in the proximity of friendly forces by providing an effective means to distinguish between friendly and enemy forces.

The Advanced Tactical Laser (ATL) ACTD evaluates the military utility of a tactical directed energy weapon on the battlefield to provide support to the warfighter. A directed energy weapon has inherent performance capabilities that can support extremely precise and selectable strikes, effects and lethality, and multi-axis engagements. These capabilities have the potential to greatly enhance the effectiveness of our SOF operators. The ATL ACTD will develop and employ a modular, high-energy laser weapon system on a C-130 platform, capable of conducting ultra-precision strike engagements to enhance mission accomplishment. In fiscal year 2004 program activities will focus on design completion of an objective ATL system, procurement of long lead material items, and begin the Military Utility Assessment (MUA) using ATL simulations and component hardware testing in conjunction with military exercises.

We are working on an array of improvements across our mission areas, including: improved body armor and chemical protection, advances in gunship armaments, developing and leveraging Information Operations (IO) tools. USSOCOM's primary success has always been ensuring we select the right people and train them for innovation: we equip the warrior, not man the equipment. We clearly recognize that the modern battlefield is comprised of land, air, sea, space and the virtual domains. IO has the potential to help SOF operators remain undetectable in hostile area—a critical element in most SOF missions. We intend to actively pursue IO capabilities and develop standing authority to employ these capabilities when needed. This will improve SOF effectiveness and access to previously denied environments, and dissuade potential competitors from engaging even if they perceive quantitative advantage.

Some of our most successful development programs have or will make a real difference in the fight against terrorism. The Multi-Band Intra-Team Radio (MBITR) provides a small, lightweight, software reprogrammable handheld radio capable of providing both secure and clear voice and data communications over 100 selectable channels. Thanks to support from the Department and Congress, USSOCOM has been able to accelerate fielding of these radios to our forces.

Another program worthy of mention is the hemostatic bandage. The development and rapid fielding of the hemostatic dressing embodies the first of our SOF truths—that humans are more important than hardware. The family of hemostatic dressings, which include the fibrin and chitosen dressings, were not due for fielding until 2007, but with the heroic actions and ultimate sacrifices of SOF in Afghanistan, USSOCOM focused on accelerated fielding of these dressings. Thanks to the combined efforts of the Department, the Services, and other combatant commands, this revolutionary medical technology was catapulted from the research laboratory to the field 5 years ahead of schedule. These dressings stop the bleeding almost effectively as surgical closure of a wound. We aim to put this technology into the hands of every soldier, hoping to end preventable hemorrhage on the battlefield.

Military Construction

USSOCOM's military construction efforts ensure our highly specialized SOF personnel and equipment are provided a modern array of SOF training, maintenance, operational, and command and control facilities to successfully execute SOF missions. USSOCOM relies on the Services to provide community support facilities and programs construction only for facilities directly contributing to SOF training, readiness and operational capabilities. USSOCOM's fiscal year 2004 MILCON request is \$99.4 million for 12 projects.

CONCLUSION

Now and in the future, SOF continue to improve their ability to execute the war on terrorism, while remaining ready to deal equally with demands of both our warfighting and peacetime roles. SOF will be deliberate in its transformation to ensure continued support to critical national requirements.

But let us never forget those who have paid the last full measure. We want to acknowledge the 36 men and women killed in direct support of our Nation's response to terrorists since October 2001 and others lost or wounded in combat operations to ensure their skills were honed and ready for the next fight. We face adversaries who would destroy our way of life. In response, SOF will not rest until we have achieved victory in the war on terrorism.

Thank you for the opportunity to provide the state of SOF and for your continued support of our soldiers, sailors, airmen, marines, and civilians; the men and women of the United States Special Operations Command.

Senator ROBERTS. Thank you, General Brown. Do either one of our special guests have any opening statements?

Mr. SCHULTE. No, sir.

Chief ROGERS. No, sir.

Senator ROBERTS. Senator Reed.

Senator REED. Thank you very much, Mr. Chairman.

Thank you, General Brown, for your statement. Well done. In your testimony you state: "SOCOM must establish command and control infrastructures that complement the geographic combatant commanders." With your new role and your mandate to operate anywhere in the world, I think this is one of the key issues that you have to face organizationally. Can you give us an idea of what you are doing and what steps you are taking to make it less hypothetical? For example, coordinating with SOUTHCOM with respect to Colombia, coordinating with Pacific Command (PACOM) with respect to the Philippines?

General BROWN. Yes, sir. What we are doing is, as we take on this new role as the supported commander, we are ensuring that we have the connectivity with all of the regional combatant commanders and Theater Special Operations Commands, we call the TSOCs. Those are Special Operations Forces that are a component of all of the regional combatant commanders.

We believe that they will be key in assisting us as we go on with the war on terror to help us identify targets, deploy folks, and command and control the battlefield. With that in mind, we have added additional people to the TSOCs, about 84 in some and about 74 in others based on the requirement, so that they can help us do this command and control when we are in the supported commander role.

Additionally, we have stood up the Joint Operations Center down at Tampa, Florida, that gives us connectivity to all these people and a Collaboration Center so that we cannot just be sharing information, but actually collaborating as we go through our planning process. We have built a campaign support group that actually has members of all of the regional combatant commanders and the inter-agencies located right with us at Tampa, Florida, in a temporary facility that we will eventually put in a world-class warfighting center.

So part of the vision is that we have tremendous connectivity out through our theater SOC's and right there from Tampa, Florida, for our planning.

Senator REED. Let me follow up if I could, General. Are there budgetary issues involved in this coordination? I mean, before you came on board with this mission the commanders in chief (CINC) had essentially this mission in their individual geographic zone with budget authority that were planning to do this mission. They

were the ones who were going to operate. Now you come in and say, no, no, it is our responsibility.

Can you elaborate just briefly on whether there are budget issues here?

General BROWN. Well, the first thing I would say is that we work in very close coordination and cooperation with the regional combatant commanders. I think one of the great things about this entire plan, that it is not an either/or. We are all in this thing together and we will coordinate very closely with the regional combatant commanders on a day-to-day basis as we take on these type of missions.

We plussed up those SOCs so that we could help not only the regional combatant commanders as we placed this additional burden on them, but additionally to help us make sure that we are informed with everything that is going on in their theater, and the regional combatant commanders have been extremely supportive of this plan.

In addition to the plus-up of personnel for resources that I already spoke about, and the building of our facilities down at Tampa, Florida, that will help us do this, we also have asked for additional force structure so that we can forward-position to increase our ability to be agile and flexible as we get these type missions and to reduce our reaction time. That is part of the plus-up, the \$1.7 billion in 2004, that we have.

A lot of that money will go to help us forward-position, increase our connectivity, increase our national mission posture, and to plus-up our TSOCs. We will actually have forward-based capability where we can react much more quickly.

Senator REED. One of the other consequences of your new mission is a refocusing of roles, giving up some traditional roles that the Special Operations community perform, like liaisons to other countries and training. Certainly we have seen that in Colombia for example, the Philippines, and elsewhere. Can you comment about how this is going? Not only are you gaining some more flexibility, but you lose something in terms of exposure to foreign militaries, language, training, and those aspects which come with the training mission for one.

General BROWN. That is a great point, Senator. That is one of the things that we want to make sure that we maintain the value of, our interaction with all of these foreign services that we work with and train with on a regular basis, because that is one of the keys to our cultural awareness, for our ability to be out around the world working.

We are already turning over some of the missions that we started to conventional forces, missions that they could pick up. I think the best example is the Georgia Train and Equip Program (GTEP), where we went in, got it started, set it up, and then brought a Marine Corps company in behind us. They spent a couple of weeks to make sure that they understood the same program of instruction (POI) so that we did not start all over again, and then they just continued on, and that Special Operations company was then allowed to redeploy to prepare for other missions.

We are also looking at other tasks, such as personal security detachments, and we are studying this very hard. For every potential

area that we could turn over to a conventional force, we intend to do that.

Senator REED. To get back to the point that I raised in my opening comments, I understand that for your operations at the 2003 level of tempo of operations (OPTEMPO) the cost of replenishing your stocks is on the order of about \$300 million. That is on top of operations, maintenance costs for current operations. The long and the short of it, can you give us an idea of the impact that you see going forward on the operations in Iraq, Afghanistan, the Philippines, and the potential situation in North Korea, in terms of additional moneys you might need?

General BROWN. It would be very difficult for me to give out a figure to say this is exactly the amount we need. We know that after this, Operation Iraqi Freedom, is done and we have redeployed, we will have to refurbish a lot of our helicopters and our C-130s. Just about every C-130 that we own right now is deployed except for keeping the schoolhouse open. Our MH-47E are all we have left in the States keeping the schoolhouse open, all those. So they are going to need refurbishment and we have some plans to do that.

Our forces are going to have to come back and we are going to have to pay for the attrition of all of our equipment that we have lost or has worn out or been damaged over there. We will have to ensure, and we have been working very hard to ensure, that our schools are operating again at a maximum capacity so that we can continue to ensure we have the force in the field that we need.

We will have to restock all of the shelves in our SOSAs, what we call our Special Operations Support Activity, that maintains our stock of parts for us. There is a myriad of things we are going to have to do.

For me to put on a specific price tag on it, it would be very difficult.

Senator REED. It sounds like it is a significant number. It is not a rounding error we are talking about here.

General BROWN. No, I think it is a significant number, Senator.

Senator REED. Is that anywhere in the budget that we are seeing before us, General, that number?

General BROWN. We have some plans. We have money for the MH-60 service life extension program (SLEP) that we will do in concert with the big Army. We have money for the MH-47 SLEP program that will convert them to the G models from the current E models. Those aircraft will just naturally go through that line and be refurbished and come out the other end. So some of those costs have already been paid.

Then additionally, of course, we are looking forward to the potential of a supplemental, which for us is about—the 2003 supplemental I am talking about—\$1.7 billion, about \$531 million that we have already, and that leaves us about \$1.2 billion. From that we will pay deployment costs, flying hour costs, but some of that will be to continue to field equipment in small numbers that we need to continue fighting the global war on terrorism.

So it is very difficult to see without knowing exactly where the end date is and when we will be able to come home and when we

will be able to start rotating our forces around to know exactly what this bill will be.

Senator REED. I think we all understand there will be a bill, and I think you would be pleased the sooner you knew, because then you could start planning.

The chairman has been very kind. I can stop now, Mr. Chairman.

Senator ROBERTS. Oh, no, please proceed. Just, General, understand: We are authorizers. We promise everything. It is the appropriators that are tough.

Senator REED. You have talked about the new mission of the special operators and we have seen the great skill and progress. One area of Special Operations, civil affairs and psychological operations, going forward the civil affairs function is going to move from the back rank to the front rank. Psychological operations are ongoing today and will continue.

In the new orientation, do we have sufficient resources committed to these two areas, civil affairs and psychological operations? Do we have enough forces? Most of these forces I believe are in the Reserves. Can we continue to count upon the Reserves to again and again be taken from communities and called up and then sent back and then taken again? Can you comment?

General BROWN. First of all, let me talk real quick about our Reserve Forces. I think in Special Operations Command we do a tremendous job of training and working with our Reserve component. As you have already mentioned, Senator, most of our civil affairs forces are in the Reserves. We only have one active civil affairs battalion and that is at Fort Bragg, North Carolina, the 96th Civil Affairs. That active component will grow. Of the 2,500 or so spaces that we will get here in the 2004 time line, that active component will grow about 184 people. That will help them with some of their tasks.

Additionally, we will grow four more civil affairs battalions in the Reserve component, because of the amount of demands that we place on these civil affairs folks.

We work with our civil affairs folks on a regular basis. They have been deployed to Kosovo, they have been deployed to Bosnia. We routinely use them around the world. They have done tremendous work for us in OEF, and of course, as you mentioned, during the final phases of OIF they will be extremely important to get out in those areas and design and figure out what the infrastructure is going to have to be to help put Iraq back together again and make sure that all those services are there.

Civil affairs forces in our Reserve component are extremely important to us and that is why we are going to grow four battalions. I think we are also growing 9 CAT-As, which are the four-man teams that go out, and about 184 in the active component.

Senator REED. Thank you, General.

A final question—

General BROWN. Sir, could I interrupt you?

Senator REED. I am sorry. Excuse me.

General BROWN. I failed to mention our great PSYOP forces and I did not want to leave them out. You are correct, about a third of our PSYOP forces are in the active component, but we are also going to grow in our PSYOP forces so that we can continue the

great work that they are doing. We will actually grow two active component companies in our psychological operations, four companies additionally in the Reserve component, and then we are standing up a joint PSYOP support element of about 70 folks that will be located at Tampa, Florida.

So both of those issues, we are getting involved with making sure that they have the force structure that they need.

Senator REED. Do these PSYOP companies have a geographic orientation or are they generic?

General BROWN. Some of them, but they are all different kinds. The truth is that some of them will be oriented on specific areas and some of them will be what we call general purpose battalions, and those have two different kinds of missions as we stand them up.

Senator REED. Thank you, General.

A final question, the Advanced SEAL Delivery System (ASDS). It has been in development since 1994. It is 6 years behind the original schedule. Costs have more than tripled. Last year we authorized the General Accounting Office (GAO) report. One of the recommendations the GAO made was to have the DOD Cost Analysis Improvement Group (CAIG) conduct an independent estimate and this recommendation was apparently rejected by the Department of Defense, indicating that they had not yet determined the level of CAIG involvement necessary.

When can we expect DOD to make at least a determination of whether the CAIG will be involved and when they will be involved? A more general question: When can we expect the cost to stabilize, the schedule to firm up, and the system to be coming on line?

I believe there is one vehicle now, a prototype in Hawaii?

General BROWN. Yes, sir. I will say something about ASDS and then I would ask Mr. Schulte to get involved with this answer.

Senator REED. Thank you.

General BROWN. Our ASDS, you are right, sir, we have one. It is a prototype. It is out in Hawaii right now. It has made 115 dives and it has spent over 1,000 hours under water at this time. It took part in Millennium Challenge 2002 and actually ran a sample scenario during Millennium Challenge, which it performed very well.

Senator ROBERTS. Now, were they on the blue team or the red team?

General BROWN. They were on the blue team in that.

Its operational evaluation (OPEVAL) starts next month and we hope to have it IOC'd (initial operational capability) this summer. So for the details on the budget pieces of it, I would ask Mr. Schulte to weigh in.

Mr. SCHULTE. Senator, you are exactly right, we have been at this a long time on ASDS. But we have hung in there and what we have ended up with in Boat No. 1 is actually a pretty formidable weapon system, we think. As General Brown said, it is going to its OPEVAL—actually it starts late this month and it goes into May. So we will have a robust test and we are very hopeful that this is going to do well.

It was taken through a vehicle integrated systems test several months ago, which is a little bit like an OPEVAL, a dress rehearsal

for an OPEVAL, and it did very well. So we are very hopeful on that.

As far as the CAIG involvement in the program, as a result of the GAO report Mr. Aldridge did make the decision to move the program up to an ACAT-1 (acquisition category). He is going to make it an ACAT-1C. The milestone decision authority will remain with Mr. Young in the Navy. I do not think it has been determined yet whether the DOD CAIG will do an estimate or not.

The program office has done an independent estimate and the Navy Cost Analysis Group has done another analysis. They were a little bit different. They have reconciled those differences now. So basically we have what we think is a pretty solid program estimate for what these boats are going to cost for Boat No. 2 through No. 6.

Whether Mr. Young will determine that he wants the DOD CAIG to do yet another estimate, whether it may be required is still unknown. We will be coming up for a full rate production decision probably this fall. So OPEVAL will be over in May, take a couple of months to get the final report, there will be a milestone decision taken to Mr. Young probably in September or October, something like that, and he will have to decide after the OPEVAL report, whether we need yet another independent cost estimate or not.

If he decides he does, from what I am told, it will take the CAIG about 6 months to do one. So if we do a DOD CAIG estimate, it might delay the milestone decision back later in the year or early next year. I think that is where the discussion is: Do we want to delay the procurement of the long lead material in 2004 until January or something like that in order to get a CAIG estimate? Really, that is Mr. Young's decision.

Senator REED. Thank you very much.

A final point. Command Master Chief, have you had a chance to ride in the delivery vehicle yet? Or within the SEAL community, what is the word, not from the cost perspective but from the warfighter perspective?

Chief ROGERS. You are talking about the ASDS, correct, sir?

Senator REED. Yes.

Chief ROGERS. I have had a chance to talk to the SEALs who have been involved in the testing. The last time we went to Hawaii I had a chance to talk to the group that did a couple of exercises out of it, and they had very positive things to say about it. It is accomplishing what we intended it to do, which is it is putting the operator in a dry, relatively comfortable—notice I say “relatively”—if you have seen one of these, you know that the inside of this thing is not what you call spacious. But it is adequate for getting our folks inside and keeping them dry and comfortable to where they get to where they are actually going to do their insertion and then continue on with the rest of the mission.

So it has been positive so far, sir.

Senator REED. Right. Well, if they were of normal size like myself it would be comfortable, it would be spacious. [Laughter.]

Thank you, Mr. Chairman.

Senator ROBERTS. Well, do not sell yourself short. [Laughter.]

Senator REED. Thank you, Mr. Chairman.

Thank you. Be brief, do not be short. [Laughter.]

Senator ROBERTS. General, unlike operations in Afghanistan, most of the media focus in Iraq has been on conventional forces, a lot of talk, a lot of talking head generals, experts, gurus, and media. I would like for you to give the subcommittee a short overview of the scope and level of participation of your forces, U.S. and coalition, in the current military operations in Iraq. As a matter of fact, most of the questions that I got from the press were, are you there, and obviously what are you doing. Obviously you cannot say that, or you say no comment.

While I think you were in the glare of the center ring and the spotlight in Afghanistan, I am not too sure that was the case with regards to Iraq. But yet I think your contributions were just as important, if not more so.

Would you care just to give a very brief overview of how you see that?

General BROWN. Sir, I think you are exactly right. We have been—our forces have been—extremely important in Operation Iraqi Freedom. We have stood up a Combined Joint Special Operations Task Force and put all of the SOF, or I should say most of the SOF, under this Combined Special Operations Joint Task Force.

Quite frankly, the press has already reported about the SEALs hitting the gas and oil platforms down off Al Faw Island and also the switching stations and there have been some reports. Especially the rescue of Jessica Lynch got a lot of press. Special Operations Forces are over there, and we have pretty well done all of the things that you would expect Special Operations Forces to do and all of our core missions. Without thinking through it in detail, we have probably done all of those, and we are decisively engaged all over the battlefield in Iraq.

Senator ROBERTS. General Jim Jones, now the Supreme Allied Commander, Europe (SACEUR), then the Commandant of the Marine Corps, indicated to the subcommittee and to all interested that he had signed agreements with SOCOM that would greatly expand the cooperation and the interaction between the Marines and the Special Operations Forces. A year later, what is the status of this cooperation, and how do you envision this relationship evolving, knowing that you are talking to a former marine? There are no ex-marines. Will there be a Marine component of SOCOM?

General BROWN. Sir, I think whether there is going to be a Marine component of SOCOM is yet to be seen. This October we will start with an 85-man detachment that will report to our Naval Special Warfare Command and become part of our maritime component. They will train from October to April. They will sail in April. About this time next year we will start having some real good definition on how these two forces have worked together.

But that is only a proof of concept and, quite frankly, that is only part of the success stories I think we are having in getting these forces together. Now, all the Marine Expeditionary Units, Special Operations Capable (MEUSOC), when they come into country, link up with our theater Special Operations Command headquarters and they exchange liaison officers (LNO) to make sure each know one another and what the capabilities of each one has.

We have now got a Marine Corps Brigadier General Chief of Staff. General Denny Hejlik has been assigned down at Special Operations Command and sits in the office right next to mine, and he is very much engaged in everything that is going on, and specifically helping with this Marine Corps initiative.

As you mentioned, General Jones and General Holland signed a memorandum of understanding. I have signed a memorandum of agreement with General Bedard of the Marine Corps to get this proof of concept going with the force recon platoon—or company—sailing with our guys.

I think the key to this thing is how to maximize the capability of both forces and ensure that we know where we can best go on the battlefield together and how to make sure that we are getting the essence out of the skills of each one.

I would go back to the story of Jessica Lynch. I think that is a great story. That was planned in conjunction between Marines and Special Operating Forces. The Marines provided the security cordon while the SEALs went in and did the actual room-clearing operation and rescued Private Lynch. So that was a great example of how we can get together and maximize the effects of both of those great forces.

Additionally, we just had the material development folks down for the Marine Corps. They looked at all of our programs. We have seen all of their programs. I will soon go on a Special Operations Capable Exercise, certification exercise, with one of the MEUSOCs. General Hejlik and I will go look at how that best works and where we might fit into that.

We share all of our technology with them. One of the great success stories in Operation Enduring Freedom was a small radio—I think we have brought it up and showed it to the subcommittee before—called the multiband inter-team radio, a very small, handheld, inter-team radio that was a tremendous success story for the Special Forces A teams on the ground. I think what most people do not know, is that the first load of those went to the United States Marine Corps even though they were developed in Special Operations Command jointly with the Marines.

So we have a lot of interaction with the Marines and we are continuing to find areas that we can work together.

Senator ROBERTS. You answered about three questions there, which is right on the money.

I mentioned in my opening comments, and Senator Reed also commented about this, about a significant portion of SOCOM resides in the Reserve components. If there is one thing I am concerned about, when we were—“we” meaning Senator Levin, Senator Warner, Senator Rockefeller, myself—the first time the Intelligence Committee and the Armed Services Committee went on a joint congressional delegation (CODEL) to the war zone.

I was talking to a lot of reservists who had been in the Balkans, Kosovo, Bosnia, and now Iraq, and I do not know how they do it. They do it at great personal sacrifice. We were able to pass some legislation that should be of help to them in terms of the monetary situation.

But this high OPTEMPO, I know it affects your Reserve components. Do you have any suggestions in terms of adjustments on the active-Reserve component mix of SOCOM to relieve this problem?

General BROWN. Sir, we are doing a little bit of that. The additional people that we are putting in the 96th Civil Affairs, the additional PSYOP active duty companies, will relieve some of those problems. I think that is about the extent of any change in the Active and Reserve Forces.

But I will tell you that we are looking at that. We see the problem. We are having to very closely manage our Reserve components and their commitment. It is a great personal sacrifice to them and it is a lot of understanding employers that are very generous to let these people constantly come to work for us.

We are looking at that very carefully to see if there is some change in the mix that we need. Those that we have immediately in front of us where we know we can change the mix a little bit, we are doing that in the civil affairs (CA) and PSYOP.

While I am on the Reserve component, sir, I would like to mention our great 19th and 20th Special Forces Group out of the Army National Guard. I failed to mention earlier in the PSYOP portion our folks from the 193rd Commando Solo at Harrisburg, Pennsylvania. Commando Solo which is doing such a phenomenal job for us and continues to in all of the things we get involved in.

The 19th and 20th Special Forces Group are two Special Forces, SF, groups that have taken part in OEF and some of their teams are in OIF. The 20th Group commander, Colonel Greg Champion, was our Joint Special Operations Task Force commander of all SOF in Afghanistan for the last 6 months. We have taken a Reserve component headquarters and put them over there controlling all of the active and Reserve SOF. Sir, they have performed tremendously.

So I go back to what I said in the original question, I think that Special Operations Command uses its Reserve components probably at a rate much higher than other folks do.

Senator ROBERTS. The MH-47 Chinook, that is a real work horse for you in Afghanistan. They suffered significant losses, eight, as staff has informed me here, and you hoped to obtain funding to replace these eight in the 2003 supplemental. It was not included in that request. They are not going to be replaced until fiscal year 2005 or 2006 if we do not do something.

What is your recommendation on how best to minimize this operational impact?

General BROWN. Sir, the CH or MH-47 Echo (47E) has been, as you said, our work horse on the battlefield, with its Special Operations-unique equipment, terrain-following terrain avoidance (TF-TA). It can work at those altitudes that a lot of aircraft cannot get to, and it continues to be the only aircraft on the battlefield that can internally load a high mobility multi-purpose wheeled vehicle (HMMWV), and that is a key part to why we need the 47 Echoes.

The basic vehicle for a Special Forces team is a HMMWV. The only helicopter that can load it internally and then fly the legs using its aerial refueling capability and, especially in marginal weather, using its TF-TA, the 47E has really come to the forefront during Afghanistan as a critical piece of equipment for our infils

and exfils, and today they are employed all over Iraq and Afghanistan.

We did lose two of them. We lost one in the Philippines, we lost one in Operation Anaconda, totally lost. Then we had 11 of them that were badly damaged in either landings in brownout conditions or to enemy fire, which we had several of them shot up.

We have in Program Decision Memorandum (PDM-1) a replacement for 16 aircraft. Our initial plan back even before all this started was to grow a new Chinook battalion to meet our requirements. That is 24 aircraft. We have the first 16, and what we are trying to do is find funding and work with the Army and the Department to get the other 8.

Senator ROBERTS. Senator Reed asked you about the combatant commands, so I think we will pass on that subject. I think you got into that, and also the budget considerations. The SOCOM budget request increased significantly this year, \$4.5 to \$6 billion, but most of this increase is for the helicopters and other aviation systems, and the spending on research and development (R&D) actually goes down. I know we should be replacing lost equipment one for one perhaps.

But on this subcommittee, if you look at the title of it, "Emerging Threats and Capabilities," we should be developing new capabilities. Are you satisfied you are investing sufficient resources to develop these future capabilities? Should we be investing more in R&D and science and technology (S&T) to develop the capabilities we need for future unexpected threats?

General BROWN. Sir, I would ask Mr. Schulte, our Acquisition Executive, to talk a little bit about R&D funding and where we are going with that area.

Senator ROBERTS. I mean, if there is any outfit that cannot stand still it is your outfit.

General BROWN. Yes, sir, I think you are exactly right.

Mr. SCHULTE. Sir, you are right that about a billion dollars of the increase in our budget for fiscal year 2004 is in procurement. That is basically to get these extra helicopters that General Brown talked about, to start the SLEP program for the MH-60, to finish the plus-4 buy for the four new gunships. There was one gunship, a new gunship, put into 2003 and there are three gunships in 2004. There is an acceleration of the air refueling mod for the Talon 2 aircraft. There is some money in there to get the CV-22 production started and there is a new simulator for the Chinook.

So all of that is over about a billion dollars, those are the kinds of things where the procurement is now. In the R&D, the actual change in the R&D was up a little bit. The request from the President's budget in 2003 was \$420 million. Congress was most generous last year and plussed us up a net of \$92 million, which is how we got up to \$512 million.

What we have asked for this year is \$440 million. So compared to our request last year, we have actually gone from \$420 million to \$440 million in R&D. We actually got \$512 million last year because Congress had some plus-ups. I think that level of R&D is adequate for what we are trying to do right now. It is more important for us to get the additional helicopters and modify the aircraft that we have right now to get the capability into the hands of the

warfighter as soon as possible. That is where the priorities of the command are right now, sir.

Senator ROBERTS. That makes sense.

Senator Kennedy, I have just two more questions, but in the interest of your time would you like to proceed?

Senator KENNEDY. Thank you, Mr. Chairman.

I want to welcome our witnesses here. I just left Chief Finnegan, who is the Police Chief in Hyannis, Massachusetts. His son is a Special Forces operator in Nasiriyah now. So we are all, I think, very much aware of what you are doing, your leadership, and all of those that you lead, and we commend you.

I would like to ask about the issue that we have seen on the television and even this morning taking place in these major cities and what your own reaction is. That is the growth of the sort of the lawlessness that is taking place. I am primarily interested in the stories that we saw this morning. One from Thomas Freedman of the New York Times, who has been pretty objective and supported the administration, talks about the fact of Umm Qasr, 20 days into the war, is without running water, security, and adequate food supplies. He went in with a Kuwaiti relief team, taking pity on the Iraqis, "tossed food from a bus window as we left; townsfolk scrambled after the food like pigeons jostling for bread crumbs. It is a scene of humiliation, not a liberation," and it goes on.

Then in The Washington Post this morning they have "Fighting in Baghdad, Other Areas, Stalls."

Senator ROBERTS. Are you sure that is not classified? It is from the Post. [Laughter.]

Senator KENNEDY. I will just read one line: "No one is more impatient than the relief workers who are poised to deliver electric generators, water, jobs to Iraq. They say the Iraqis will benefit after hostilities end. The frustration level is going up. We feel like a bunch of pigeons perched on the boundaries. One U.S. relief staffer said: 'We are ready to do stuff, but we need a secure environment in which to do it.'"

My question has two parts: What is your assessment of the secure environment, how far are we away from it in these areas where the humanitarian need is the greatest? Also, what is the policy with regards to the, whether it is Baghdad or Nasiriyah or these other communities, in terms of the growth of lawlessness where we have some presence?

[The information referred to follows:]

THOMAS L. FRIEDMAN

Hold Your Applause

UMM QASR, Iraq
It's hard to smile when there's no water. It's hard to applaud when you're frightened. It's hard to say, "Thank you for liberating me," when liberation has meant that looters have ransacked everything from the grain silos to the local school, where they even took away the blackboard.

That was what I found when spending the day in Umm Qasr and its hospital, in southern Iraq. Umm Qasr was the first town liberated by coalition forces. But 20 days into the war, it is without running water, security or adequate food supplies. I went in with a Kuwaiti relief team, who, taking pity on the Iraqis, tossed out extra food from a bus window as we left. The Umm Qasr townsfolk scrambled after that food like pigeons jostling for bread crumbs in a park.

This was a scene of humiliation, not liberation. We must do better.

I am sure we will, as more relief crews arrive. But this scene explained to me why, even here in the anti-Saddam Shia heartland of southern Iraq, no one is giving U.S. troops a standing ovation. Applause? When I asked Lt. Col. Richard Murphy, part of the U.S. relief operation, how Iraqis were greeting his men, he answered bluntly and honestly: "I have not detected any overt hostility."

Overt hostility? We've gone from expecting applause to being relieved that there is no overt hostility. And we've been here only 20 days. As I said, I'm certain things will improve with time. But for now, America has broken the old order — Saddam's regime — but it has yet to put in place a new order, and the vacuum is being filled in way too many places by looters, thugs, chaos, thirst, hunger and insecurity. A particular problem here in the south is the fact that British troops have still not totally secured Basra, the regional center. Without free access to Basra, the whole southern economy is stalled.

It would be idiotic to even ask Iraqis here how they felt about politics. They are in a pre-political, primordial state of nature. For the moment, Saddam has been replaced by Habbes, not Bush. When I asked Dr. Safaa Khalaf at Umm Qasr Hospital why the reception for U.S. forces had been so muted, he answered: "Many people here have sons who were soldiers. They were forced to join the army. Many people lost their sons. They are angry from the war. Since the war, no water, no food, no electricity. . . . We have not had water for washing or drinking for five days. . . . There is no law, no policeman to ar-

rest people. I don't see yet the American reign of running the country."

The scene at Umm Qasr Hospital is tragic. A woman who delivered a baby an hour earlier is limping home, and her mother has the baby tucked under her black robe. An old orange Dodge speeds up and a malnourished teenage boy moans on the back seat. A little kid is playing with an X-ray film of someone's limb. In the hospital lab, the sink is piled with bloody test tubes, waiting to be washed when the water comes back on.

What is striking, though, is that after people get through complaining to you about their situation, they each seem to have a story about a family member or cousin who was arbitrarily jailed or killed by Saddam's thugs. They are truly glad to be rid of him. America did good in doing that, so now we must build a peace we can be equally proud of.

But this is such a broken land. Its spirit was broken by Saddam long before we arrived, and now, because of this war, its major cities and infested order are being broken as well.

No water, no food, no happy faces.

Killing Saddam alone will not bring America the thank-yous it expects because Iraqis are not yet feeling free. Only replacing Saddam's order with a better order will do that. "There is no freedom because there is no security," said Dr. Mohammed al-Mansuri, the hospital's director.

We are so caught up with our own story of "America's liberation of Iraq," and the Arab TV networks are so caught up with their own story of "America's occupation of Iraq," that everyone seems to have lost sight of the real lives of Iraqis.

"We are lost," said Zakiya Jassim, a hospital maintenance worker. "The situation is getting worse. I don't care about Saddam. He is far away. I want my country to be normal."

America broke Iraq; now America owns Iraq, and it owns the primary responsibility for normalizing it. If the water doesn't flow, if the food doesn't arrive, if the rains don't come and if the sun doesn't shine, it's now America's fault. We'd better get used to it, we'd better make things right, we'd better do it soon, and we'd better get all the help we can get. □

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Fighting Stalls Relief Operations Crucial To Overhaul Of Iraqi State

By Peter Slevin, Washington Post Staff Writer

Persistent guerrilla warfare in much of Iraq and the punishing fight for Baghdad are stalling the Bush administration's ambitious relief operations even as they make humanitarian successes more critical to the larger U.S. mission of overhauling the Iraqi state, according to U.S. officials and analysts.

U.S. and international aid agencies remain largely stranded outside Iraq's borders while fighting continues for control of Baghdad and other key areas of the country. Food stocks, while adequate in most places, will run out in weeks. Across the country, water is running short. Perhaps the greatest immediate need is for medical assistance -- especially in the Iraqi capital, where deaths are now in the thousands and hospitals are overwhelmed.

"The situation in the city is extremely critical," International Committee of the Red Cross spokeswoman Amanda Williams said yesterday. Red Cross workers took supplies to the Medical City Hospital, which she said had no water or power, and where only six of 27 operating theaters were functioning.

Fighting blocked Red Cross efforts to reach another hospital, she said. Meanwhile, the World Health Organization reported that trauma kits for 6,400 patients, as well as 38 tons of medical supplies, were stranded in Jordan because of the fighting.

The worsening casualty figures and the increasing damage are complicating relief operations that the administration considers central to winning support from Iraqis for the difficult postwar challenges ahead, according to government officials and aid specialists.

"Every day this drags on, the more significant the human needs will be. There's bound to be a lot of hard feelings," said George Devendorf, director of emergency operations for Mercy Corps, a U.S.-based aid group. "The bitterness is going to be tough."

The military imperative to defeat Iraqi President Saddam Hussein's forces is colliding with the political demands to win Iraqi hearts and minds, analysts said. The war is only three weeks old and could end soon, but the more death and disruption it causes, the more difficult the challenge for the Bush administration.

"You're going to find people saying, 'We're much worse off than we were before,' and there's going to be resentment against the liberators," said Roberta Cohen, a Brookings Institution specialist in displaced persons.

"We said we were going to bring water and medical aid and food," Cohen said. "We were going to flood areas of the country with aid. None of that seems to be happening."

No one is more impatient than the relief workers who are poised to deliver electrical generators, water and jobs to Iraq, and who say that Iraqis will benefit after hostilities end. "The frustration level is going up. We feel like we're a bunch of pigeons perched on the boundaries," one U.S. relief staffer said. "We are ready to do stuff, but we need a secure environment in which to do it."

The only significant international relief presence in Iraq thus far has been that of the Red Cross. In recent days, U.S. government aid workers have made their first tentative moves into the country. A two-person disaster assessment team from the U.S. Agency for International Development has inspected Basra and its airport, while USAID workers and members of the Pentagon's relief and reconstruction staff have moved into the southern port of Umm Qasr. Trucks have entered Iraq carrying Kuwaiti medical supplies, and USAID, United Nations and Pentagon-led teams hope to set up shop in Kurdish-controlled territory in the coming days.

Although trucks carrying U.N. cargo have begun moving into northern Iraq from Turkey, independent aid groups reported that Turkish authorities have been slow to approve shipments and have blocked relief workers from entering the north. Aid groups asked Secretary of State Colin L. Powell to press the Turks to allow freer movement into Iraq during his visit to Ankara, Turkey, last week, but one worker said: "[W]e're no closer than we were a week ago."

"There are no good ways to get into northern Iraq right now," the worker said. He added that continuing bombardment and fighting in parts of the north make things "a little prickly" for humanitarian organizations.

The U.N. World Food Program reported yesterday that food stocks in northern Iraq would last 15 to 25 days. The United Nations identified 266,000 people in the north who have fled from the cities for rural areas that they consider safer. Ninety percent are staying with families, and nearly 10 percent are in public buildings, limiting the humanitarian need.

Supplies of food have been stored in countries that share borders with Iraq, and thousands of tons of wheat should arrive from Texas in two to three weeks. Two Australian ships, each holding 50,000 tons of wheat, have been unable to dock in Umm Qasr because they are too large for the port's silted channel and narrow berths.

The U.N. official in charge of Iraq's oil-for-food program warned the Security Council yesterday that emergency goods have yet to be ordered. Benon V. Savan said the Iraqi pipeline, consisting of goods sought by Hussein's government before the war, lacks crucial supplies.

Savan also said that the United Nations does not have the capacity to deliver all the goods in the pipeline before the world body's control over Iraq's finances expires. He called on members, who have been bickering over the Iraqi program, to contribute to an emergency appeal.

"I appeal to all concerned to put aside political considerations and concentrate on the emergency humanitarian needs of the Iraqi people," said Savan, director of the United Nations' Iraqi Program.

When U.S. workers enter the country in force, they intend to focus on water, sanitation, food and the health care system, said Michael Marx, leader of USAID's disaster response team. He told reporters in Amman, Jordan, that the relief workers are pleased that the war in Iraq has not yet generated a humanitarian crisis.

"We are seeing pockets of need," Marx said. "We are seeing some displacement, which is absolutely normal in this type of situation, but the displacement is in the thousands instead of the millions, which is what we had planned for."

Security will rule the next steps, Marx said.

"It's frustrating," Marx added, "but this is not time- or calendar-driven. We have to wait until the combat operations have ceased."

General BROWN. Senator, it is hard for me to tell exactly what the situation is over there in all of these cities. This war is being fought by CENTCOM. We are providing the forces to it and we are certainly involved with what is going on over there. But for me to know the exact environment that is taking place in all these towns, I would just tell you that I get briefings and I see it, but the exact state and when we are actually going to have a secure environment, that would be difficult for me to say. I think that CENTCOM and General Franks would probably come a lot closer to that.

I can tell you that we have deployed our civil affairs folks and that is what they do for a living, to get out there and assess those kinds—

Senator KENNEDY. Could you elaborate on that? How has that worked? That is a key element? What is the dimension? When have they been going in? Can you tell us where and what success they have been having?

General BROWN. Sir, right from the beginning we will put civil affairs teams in any conflict. We will put civil affairs teams with the combatant commander's forces when they go in. He will have planners. They will stand up a civil-military operations center to coordinate these kind of activities that you are talking about at his headquarters.

Then our civil affairs teams will go in with the combatant troops when they go in. The civil affairs teams will do analysis of each one of these cities and they will look for those infrastructure pieces and they will look for the food and running water and electricity. They will then design plans to solve any problems that they have, that they will take back to the regional combatant, General Franks in this case, his headquarters, and they will try and implement those plans.

So that is how the system works with our civil affairs guys.

Senator KENNEDY. What are the funds available in the budget supplemental for civil affairs?

General BROWN. I do not have that figure right off the top of my head. I did talk about a little earlier, sir, that we are growing our civil affairs force. You know it is predominantly a Reserve component force in Special Operations Command. We only have one active battalion. We will grow that battalion, the Active Force portion of it, by about 190 people to give us a little more flexibility in the active component.

At the same time, we will grow four additional civil affairs battalions. We use our civil affairs. They are all very well trained. We have deployed them to Afghanistan in numbers. We have deployed them to Kosovo. We have deployed them to Bosnia. So we are intending to grow our civil affairs force and that is part of our plus-up.

Senator KENNEDY. Maybe you could provide what they have requested on that. You would probably indicate that that was enough to do it, but I would be interested in what is in the budget in the supplemental, what they are planning to do in terms of the budget as well.

General BROWN. I would be glad to, Senator.

[The information referred to follows:]

The importance of Civil Affairs is evidenced by the ongoing actions in Afghanistan and as the United States transitions towards the process of rebuilding Iraq. Civil Affairs units are made up mostly of Reserve soldiers with occupations varying from city managers and judges to school administrators and public works engineers. In their civilian jobs, the soldiers hone the skills they need in their military specialty. Civil Affairs tactical teams accompany Special Forces and conventional forces to provide humanitarian assistance to the local population by providing food and medical care for refugees in a war zone and rebuild schools and hospitals when the fighting is over. The fiscal year 2003 supplemental request for USSOCOM includes \$22.6 million for costs associated with the deployment of Civil Affairs forces and \$12.2 million to procure the necessary equipment to carry out their assigned missions. Not included in the USSOCOM portion of the supplemental are funds that are required by the Department and Services to provide the common support equipment, logistics support and special pays, etc. required by Civil Affairs units.

Senator KENNEDY. Thank you, Mr. Chairman.

Senator ROBERTS. Yes, sir.

Mr. Schulte.

Mr. SCHULTE. Sir.

Senator ROBERTS. The capabilities developed by SOCOM sometimes have migrated to the other services. I am astounded that the new radio went to the Marines first. That works at cross-purposes with the Corps. Did they actually accept them?

Mr. SCHULTE. Yes, sir. The reason it went to them first is they put a little money up front to help us develop it. So we were co-developers of this radio and when the first production units came out they took theirs first.

Senator ROBERTS. Can you give us some other examples where you have provided some significant benefit to other military services as a result of your R&D?

Mr. SCHULTE. There has been a number of places where, for instance in soldier kinds of equipment, the new helmet that we developed, the Modular Integrated Communications Helmet (MICH)——

Senator ROBERTS. Yes, but you cannot sit on it and you cannot cook in it, so it is not worth a damn. [Laughter.]

Mr. SCHULTE. No, but it actually does stop bullets, which, they kind of like that part. [Laughter.]

Senator ROBERTS. Right, okay.

Mr. SCHULTE. So they do like that.

We have done some uniform kinds of things, some night vision goggles kinds of things. In fact, the Special Operations Peculiar Modification kit which we put all the different—when we missionize an M-4 carbine with night scopes and other things like that, a lot of those kind of night vision devices and scopes and things like that eventually the Army will pick up. Probably several years after we first introduce it into the SOF, they will pick those kind of things up, too.

So there has been a number of things where we have been able to move out. Sometimes what happens in our development is we will work a very special item for a classified unit, it will be adopted in that classified unit, and eventually the non-classified units will get a chance to see that and say: I think this has application in the kinds of missions that we do also. That would migrate then into our Special Forces groups and even the Rangers, and then the Army will look at some of these things and once in a while adopt some of them as best practice and go ahead and buy it for the Army forces.

So we have had some luck migrating things that way. Of course, when the Army buys it and it becomes Army standard, then they provide it back to us at that point, which is good for them and is good for us.

General BROWN. I realize you did not ask me, but I will get in here real quick, just some of the ones I jotted down here. Night vision equipment, especially for the ground soldier, SOF has been the leading guys in all of that. You will notice as you see everybody in Iraq in the press reports, they are all wearing that little night vision goggle thing on their helmet. All of that started or got really moving down at Special Operations Command.

The M-4 carbine that everybody is carrying. Our ballistic body armor; we spent a lot of time working the best body armor possible. Those are migrating over to the Services. Our MICH which Harry mentioned, everybody you see out there has a MICH that was built

by our folks down in the Special Operations Acquisition and Logistics (SDAL) center.

I would tell you a tremendous part of our R&D that is moved over to the Services is in the helicopter world: 1,553 data buses, flat panel screens, forward-looking infrared sensors, forward-looking infrared balls on aircraft, we are the first ones to do that really in the Services and now you see that on a lot of other Services' aircraft. Fuel tanks on the inside, fast rope bars, miniguns, weapons systems. So we have a very robust plan for migrating stuff over to the Services.

Senator ROBERTS. Your mission focus, when the Secretary changed that there was discussion that SOCOM would divest itself of certain missions that could be done by conventional forces. Did you recommend any missions that you would divest? The second part of that: What decisions have been made with regard to moving any missions away from SOCOM to other Services or other agencies?

General BROWN. Right now, sir, that is an ongoing Joint Chiefs of Staff (JCS) study that is a very large study that is reporting out probably in the next 30 to 45 days, to take a look at all of that. The Department is looking at that.

We immediately took a very hard look at tasks and started seeing which one of those—we were going to be training the Afghan National Army. We will now train battalion 8 and battalion 9 of the Afghan National Army and then someone else will come in and take that over for us. The GTEP I already mentioned; some personal security detachments that we do around the world, we are giving those over to other forces.

So we are looking at every opportunity. I would not call those mission sets as much as I would call those specific tasks that will just unencumber our forces to bring them back and let them take other tasks.

Senator ROBERTS. You are doing a good job over in Afghanistan. Senator Warner, Senator Levin, Senator Rockefeller, and I were there, watched that training, met the first company, "enjoyed" some real Afghan food for lunch. So you are doing a good job.

I want to just touch on one other thing and then I am through with the questions. Senator Kennedy, do you see a need for a closed session?

Senator KENNEDY. No, no.

Senator ROBERTS. Jack?

Senator REED. No, I do not, sir.

Senator ROBERTS. I think we are going to bid you, not fond farewell, but a job well done.

Are your forces being given the right authority and flexibility and support to go after al Qaeda in Afghanistan or, for that matter, go after anybody? I am talking primarily about the southeastern border and General McNeil, and whether there remains within the civilian DOD leadership any culture of risk aversion when it comes to employing your forces.

General BROWN. Sir, I see no culture of risk aversion when we take on al Qaeda. I think that we are given pretty much all the authority that we need and would like to have in going after these guys.

Senator ROBERTS. That concludes the questions I have. Senator Reed?

Senator REED. One question, General Brown. I understand that you have a number one unfunded priority for military construction for your new operations center in Tampa and this is about a \$27 million project. Is this money in the supplemental?

General BROWN. Sir, I am happy to report that the Department has found a way to fund our operations center and that will be built at Tampa. It will integrate all of these little organizations that I spoke about earlier: our Inter-Agency Collaboration Center; our CSG, which is our Campaign Support Group; our Joint Operations Center that right now we have built in trailers and other places. The Department has said that they will help us build that, and so we are thrilled about that and we are about to get on with it.

Senator REED. We can presume you will revise your unfunded list?

General BROWN. Yes, sir, we will.

Senator REED. Great.

Thank you, sir.

Senator ROBERTS. Senator Kennedy.

Senator KENNEDY. I just want to again commend you. Did you talk a little bit about the situation of the Special Forces in Afghanistan, the kinds of increased threats that they are under? Did you talk about that?

Senator ROBERTS. General Brown was asked a rather generic question in regards to all the media attention on his force in Afghanistan and yet the media attention on conventional forces in Iraq and could he give a review of the Special Operating Forces in Iraq, and he has done that.

Senator KENNEDY. In Afghanistan, has he talked about that?

Senator ROBERTS. Not so much Afghanistan as in the Iraq situation, because of the difference in the media focus. They were on the front page in regards to Afghanistan and then of course the operations in Iraq were equally important, if not more so. So I asked him to summarize that and he did.

Senator KENNEDY. Just finally, General, could you go into the numbers that they have. To the extent that you can give us an idea without getting into the classifications, what you expect the numbers are going to continue to be there in Afghanistan? What could we expect?

General BROWN. Sir, I think for the near term it will be about what it is right now. I prefer not to say the exact troop level.

Senator KENNEDY. Okay, all right.

General BROWN. I think the forces, type of forces, and the amount will probably stay about where they are right now. As far as threats go, we did look down the road and see if in fact we were to go into Iraq that it might raise the threat level over in Afghanistan against our forces that are pretty much out there operating in small units by themselves. So we thought a little bit ahead of that and got the guys prepared for those kind of potentialities.

Senator KENNEDY. Your threat assessment in terms of the Special Forces in Afghanistan for the next 6 months is what?

General BROWN. Sir, I think right now we take force protection very seriously, so all of our guys that are over there are pretty much in the areas that they have been working and have built up pretty good force protection postures, have built relationships with the local Afghans, and are doing a pretty good job.

While we are out hunting folks down and on patrol, there will still be firefights. It will be a very dangerous time over there. We had some people ambushed last week coming back from a patrol and lost a couple special operators last week in Afghanistan that were ambushed. So it is still a very dangerous area.

As far as our posture, I think that we have a pretty good force protection posture over there and I think every person over there understands how dangerous the environment is right now.

Senator KENNEDY. Thank you, Mr. Chairman.

Senator ROBERTS. Let me just say, Senator, on the Warner CODEL, which we dubbed the forced march, we found a great deal of progress in Pakistan with our intelligence community and the Pakistanis without our military.

Then with General McNeil and the snake-eaters—that is what I call you—but there are 550 less of the al Qaeda than there were a year ago. I think that figure is probably higher today. A very dangerous situation, but they actually thwarted in my view the spring offensive of the al Qaeda. Rest assured, force protection is absolutely primary.

If you take in Afghanistan and Iraq, killed in action in regards to this particular force were 22 wounded in action, 103 died of wounds, 1 non-hostile, 47 injured, and 19 captured. It is in their memory, those who paid the ultimate sacrifice, that we recommit to what you are all about in terms of our national security, and we thank you for coming.

General BROWN. Thank you very much, sir, and thanks for the continued support up here. We appreciate it.

Senator ROBERTS. We are adjourned.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR ELIZABETH DOLE

SPECIAL OPERATIONS FORCES SUPPORT

1. Senator DOLE. General Brown, since September 11, much has been asked of Special Operations Forces' personnel. There have been repeated and lengthy deployments to Afghanistan and other fronts in the war on terrorism. Now we are in the midst of a very substantial deployment of Special Forces in Iraq. While the successes have been many, I am very concerned about how long the Special Forces personnel and their families can sustain this pace. What plans are there for the continuing presence of Special Forces units in post-Saddam Iraq and in Afghanistan?

General BROWN. [Deleted.] SOF will continue to support Central Command as required and will maintain a continuous presence which can be sustained for the long term. This presence would be a little more than our pre-September 11 levels, which we have maintained since 1991.

2. Senator DOLE. General Brown, what concerns do you have about the continuing readiness of the people who have been through repeated and lengthy deployments, and the morale of those forces and their families?

General BROWN. One of the SOF truths is that people are our most important assets. We place great emphasis on and resources toward these highly motivated professionals because they cannot be built or rebuilt overnight. SOF stay motivated by doing the work they are trained to do. They are doing that work and for the most part report high satisfaction. In coordination with the Services, we closely and continuously monitor the impact of operations tempo to ensure we adjust as we see

tempo-related problems at the onset (training, maintenance, quality of life, retention, etc.). Top-down emphasis and family assistance programs have and will continue to have an overall positive effect on the services and programs offered to families before, during, and after deployments.

3. Senator DOLE. General Brown, how are the families holding up under this strain?

General BROWN. SOF families are a tight-knit, close community that offer family support programs of the highest caliber. Due to the nature of SOF operating tempo, these family support structures are thriving and responsive. Just as the SOF warrior is satisfied when "doing his job," the families are wholly supportive of the units and missions.

Our family members are accustomed to deployments. They understand from the beginning that the military member will be frequently deployed. Because of this understanding, they become strong and independent.

Programs offered through our Family Support Centers and Chaplain's offices have been very successful in helping our military members and their families adjust before, during, and after deployments.

4. Senator DOLE. General Brown, do you have in place both good support networks and ready availability of counseling services?

General BROWN. Special Operations Forces' Service component commands benefit from programs offered by their Services and home-base installations. Training and outreach programs are available and chaplains and counseling programs are in place. Additionally, the Department of Defense sponsored Lifeworks system has been implemented at Fort Bragg to assist families with a myriad of issues.

The Family Readiness Office at Fort Bragg has established a toll free phone number that is available to SOF families 24 hours per day, 7 days per week (24/7). This office is staffed with people who are trained to provide information and referrals to anyone requesting help.

All three Services provide excellent Family Support Programs and websites that supply information to assist our families. The remainder of the United States Special Operations Command has recently been added to the Department of Defense "Lifeworks" contract. This program will also provide assistance through a website and a toll free phone number 24/7.

Our chaplains are very supportive and provide many counseling programs to our service members and their families. A new program titled "Building Strong and Ready Families" has begun at Fort Bragg, North Carolina, with a goal of reaching families before there are problems.

All returning military members and their families are offered counseling and leave to enable a readjustment period.

5. Senator DOLE. General Brown, does Special Operations Command or your component Service units need additional resources to help the Service members and their families deal with the stress and burdens of these constant deployments?

General BROWN. There are no Major Force Program-11 (MFP-11) funding requirements for family support issues. Those are Service responsibilities.

6. Senator DOLE. General Brown, is the issue of family readiness a matter you oversee from SOCOM or do you leave it up to each Service component command?

General BROWN. The Services and home-base installations provide family support programs for their respective service members. The leadership of SOCOM also monitors and provides guidance and support as needed. More importantly, we ensure training and outreach for family members prior to, during, and after the deployment is provided. Our SOF leaders ensure contact between families and rear detachment commanders is ongoing and ensures all returnees are treated equally.

SOCOM BUDGET INCREASE

7. Senator DOLE. General Brown, as part of the budget increase for fiscal year 2004, I understand that SOCOM will have an increase of over 2,500 spaces and that over the next 5 years there is a planned increase of over 4,000 spaces. Where will these additional personnel be assigned?

General BROWN. The budget increase for fiscal year 2004 did indeed add a significant amount of spaces to the U.S. Special Operations Command. The placement of these additional personnel is identified below:

[Fiscal Year]

Location	Adds					
	2004	2005	2006	2007	2008	2009
Bahrain	3	3	3	3	3	3
Birmingham, AL	12	12	12	12	12	12
Camp Smith, HI	79	79	79	79	79	79
Coronado, CA	17	17	17	17	153	153
Ft. Benning, GA	14	14	14	14	14	14
Ft. Bragg, NC	439	1,369	1,369	1,369	1,369	1,369
Ft. Campbell, KY	845	845	845	845	845	845
Ft. Carson, CO	12	12	12	12	12	12
Ft. Lewis, WA	25	25	25	25	25	25
Hunter AAF, GA	13	13	13	13	13	13
Hurlburt Field, FL	27	37	56	349	533	579
Little Creek, VA	10	10	146	146	146	146
MacDill AFB, FL	265	293	320	320	320	320
Nagshead, VA	198	198	198	198	198	198
Salt Lake City, UT	12	12	12	12	12	12
Stuttgart, GE	79	89	89	89	89	89
Grand total	2,050	3,028	3,210	3,503	3,823	3,869

8. Senator DOLE. General Brown, what resources will you need to support these increases?

General BROWN. The Department has already resourced our personnel shortfalls during the Fiscal Year Defense Program build.

9. Senator DOLE. General Brown, does your budget include what you need for this purpose?

General BROWN. Yes, it has been included in our submission to Congress.

[Whereupon, at 11:11 a.m., the subcommittee adjourned.]

