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DEPARTMENT OF DEFENSE POLICIES AND PROGRAMS TO TRANSFORM THE ARMED FORCES TO MEET THE CHALLENGES OF THE 21ST CENTURY

HEARING

BEFORE THE

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

ONE HUNDRED SEVENTH CONGRESS

SECOND SESSION

APRIL 9, 2002

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DEPARTMENT OF DEFENSE POLICIES AND PROGRAMS TO TRANSFORM THE ARMED FORCES TO MEET THE CHALLENGES OF THE 21ST CENTURY

TUESDAY, APRIL 9, 2002

U.S. SENATE,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

The committee met, pursuant to notice, at 9:38 a.m. in room SH–216, Hart Senate Office Building, Senator Carl Levin (chairman) presiding.

Committee members present: Senators Levin, Lieberman, Reed, Akaka, Bill Nelson, E. Benjamin Nelson, Warner, Sessions, and Bunning.

Committee staff member present: David S. Lyles, staff director.

Majority staff members present: Daniel J. Cox, Jr., professional staff member; Kenneth M. Crosswait, professional staff member; Richard D. DeBobes, counsel; Gerald J. Leeling, counsel; Arun A. Seraphin, professional staff member; and Christina D. Still, professional staff member.

Minority staff members present: Judith A. Ansley, Republican staff director; Charles W. Alsup, professional staff member; Edward H. Edens IV, professional staff member; William C. Greenwalt, professional staff member; Gary M. Hall, professional staff member; Carolyn M. Hanna, professional staff member; Ambrose R. Hock, professional staff member; George W. Lauffer, professional staff member; Patricia L. Lewis, professional staff member; Thomas L. MacKenzie, professional staff member; Scott W. Stucky, minority Counsel; and Richard F. Walsh, minority counsel.

Staff assistants present: Dara R. Alpert, Leah C. Brewer, and Nicholas W. West.

Committee members' assistants present: Frederick M. Downey, assistant to Senator Lieberman; Davelyn Noelani Kalipi and Richard Kessler, assistants to Senator Akaka; William K. Sutey, assistant to Senator Bill Nelson; Eric Pierce, assistant to Senator Ben Nelson; John A. Bonsell, assistant to Senator Inhofe; George M. Bernier III, assistant to Senator Santorum; Robert Alan McCurry, assistant to Senator Roberts; and David Young, assistant to Senator Bunning.

OPENING STATEMENT OF SENATOR CARL LEVIN, CHAIRMAN

Chairman LEVIN. The committee meets this morning to receive testimony on Department of Defense policies and programs to

transform the Armed Forces to meet the challenges of the 21st century. Because Senator Warner must leave for a few minutes, I am going to turn this over to him right now for his opening statement or that part of it that he is able to give, and then I will finish my own opening statement. Senator Warner.

STATEMENT OF SENATOR JOHN WARNER

Senator WARNER. Thank you, Mr. Chairman. I will just momentarily be detained, but I would like to welcome our witnesses. This is an enormously important hearing. You have laid the foundation in the Executive Branch. Now we must take into consideration that foundation in the Legislative Branch. I see from the opening statements provided by the witnesses that great progress has been made.

I do hope that as this successful operation in Afghanistan reaches its anticipated conclusion at some point in time—the President said there will be no hurry until the job is finished—that we take to heart some of the extraordinary actions performed by the men and women of the Armed Forces, utilizing the modern weapons that we have today. This individual soldier, sailor, airman, and marine is exhibiting courage and professionalism without peer in the history of our country.

I can only think of the World War II era, when this whole Nation stood behind the uniformed persons in the battle fronts of the world. That same solid support is here at home today, led by a President who shows really extraordinary qualities as the Commander in Chief.

These soldiers and sailors, airmen and marines have made history. We have to learn from that history as we continue the war on terrorism with our allies, and direct our actions in the future to protect our freedom here at home.

I will put the balance of my statement in the record. I thank the chair.

[The prepared statement of Senator Warner follows:]

PREPARED STATEMENT BY SENATOR JOHN WARNER

Senator WARNER. Thank you, Mr. Chairman. I join you in welcoming all of our distinguished witnesses.

This hearing focuses on the type of military our Nation will need to face the challenges ahead. The basic question before us is this—how should our military "transform" to meet future threats? I look forward to the testimony of each of our witnesses.

I find it interesting that today we are discussing "transforming" our Armed Forces at the same time we are witnessing impressive demonstrations of military capabilities and competence by our Armed Forces as they prosecute the global war against terrorism. It is a war unlike any we have fought before. As Chairman Levin and I visited our servicemen and women in the region last November, I was struck by a recurring thought—we are writing a new chapter in military history with this operation and those that will follow.

This war has truly been a joint operation—U.S. land, sea, and air forces operating together as one; and forces from the many coalition nations interacting seamlessly. Soldiers on horseback and afoot are directing 21st century weapons with extraordinary precision. Maritime forces are operating hundreds of miles inland in a landlocked country. Old bombers are delivering new weapons with devastating accuracy. New communications systems and information processing technologies are allowing U.S. and coalition forces to share information instantly and execute orders quickly. Agility, precision, lethality, and interoperability are the measures of success for our systems and organizations.

The bottom line is that the professionalism exhibited by these individual soldiers, sailors, airmen, and marines has been remarkable. The American people recognize this extraordinary effort and have responded with an outpouring of support. Not since World War II have our troops received such strong support from the home front. I know how much these young servicemen and women appreciate this support and what a difference it makes as they prepare for current and future operations.

Clearly, we are focused on this current war against terrorism. It is a war we must win; a war we will win. But, it is also important to note that the President's fiscal year 2003 budget request also recognizes the ongoing, traditional commitments and obligations of the United States. Let no nation or adversary think for a moment that we are not prepared to defend our interests and friends worldwide—beyond the war on terrorism.

We have all been encouraged by early successes in Afghanistan, but recent events serve to remind us that we are involved in a long struggle that will take us to the far corners of the world. But it will end some day and we must all be prepared for the next war—not the last one.

"I hope there will be no more warfare. But, if and when such a tragedy as war visits us again, it is always going to happen under circumstances, at places and under conditions different from those you expect or plan for."

We have all wrestled with this predicament—how do you plan for the unknown? I think Secretary Rumsfeld has made a very important contribution with his extensive strategic review and Quadrennial Defense Review, wherein he concludes that we must move from a "threat-based force" to a "capabilities-based force" that can deter and, if necessary, defeat the unexpected threats.

That brings me back to the focus of this hearing—transformation. What does transformation mean? I believe that transformation means different things to different people. Most discussions of transformation quickly focus on weapons systems. but transformation includes insertion of new technology and new capabilities, but that's far from the whole story.

Secretary Rumsfeld, and others, point out that Germany's "blitzkrieg" concept terrorized adversaries and revolutionized warfare in 1939. Curiously, only about 15 percent of the entire German army was "transformed" with new equipment. Let me repeat that—only 15 percent new equipment. However, new ideas and operational concepts were superimposed over their entire army. In that case, transformation was at least as much about organization and the application of new capabilities as it was about new equipment. Transformation today is about new technologies, but it is also about new thinking, new processes, and new ways to apply old capabilities.

The events of September 11, have given new resonance—and a new urgency—to calls for change. The challenges are clear—history will judge our response. But, the time to act—the time to secure a lasting peace through current strength and wise investment in future capabilities—is now.

Chairman LEVIN. Thank you so much, Senator Warner.

More than 4 years ago, the congressionally-mandated independent National Defense Panel recognized the need for the transformation of our Armed Forces. Its December 1997 report entitled "Transforming Defense: National Security in the 21st Century" concluded as follows: "The United States needs to launch a transformation strategy now that will enable it to meet a range of security challenges in 2010 to 2020. Yet we must do this without taking undue risk in the interim. This transformation promises to be complex. Yet we must make critical decisions and choices entailing significant investments of resources and energies."

The Panel's report also stated that: "A successful transformation strategy must provide for frequent and large-scale experimentation in potentially new ways of war, effecting meaningful and appropriate change in operational concepts, force structures, military systems, and budgets."

Starting in the late 1990s, the Services began the process of transforming their force structure to meet the challenges of the 21st century. For instance, the Army began to transition to a force that is strategically responsive and dominant at every point in the spectrum of operations. This involves the selective modernization

and partial digitization of the current force as a first step and eventual development of a responsive, agile, deployable, and lethal Objective Force.

The 2001 Quadrennial Defense Review submitted by Secretary Rumsfeld to Congress last September reemphasized the requirement to continue the transformation of our forces. In his testimony before this committee last October on the Quadrennial Defense Review, Deputy Secretary Wolfowitz testified that: "Transformation is about more than technology; it is about innovative concepts of operating and configuring our forces, adjustments in how we train and base our people and material, and how we conduct business day to day. The goal of transformation is to maintain a substantial advantage over any potential adversaries in key areas such as information warfare, power projection, space, and intelligence."

The purpose of today's hearing is to review the manner in which the Department is pursuing the transformation of our Armed Forces, to assess the progress that has been made in terms of acquisition programs, experimentation activities, operational concepts, organizational changes, and cultural adjustments; to identify truly transformational items in the fiscal year 2003 budget request; and to determine if legislation is necessary to facilitate and promote transformation.

Some of the issues that I hope our witnesses will address this morning include: how do we define transformation and identify its elements; how do we distinguish truly transformational programs, concepts, and activities from those that are not; what is the proper role of experimentation, including in helping to decide what not to acquire; how can we stimulate and incentivize creative and transformational thinking; how do we provide funding to take advantage of results from experimentation in the absence of programmed funding; how do we avoid becoming so dependent on sensor linkages that we create an Achilles heel that can be taken advantage of by an enemy who finds a way to block such linkages; and how do we share transformational innovations, concepts, and programs with allies, particularly NATO allies, so as to preserve interoperability and strengthen alliances.

We have two panels this morning. Our first panel will consist of four witnesses from the Department of Defense and the lead is Deputy Secretary Paul Wolfowitz, who as I mentioned earlier represented the Department last year in presenting the Quadrennial Defense Review to Congress. We also have Retired Vice Admiral Arthur Cebrowski, who is the first Director of the Office of Force Transformation; General Peter Pace, Vice Chairman of the Joint Chiefs of Staff, who serves as the Chairman of the Joint Requirements Oversight Council and is a member of several of the Department's boards that are involved in the planning, programming, and budgeting system, all of which have important roles in transformation; and General William Kernan, the Commander in Chief of U.S. Joint Forces Command, who is in charge of joint experimentation and is the chief advocate for jointness and transformation.

Our second panel consists of Dr. Andrew Krepinevich and Dr. Loren Thompson. Dr. Krepinevich is Executive Director of the Center for Strategic and Budgetary Assessments and was one of the seven members of the 1997 National Defense Panel to which I re-

ferred earlier. Dr. Thompson is the Chief Operating Officer of the Lexington Institute. Both Dr. Krepinevich and Dr. Thompson are frequent commentators on national security issues, including military transformation.

Let me see if any of our other colleagues has an opening statement.

Senator BUNNING. I would like to put one into the record, please.

Chairman LEVIN. Senator Bunning's statement will be made part of the record.

[The prepared statement of Senator Bunning follows:]

PREPARED STATEMEMT BY SENATOR JIM BUNNING

I would like to join my colleagues in welcoming our distinguished panel members for today's hearing on transformation. Though I have concerns with many areas of transformation, some of which I hope to address today, I am very pleased with the administration's vision and energy in undertaking this tremendous and necessary task. I know there has been a lot of hard work and dedication by our men and women in uniform and our civilian workforce to move the transformation of our forces forward. This committee and our Nation are very proud of their efforts.

Last week, I had the opportunity to visit with Secretary White at Fort Knox, Kentucky to see firsthand the Army's mounted maneuver battle lab. Fort Knox has been designated as the lead for the Army's transformation and the hub that will synchronize the efforts of all the combined arms centers of the Army such as Forts Benning, Sill, Rucker, Leavenworth, Lee, and Leonard Wood. Transformation is not something we are going to do several years from now. Transformation is already in progress.

Chairman LEVIN. Let me now welcome Secretary Wolfowitz, Admiral Cebrowski, General Pace, and General Kernan. Each of you have had a role and continue that major role in the difficult task of transforming our forces for the challenges of the 21st century. Each of your statements will be printed in full in the record. I understand, Secretary Wolfowitz, that you do have an opening statement and we would be happy to receive that now on behalf of all of the panel members.

STATEMENT OF HON. PAUL D. WOLFOWITZ, DEPUTY SECRETARY OF DEFENSE; ACCOMPANIED BY GEN. PETER PACE, USMC, VICE CHAIRMAN, JOINT CHIEFS OF STAFF; VICE ADM. ARTHUR K. CEBROWSKI, USN (RETIRED), DIRECTOR OF FORCE TRANSFORMATION, OFFICE OF THE SECRETARY OF DEFENSE; AND GEN. WILLIAM F. KERNAN, USA, COMMANDER IN CHIEF, UNITED STATES JOINT FORCES COMMAND

Secretary WOLFOWITZ. Thank you, Mr. Chairman. I appreciate very much the opportunity to meet with this committee to discuss this important subject. As you have noted already, I have with me three of the leaders of the Department's efforts at transformation. You have picked an extremely important topic and it is a pleasure to be here to discuss it.

Indeed, looking back, this committee and Congress have played a major role in transformation efforts in the past, including landmark legislation such as the 1947 National Security Act, the 1973 All-Volunteer Force Act, and the 1986 Goldwater-Nichols Act. Congress, moreover, has sponsored and supported numerous transformational technologies, including stealth, cruise missiles, and precision guided munitions.

So as we undertake what may be the most significant transformation of our military forces in many decades, we hope to continue to work closely with Congress to achieve our common national security objectives.

In the civil economy today, we are witnessing a transformation in the manner, speed, and effectiveness with which industrial and commercial tasks can be accomplished. These transformational efforts derive from the impact of advances in technology, in computing, communicating, and networking. Taken together, they constitute an information revolution whose effects extend far beyond technology into the organization and even the culture of the business and commercial worlds.

This transformational potential affects our military as well. In the current campaign in Afghanistan, for example, young noncommissioned officers are routinely integrating multiple intelligence collection platforms by simultaneously coordinating what amounts to several chat rooms. We have seen them creatively improvise with new military applications not unlike the technology they have grown up with. Indeed, they display an agility with that technology that comes from being completely comfortable with this new way of doing things.

In the same way, the agility that we need to continue meeting threats here and abroad depends on more than just technology, although that must be a fundamental part of our response. It is tied also to changing organizational designs and embracing new concepts. One of my key points today is that transformation is about changing the military culture into one that encourages, as Secretary Rumsfeld says, innovation and intelligent risk-taking.

Twelve months ago some might have questioned the continued investment in improving our advantage, given the huge military lead the United States enjoyed. Some were asking, who will fight us now? September 11 brought home the fact that, while it is likely few would seek to meet us head-to-head, they can still attack us, they can still threaten us. When they did attack last September, using box cutters and jetliners, our response required much more than just box cutters and jetliners. Our response, as we seek to deny future terrorists avenues to similar attacks, has been and must be disproportionately asymmetrical, and it does not come cheaply or without great effort at innovation.

My second key point is that, although we now face the enormous challenge of winning the global war on terrorism, we must also address the equally large challenge of preparing our forces for the future. We cannot wait for another Pearl Harbor or another September 11, either on the ground, in space, or in cyber space. Even as we fight the war of today, we must invest in tomorrow. It is a process of balancing the risks of today with those of tomorrow, one that should ultimately redefine how we go to war.

Back in the 1920s and the 1930s, the French and British establishments looked on the transformational issues of their time with a victor's sense that the next war would be fought like the last. But by the spring of 1940, with the Germans' lightning strikes across the Meuse and through the Ardennes, it was clear then that blitzkrieg had redefined war and would reshape battles for years to come.

But we do not have to look back 60 years or even 20 years to find dramatic examples of military transformations. In Afghanistan today, brave Special Forces on the ground have taken 19th century horse cavalry, combined it with 50-year-old B–52 bombers, and, using modern satellite communications, have produced a truly 21st century capability.

When asked what he had in mind in introducing the horse cavalry back into modern war, Secretary Rumsfeld said, "It is all part of the transformation plan," and indeed it is. Transformation can mean using old things in new ways, a natural result of creative innovation.

Finally, our overall goal is to encourage a series of transformations that in combination can produce a revolutionary increase in our military capability and redefine how war is fought. The capabilities demonstrated in Afghanistan show how far we have come in the 10 years since the Persian Gulf War, but they are just a glimpse of how far we can still go.

Let me briefly discuss how transformation was treated in the Quadrennial Defense Review. Long before September 11, the Department's senior leaders began an unprecedented degree of debate and discussion about where the military should go in the years ahead. The outline of those changes is reflected in the Quadrennial Defense Review and the fiscal year 2003 budget request. Among the new directions set in the QDR, the following four are perhaps the most important:

First, we decided to move away from the Two Major Theater War Force Plan construct. By doing so, we gain more flexibility in planning for a wider array of contingencies and we gain more flexibility in investing for the future.

Second, during the QDR the senior civilian and military leadership agreed on a new framework for assessing risk. We identified four categories of risk: force management risks, operational risks, future challenges risks, and institutional risks. The approach we adopted in light of this framework seeks to balance risks in all of these categories and avoid extreme solutions that would lower risks in some areas while raising other risks to unacceptable levels.

Third, to confront a world of surprise and uncertainty, we are shifting our planning from the threat-based model that has guided our thinking in the past to a capabilities-based model for the future. We do not know who may threaten us or when or where, but we do have some sense of what sort of capabilities they might threaten us with and how. We also have a sense of which capabilities we have that could provide us important new advantages.

Fourth, to support this capabilities-based approach to force planning, we worked to define goals to focus our transformation efforts. Historically, successful cases of transformation have occurred to meet compelling strategic and operational challenges. Therefore, we endeavored to determine what those challenges were in the 21st century and what goals we needed to have to address them.

The U.S. military is pursuing not a single transformation, but a host of transformations, including precision surveillance, network communications, robotics, and information processing. The six specific transformation goals identified in the QDR are: first, to defend the U.S. homeland and other bases of operation and defeat nuclear,

biological, and chemical weapons and their means of delivery; second, to deny enemies sanctuary, depriving them of the ability to run or hide any time, anywhere; third, to project and sustain forces in distant theaters in the face of access denial threats; fourth, to conduct effective operations in space; fifth, to conduct effective information operations; and sixth, to leverage our information technology to give our joint forces a common operational picture.

In my written testimony, I elaborate on each of these six goals, but in the interest of time let me just move on to discuss how we have tried to reflect those goals in the budget that is now before your committee. Taken together, these six goals will guide the U.S. military transformation efforts and improvements in our joint forces. Over time they will help us to shift the balance of U.S. forces and capabilities.

U.S. ground forces will be lighter, more lethal, more highly mobile. They will be capable of insertion far from traditional ports and air bases and they will be networked to leverage the synergy that can come from ground forces and long-range precision fires from the air and sea.

Naval and amphibious forces will be able to assure U.S. access even in area denial environments. Air and space forces will be able to locate and track mobile targets over vast areas and strike them rapidly at long ranges without warning. These future attributes are the promise of U.S. transformation efforts.

As I will be saying in a few minutes, transformation is about much more than just investment, but investment is important. Over the next 5 years, we plan to invest more than $136 billion in transformational technologies and systems. Of this, $76 billion represents new investments to accelerate or start new transformations. We have applied a very strict definition to programs to be included in these totals as transformational. Many things that enable transformation or extend current capabilities are not included in the figures I will be citing. For example, the $1.7 billion in this year's budget for funding Joint Direct Attack Munitions, or JDAMs, and other precision-guided munitions, is not included. The total additional investment in systems that support transformation approaches $25 billion in the fiscal year 2003 budget and $144 billion over the FYDP.

Let me highlight some of the capabilities we are investing in to meet the transformational goals. First, the goal of protecting bases of operations. We are pursuing advanced biological defenses and accelerating the development of missile defense. Missile defense investment includes increased funding for the airborne laser program, a directed energy weapon to destroy ballistic missiles in their boost phase. The budget invests $8 billion in transformational capability to support defense of the U.S. homeland and forces abroad, a total of $45.8 billion over the 5-year defense plan, an increase of 47 percent.

I would note that that does not include some $10.5 billion in our budget that is invested in programs for counterterrorism and antiterrorism, almost double from where we were 2 years ago. Most of that is force protection measures associated with the global war on terrorism.

Second, to project power in denied areas, we are developing new shallow-draft fast transport ships to move forces into contested littoral areas more rapidly and less dependent on traditional ports. We are also developing unmanned underwater vehicles that can help to assure U.S. naval access. Overall, the fiscal year 2003 budget requests $7.4 billion for programs to support the goal of projecting power into denied areas and $53 billion over the FYDP, an increase of 21 percent.

Third, to deny enemies sanctuary, we are developing a space-based radar system to provide persistent global ground surveillance and tracking capability. We are converting four SSBNs to carry more than 150 Tomahawk missiles each and up to 66 SEALs. We are also accelerating a number of unmanned vehicle programs. The budget in fact includes $1 billion to increase the development and procurement of Global Hawk, Predator, and unmanned combat aerial vehicles.

Finally, we are developing a range of new precision and miniature munitions for attacking deep underground facilities, mobile targets, and targets in dense urban areas. The fiscal year 2003 budget requests $3.2 billion for transformational programs to support the objective of denying sanctuary to adversaries and $16.9 billion over the FYDP.

Fourth, to leverage information technology, perhaps one of the most important developments we are pursuing in this budget is our investment in laser communications and space, the technology that has the potential to provide fiber optics-quality broadband secure communications any time and anywhere U.S. forces may operate. That is a transformational technology that can affect everything our forces do. The fiscal year 2003 budget requests $2.5 billion for programs to support this objective and $18.6 billion over the FYDP.

Fifth, to conduct effective space and information operations, we are increasing investments in both of those categories. The fiscal year 2003 budget requests $174 million for programs related to information operations, $773 million over the FYDP. We request an additional $200 million to strengthen space capabilities and $1.5 billion over the FYDP.

We could not have made these investments without terminating a number of programs and finding other savings. Although this year's defense budget is the largest in a long time, virtually the entire increase was spoken for by needed increases to cover inflation, health care and pay raises, realistic costing of readiness and procurement, and funding the war. We have saved some $9.3 billion by terminating and restructuring a number of programs. Major terminations include the DD–21 Destroyer program, which has been replaced by a restructured DDX program, and we have cut 18 Army legacy systems. We also terminated the Navy Area Missile Defense program because of delays, poor performance, and cost growth. But we are still looking to develop sea-based defenses under a replacement program.

But, as we have seen in Afghanistan, transformation is about more than just new technology. Although the Germans were the first to make tanks a decisive instrument of war, they are not the ones who invented tanks. They were not even the ones to first field tanks in combat. What they did do first was to use tanks to dev-

astating effect through the combination of armor with air and radio communications, the willingness to risk employing a new and bold doctrine, allowing armor to emerge in an army traditionally dominated by infantry, and delegating responsibility to lower levels so that units could operate with the autonomy that armor and radio communications provided them. Their success went even beyond doctrine, beyond speed, beyond communications. It was a culture change from top to bottom.

Another example of culture change in our own forces is the development of our ability to conduct night operations. Drawing from our experience in Vietnam, we worked to acquire technology such as night vision goggles that allowed us to virtually turn night into day. We now conduct extensive night training operations and we have turned what was once a vulnerability into an advantage. Today it is not hyperbole to say we own the night.

The campaign in Afghanistan has planted the seeds of culture change in other areas that will prove to be as significant, I think. Historically, Special Operations Forces have operated separately from conventional forces, but this campaign has necessitated their close integration with conventional forces and especially air forces. One of the results is an order of magnitude change in how precise we are in finding and hitting targets from just a decade ago. That is not only changing the culture of Special Operations Forces, but it is changing how the rest of the force thinks about Special Operations and how it thinks about the integration between air and ground power.

Another example from the present involves what it means to be a pilot today. That is undergoing a transformation as well. Not long ago, an Air Force F–15 pilot had to be persuaded to forego a rated pilot's job to fly—I guess that is still the word—an unmanned Predator aircraft from a location far from the field of battle. Of course, UAVs have made a significant impact in the current campaign and promise even greater operational impacts, which is why the Air Force leadership is working hard to encourage this pilot and others to think of piloting UAVs as a major mission and to become trailblazers in defining new concepts of operations.

Some of the greatest military transformations of the last century were the product of American innovation: the development of amphibious warfare, of aircraft carriers, of stealth and nuclear-powered submarines, to name just a few. Great names like Billy Mitchell and Hyman Rickover are associated with some of these developments and it is no secret that the unconventional style of some of these innovators was sometimes difficult for their large organizations to adjust to.

But even less iconoclastic officers have had difficulties when they clashed with perceived wisdom. In the period between the wars, one infantry officer began writing about the future of armored warfare, only to have his commander tell him that if he published anything contrary to "solid infantry doctrine" it would mean court-martial. The commander even tried to scuttle that officer's career. It took the personal intervention of Pershing's chief of staff to put that soldier's career on a new path. That officer so interested in the future of armored warfare was Dwight Eisenhower.

One of our fundamental goals is to encourage all the potential Eisenhowers who are thinking about war of the future. Instead of stifling those who seek to look forward so we can lean forward when necessary, we must encourage and reward them. We need to accelerate the development of a culture that supports the sort of innovation, flexibility, and vision that can transform the face of battle.

From my observations, the Armed Forces today are much more congenial toward innovation and innovators. Certainly the way in which General Tommy Franks has experimented in Afghanistan demonstrates an openness to change, an openness that is helping us win the war and transform the military.

One of the best arenas for encouraging our forces to try hard, lean forward, and risk failure is through field exercises. Field exercises that incorporate experimentation at both the joint and the service levels provide an indispensable means for tackling emerging challenges. In the period between the wars, Marine Major Pete Ellis perceived that war in the Pacific was likely to come, and he proposed the landing concept that we now call amphibious warfare. Taking Ellis's idea from the drawing board to practice beaches resulted in success at Iwo Jima, Okinawa, and elsewhere in World War II.

General Kernan will be able to address in more detail how Joint Forces Command is developing a joint experimentation plan that uses war games, synthetic environment experiments, and field experiments to develop and evaluate joint concepts.

Likewise, training must go hand-in-hand with the fielding of new concepts and capabilities. We must train as we will fight, and today we will always fight in combinations of mission-oriented joint forces. We must, therefore, emphasize a culture that stresses joint sharing of information, concepts, and awareness to ensure that our troops can fight on day one of the battle with experience and confidence. A centerpiece of our training transformation effort will be a joint national training center.

We have also seen the need in our transformation efforts to redesign some of our military organizations to harness the tremendous power of new technologies and exploit the synergy of joint forces. DOD is taking steps to realign its organizations to better integrate and deploy combat organizations that can respond rapidly to events that occur with little or no warning—the type of environment that characterizes our world today.

To strengthen joint operations, the Department is developing options to establish standing joint task force headquarters with uniform standard operating procedures, tactics, techniques, and technical system requirements, thereby permitting the movement of expertise among commands. The Department is also examining options for establishing actual standing joint task forces. Standing joint task force organizations could provide the organizational means to achieve a network capability and serve as the vanguard for the future transformed military.

Finally, we also need to ensure that the classroom education our senior military leaders receive includes military transformation, an education that nurtures innovative thinking and encourages risk-taking and willingness to confront failure in the pursuit of new ideas and capabilities.

In conclusion, Mr. Chairman, even as we fight this war on terror, potential adversaries scrutinize our methods. They study our capabilities, they seek our weaknesses, they plan for how they might take advantage of what they perceive as our vulnerabilities. So as we take care of today, we must invest in tomorrow. We are emphasizing multiple transformations that, combined, will fundamentally change warfare in ways that could give us important advantages and help us secure the peace for coming generations.

We realize that achieving this goal requires transforming our culture and the way we think. We must do this even as we fight this difficult war on terrorism. We cannot afford to wait.

Thank you.

[The prepared statements of Secretary Wolfowitz, General Pace, Admiral Cebrowski, and General Kernan follow:]

PREPARED STATEMENT BY HON. PAUL D. WOLFOWITZ

THE IMPERATIVE FOR TRANSFORMATION

Mr. Chairman and members of the committee: You have provided our country great bipartisan support and strong leadership, and our relationship with the committee and its staff has been truly outstanding. I appreciate the opportunity to return today to talk about how the Department of Defense plans to meet the challenges of the 21st century through the transformation of our forces.

This committee and Congress have played a major role in transformation efforts in the past, including the role in several institutional changes of transformational character, such as the 1947 National Security Act, the 1973 All-Volunteer Force Act, and the 1986 Goldwater-Nichols Act. Congress has sponsored and supported numerous transformational technologies, including stealth, cruise missiles and precision-guided munitions. As we undertake what may be the most significant transformation of our military forces in many decades, we hope to continue to work closely with Congress to achieve our common national security objectives.

In the civilian economy today, we are witnessing a transformation in the manner, speed and effectiveness with which industrial and commercial tasks can be accomplished; these transformational efforts derive from the impact of advances in technology in computing, communicating and networking that, taken together, constitute an information revolution whose effects extend far beyond technology into the organization and even the culture of the business and commercial worlds.

This enormous rate of change can be explained in significant measure by a law known as Moore's Law, after Gordon Moore, co-founder of Intel, who first advanced the proposition that the power of computers will double every 18 months or so. Put more dramatically, that means that the power of computers increases by a factor of a thousand in a little more than a decade. But, the effect of this, as we know from daily life, extends far beyond just technological changes. Indeed, transformations that result from increased capability are due, in even greater measure, to innovative minds that take this technology and use it to transform everything—from how we work to how we navigate on the highways and how we ship packages around the world.

This transformational potential affects our military as well—in terms of both hardware and brainpower. In the current campaign, for example, young non-commissioned officers routinely integrate multiple intelligence collection platforms by simultaneously coordinating what amounts to several "chat rooms." We have seen them creatively improvise with new military applications not unlike the technology they have grown up with. They display an agility that comes from being completely comfortable with this new way of doing things.

In the same way, the agility that we need to continue meeting threats here and abroad depends on more than just technology, although that must be a fundamental part of our response. It is tied to changing our organizational designs and embracing new concepts. Transformation is about more than what we buy or how much we spend on technology. One of my key points today is that transformation is about changing the military culture into one that encourages, in Secretary Rumsfeld words, "innovation and intelligent risk taking."

Twelve months ago, some might have questioned the continued investment in improving our advantage, in real and intellectual capital. Given the huge military lead we enjoy, some were even asking: who will fight us now? But, September 11,

brought home the fact that, while it is likely few would seek to meet us head to head, they can still attack us. They can still threaten us. When they did attack last September, using box cutters and jetliners, our response required much more than just box cutters and jetliners. Our response, as we seek to deny future terrorists avenues to similar attack, has been—and must be—disproportionately asymmetrical. It does not come cheaply or without great effort at innovation.

My second key point is that, although we now face the enormous challenge of winning the global war on terrorism, we must also address the equally large challenge of preparing our forces for the future. We cannot wait for another Pearl Harbor or September 11, either on the ground, in space or in cyberspace. Our ability either to deter or defeat aggression will continue to demand unparalleled capabilities—from technology to training and decision-making. That is why we must develop the transformational capabilities that will provide our crucial advantages a decade or more from now. Even as we take care of today, we must invest in tomorrow—an investment we simply cannot postpone. It is a process of balancing the risks of today with those of tomorrow, one that that should ultimately redefine how we go to war.

In the 1920s and 1930s, the French and British military establishments looked on the transformational issues of the time with a victor's sense that the next war would be fought like the last. But by the spring of 1940, with the Germans' lightning strikes across the Meuse and through the Ardennes, it was clear then that blitzkrieg—a term coined by Western journalists to describe this unmistakably new phenomenon—had redefined war and would shape battles for years to come.

We do not have to look back 60 years—or even 20 years—to find dramatic examples of military transformations. In Afghanistan today, brave Special Forces on the ground have taken 19th century horse cavalry, combined it with 50-year-old B–52 bombers, and using modern satellite communications, have produced truly 21st century capability. When asked what he had in mind in introducing the horse cavalry back into modern war, Secretary Rumsfeld said, "it was all part of the transformation plan." It is. Transformation can mean using old things in new ways—a natural result of creative innovation.

These two examples suggest my final key point: our overall goal is to encourage a series of transformations that, in combination, can produce a revolutionary increase in our military capability and redefine how war is fought.

In the example from Afghanistan, we can see how dramatically our military has changed in just the 11 years since the Persian Gulf War. During that war, one of our biggest concerns was trying to destroy Scud missiles, the only Iraqi system whose capability we had underestimated. We flew hundreds of sorties and dropped thousands of pounds of bombs in the attempt to attack these elusive and fleeting targets that our pilots could not find from the air. Brave Special Operations Forces on the ground in western Iraq succeeded in finding Scuds, but did not have the capability to direct air strikes. In the end, as a result, we managed to take out only one Scud "launcher," and that one was a decoy. The successful operations in Afghanistan demonstrate how much progress has been made in the last decade, but that is only a glimpse of where we can go in the decades to come.

Long before September 11, the Department's senior leaders—civilian and military—began an unprecedented degree of debate and discussion about where America's military should go in the years ahead. Out of those intense debates, we agreed on the urgent need for real changes in our defense strategy. The outline of those changes is reflected in the Quadrennial Defense Review and the 2003 budget request.

Our conclusions have not gone unnoticed. One foreign observer reported that the QDR contains "the most profound implications" of the four major defense reviews since the end of the Cold War. What is most interesting about this analysis is its source: a Chinese military journal. That Chinese observer thinks the QDR is important as a outline for where we go from here—and we think so, too.

Among the new directions set in the QDR, the following four are among the most important:

First, we decided to move away from the two Major Theater War (MTW) force planning construct, which in its day was a major shift from the Cold War paradigm that planned for a global war focused on the defense of Europe from a massive Soviet invasion. The two MTW concept called for maintaining forces capable of nearly simultaneously marching on and occupying the capitals of two regional adversaries and changing their regimes. Today's new approach emphasizes deterrence in four critical theaters, backed by the ability to swiftly defeat two aggressors in the same timeframe, while preserving the option for one major offensive to occupy an aggressor's capital and replace the regime. By removing the requirement to maintain a second occupation force, we gain more flexibility in planning for a wider array of contingencies, and we gain more flexibility in investing for the future.

Second, during the QDR the senior civilian and military leaders agreed on a new framework for assessing risk. We agreed that we couldn't simply judge the program on how it addressed near-term warfighting risks. A new framework was required, one that would get other risk up on the table as well. We identified four categories of risk: force management risks dealing with how we sustain our people, equipment, and infrastructure; operational risks dealing with the ability of our forces to accomplish the missions called for in near-term military plans; future challenges risks dealing with the investments and changes needed today to permit us to deal with military challenges of the more distant future; and institutional risks involved with inefficient processes and excessive support requirements that jeopardize our ability to use resources efficiently. The approach we adopted in light of this framework sought to balance risks in all of these categories, and avoid extreme solutions that would lower risks in some areas while raising other risks to unacceptable levels. While reasonable people may differ on specific decisions regarding our investments and budgetary decisions, it is important that we understand the need to balance among the different risks that we confront.

Third, to confront a world of surprise and uncertainty, we are shifting our planning from the "threat-based" model that has guided our thinking in the past to a "capabilities-based" model for the future. We don't know who may threaten us or when or where. But, we do have some sense of what sort of capabilities they may threaten us with and how. We also have a sense of which capabilities can provide us important new advantages.

Fourth, to support this capabilities-based approach to force planning, we worked to define goals to focus our transformation efforts. Historically, successful cases of transformation have occurred in the face of compelling strategic and operational challenges. Therefore, we endeavored to determine what those challenges in the 21st century and the goals to address them might be.

MANY TRANSFORMATIONS TO REVOLUTIONIZE WARFARE

The U.S. military is pursuing not a single transformation, but a host of transformations including precision, surveillance, networked communications, robotics and information processing. When these transformations come together, the resulting synergy could produce a revolutionary level of improvement in the ability of U.S. joint forces to dominate the battlespace. The convergence of military transformations within our land, air, sea, space, and information forces could allow the development of new concepts of operations that will further exploit our ability to conduct military actions in a parallel rather than a sequential manner. We will be better able to overcome the enormous challenges posed by distance and geography. In short, transformations over the next several decades can give U.S. forces new asymmetric advantages while reducing many of our current vulnerabilities.

SIX TRANSFORMATIONAL GOALS—TAKING CARE OF TODAY WHILE INVESTING IN TOMORROW

Setting specific transformation goals has helped to focus our transformation efforts, from investments to experimentation and concept development. The six goals identified in the QDR are:

- First, to defend the U.S. homeland and other bases of operations, and defeat nuclear, biological and chemical weapons and their means of delivery;
- Second, to deny enemies sanctuary—depriving them of the ability to run or hide-anytime, anywhere.
- Third, to project and sustain forces in distant theaters in the face of access denial threats;
- Fourth, to conduct effective operations in space;
- Fifth, to conduct effective information operations; and
- Sixth, to leverage information technology to give our joint forces a common operational picture.

Protecting Critical Bases of Operations and Defeating NBC Weapons

Above all, U.S. forces must protect critical bases of operations and defeat weapons of mass destruction and their means of delivery. No base of operations is more important than the U.S. homeland. Defending the American homeland from external attack is the foremost responsibility of the U.S. Armed Forces. Vast oceans and good neighbors no longer insulate the United States from military attacks that emanate from abroad. The attacks of September 11 revealed the vulnerability of America's open society to terrorist attacks. Therefore, we must shore up our vulnerabilities to all forms of attacks.

Projecting and Sustaining Forces in Anti-Access Environments

Future adversaries are seeking capabilities to render ineffective much of the current U.S. military's ability to project military power overseas. Today, U.S. power projection depends heavily on access to large overseas bases, airfields, and ports. Saturation attacks by ballistic or cruise missiles armed with nuclear, biological, or chemical warheads could deny or disrupt U.S. entrance into a theater of operations. Advanced air defense systems could deny access to hostile airspace to all but low-observable aircraft. Military and commercial space capabilities, over-the-horizon radars, and low-observable unmanned aerial vehicles could give potential adversaries the means to conduct wide-area surveillance and track and target American forces.

New approaches for projecting power are needed to meet these threats. These approaches must place a premium on enhancing U.S. defenses against missiles and NBC weapons; conducting distributed operations; reducing the dependence of U.S. forces on major air and sea ports for insertion; increasing U.S. advantages in stealth, standoff, hypersonic and unmanned systems for power projection; and developing ground forces that are lighter, more lethal, more versatile, more survivable, more sustainable, and rapidly deployable.

Denying Enemies Sanctuary

Adversaries will also seek to exploit territorial depth and the use of mobile systems, urban terrain, and concealment to their advantage. Mobile ballistic missile systems can be launched from extended range, exacerbating the anti-access and area-denial challenges. Space denial capabilities, such as ground-based lasers, can be located deep within an adversary's territory. Accordingly, a key objective of transformation is to develop the means to deny sanctuary to potential adversaries—anywhere and anytime.

This will require the development and acquisition of robust capabilities to conduct persistent surveillance of vast geographic areas and long-range precision strike—persistent across time, space, and information domains and resistant to determined denial and deception efforts. The awesome combination of forces on the ground with long-range precision strike assets was amply demonstrated in Afghanistan. It offered a glimpse of the potential future that integration efforts can achieve if consciously exploited through U.S. transformation and experimentation efforts.

Leveraging Information Technology

U.S. forces must leverage information technology and innovative network-centric concepts of operations to develop increasingly capable joint forces. Our ability to leverage the power of information and networks will be key to our success in the 21st century. New information and communications technologies hold promise for networking highly distributed joint and multinational forces and for ensuring that these forces have better situational awareness-about friendly forces and those of adversaries-than in the past. C^4ISR systems draw combat power from the networking of a multitude of people using an array of platforms, weapons, sensors, and command and control entities, which are collectively self-organized through access to common views of the battlespace. Leveraging information technology and harnessing the power of networks poses three challenges: We must make information available on a network that people will be willing to depend on and trust. We must populate that network with new types of information needed to defeat future enemies and make existing information more readily available. We must deny enemies' information advantages against us. The ultimate goal is to empower U.S. forces through the network, as Assistant Secretary of Defense John Stenbit has put it, "to move power to the edge." The edge doesn't just mean the guy in the foxhole—it refers to anyone who urgently needs information anywhere on the network.

Assuring Information Systems and Conducting Information Operations

Information systems must be protected from attack and new capabilities for effective information operations must be developed. The increasing dependence of advanced societies and military forces on information networks creates new vulnerabilities. Potential adversaries could exploit these vulnerabilities through their own computer network attacks. Closely coordinating U.S. offensive and defensive capabilities and effective integration of both with intelligence activities will be critical to protecting the current U.S. information advantage.

Enhancing Space Capabilities

The Department of Defense must enhance the capability and survivability of its space systems. Both friends and potential adversaries will become more dependent on space systems for communications, situational awareness, positioning, navigation, and timing. In addition to exploiting space for their own purposes, future adversaries will likely also seek to deny U.S. forces unimpeded access to and the abil-

ity to operate through and from space. A key objective for transformation, therefore, is not only to capitalize on the manifold advantages space offers the United States but also to close off U.S. space vulnerabilities that might otherwise provoke new forms of competition. U.S. forces must ensure space control and thereby guarantee U.S. freedom of action in space in time of conflict.

Taken together, these six goals will guide the U.S. military's transformation efforts and improvements in our joint forces. Over time, they will help to shift the balance of U.S. forces and capabilities. U.S. ground forces will be lighter, more lethal, and highly mobile; they will be capable of insertion far from traditional ports and air bases; and they will be networked to leverage the synergy that can come from ground forces and long-range precision fires from the air and sea. Naval and amphibious forces will be able to assure U.S. access even in area-denial environments, operate close to enemy shores, and project power deep inland. Air and space forces will be able to locate and track mobile targets over vast areas and strike them rapidly at long-ranges without warning. These future attributes are the promise of U.S. transformation efforts.

Providing Capabilities to Meet the Transformational Goals

While new technologies represent only a portion of the Department's overall transformation program, transformational investments account for 17 percent (about $21 billion) of all procurement and research, development, test, and evaluation (RDT&E) in 2003, rising to 22 percent by 2007. Over the next 5 years, we plan to invest more than $136 billion in transformational technologies and systems. Of this, $76 billion represents new investments to accelerate or start new transformation programs.

It is important to note that we have applied a very strict definition to programs we include in these totals as transformational (the system should offer the warfighter a distinctly new kind of capability). Many things that enable transformation, or extend current capabilities, are not included in these figures. For example, the $1.7 billion in this budget for funding for the Joint Direct Attack Munitions (JDAMs) and other precision guided munitions. This category also includes buying more C–17s to modernize our lift capability, and buying stealthy F–22s, and is, in fact, critical to making transformation work. The total additional investment in systems to support transformation approaches $25 billion in the fiscal year 2003 budget and $144 billion over the FYDP.

Not included in either of these totals is the $10.5 billion that the budget invests in programs for combating terrorism, which is $5.1 billion more than we were investing in that area just 2 years ago and approximately $3 billion more than we have budgeted on missile defense in 2003. That is due, in very great measure, to new priorities we must address in the wake of September 11—needs that range from immediate necessities of hiring guards and building jersey barriers to long-term necessities like training first responders and refining our intelligence response to the on-going threat of terrorism.

There are many new transformation starts in this budget, many of which will not reach fruition within our programming horizon. Because they are new programs, there are limits to how much we can usefully invest in today. However, many R&D programs today, if successful, will place increased demands on procurement in the out-years. As transformation initiatives mature, we need to be prepared to make adjustments in the programs to take advantage of success. In doing so, however, we will constantly have to weigh the risks I referred to earlier between the need to be adequately prepared for future wars and the need to sustain the current force and to be adequately prepared for war tomorrow.

Let me highlight some of the capabilities we are investing in to meet the transformation goals:

Protecting Bases of Operations. To address the goal of protecting the homeland and other bases of operations, and defeating nuclear, biological, and chemical (NBC) weapons and their delivery means, we are pursuing advanced biological defenses and accelerating the development of missile defenses. Missile defense investment includes increased funding for the Airborne Laser program, a directed energy weapons to destroy ballistic missiles in their boost-phase. The budget invests $8 billion in transformational capability to support defense of the U.S. homeland and forces abroad—$45.8 billion over the Future Years Defense Plan (2003–2007), an increase of 47 percent from the previous FYDP.

Projecting Power in Denied Areas. To address the goal of projecting power into denied areas, we are developing new, shallow-draft fast transport ships to move forces into contested littoral areas more rapidly and less dependent on traditional ports. Similarly, we are developing the V–22 aircraft for inserting amphibious and special operations forces into denied areas. We are also developing unmanned underwater

vehicles that can help to assure U.S. naval access in denied areas. Overall, the 2003 budget requests $7.4 billion for programs to support the goal of projecting power into denied areas, and $53 billion over the 5 year FYDP (2003–2007)—an increase of 21 percent.

Denying Enemies Sanctuary. In the area of denying enemies sanctuary, we are developing a space-based radar system to provide a persistent, global ground surveillance and tracking capability. We are converting four SSBNs to carry more than 150 Tomahawk cruise missiles each and up to 66 SEALs.

We are also accelerating a number of unmanned vehicle programs. Unmanned surveillance and attack aircraft like Global Hawk and Predator offered a glimpse of their potential in Afghanistan. The 2003 budget increases the number of unmanned aircraft being procured and accelerates the development of new unmanned combat aerial vehicles capable of striking targets in denied areas and sustaining persistent surveillance and strike capability over key targets. The budget includes $1 billion to increase the development and procurement of Global Hawk, Predator, and unmanned combat aerial vehicles.

DOD is also taking steps to shift the balance of its weapons inventory to emphasize precision weapons—weapons that are precise in time, space, and in their effects. We are developing a range of new precision and miniature munitions for attacking deep underground facilities, mobile targets, and targets in dense urban areas and for defeating chemical and biological weapons. We are also developing new families of ground-launched munitions, such as the GPS-guided Excaliber artillery round that will further the precision revolution in our ground forces. The 2003 budget requests $3.2 billion for transformational programs to support the objective of denying sanctuary to adversaries, and $16.9 billion over the 5 year FYDP (2003–2007)—an increase of 157 percent.

Leveraging Information Technology. We are also leveraging information technology to create a single, integrated air picture. We have increased investment in datalinks and communications, such as Link-16, needed to transmit targeting information rapidly from sensors to shooters. We are pursuing the development of laser communications in space that has the potential to provide fiber optics-quality broadband, secure communications anytime and anywhere U.S. forces may operate. This capability could have a revolutionary effect across many of our programs because bandwidth limitations are one of the key constraints on our ability to exploit unmanned systems, networked information systems, and new surveillance capabilities. Laser communications is a good example of the synergistic effects that capabilities in one area can have on others. The 2003 budget requests $2.5 billion for programs to support the objective of leveraging information technology, and $18.6 billion over the 5 year FYDP (2003–2007)—an increase of 125 percent.

Conducting Effective Space and Information Operations. Finally, we are increasing investments also in information and space operations. Many of these are highly classified programs. The 2003 budget requests $174 million for programs related to information operations—$773 million over the 5-year FYDP (2003–2007)—an increase of 28 percent. The 2003 budget requests about $200 million to strengthen space capabilities—$1.5 billion over the 5-year FYDP (2003–2007)—an increase of 145 percent.

We couldn't have made these investments without terminating a number of programs and finding other savings. Although this year's defense budget increase is the largest in a long time, virtually the entire increase was "spoken for" by needed increases to cover inflation ($6.7 billion), "must-pay" bills for health care and pay raises ($14.1 billion), unrealistic costing of readiness and procurement ($7.4 billion), and funding the war ($19.4 billion). We have saved some $9.3 billion by terminating a number of programs. Major terminations include the DD–21 Destroyer program, which has been replaced by a restructured DD (X) program that will develop a new family of surface combatants with revolutionary improvements in stealth, propulsion, and manning levels. We have cut 18 Army legacy systems. Although the Navy Area Missile Defense program was terminated because of delays, poor performance and cost growth, we are still looking to develop sea-based defenses under a replacement program.

It is important to point out that in the area of missile defense, we are pursuing some parallel technologies to meet the same objectives—for example, the kinetic kill boost vehicle and a space-based laser. At this point, we are not certain which of these programs will work best. But, we think that pursuing both will help us reach our goal faster—success in one will inform the other. As we continue, however, it is very likely that one of these programs will not survive. As with the Navy Area Missile Defense program, when it becomes clear we have reached a dead end, we must be willing to cut a program, take what we have gained, and redirect our energy and efforts in more potentially productive directions. This sort of intelligent

risk taking, which can sometimes produce dead-ends, is a necessary part of transformation.

TRANSFORMATION: BEYOND PLATFORMS AND SYSTEMS—CHANGING THE CULTURE

As we have seen in Afghanistan, transformation is more than a simple introduction of new technology. Although the Germans were the first to make tanks a decisive instrument of war, they did not invent the tank; nor were they the first to use the tank in combat, or in figuring out that tanks could prove decisive in warfare. What they did do first was use it to devastating effect through: the combination of armor with air and radio communications; the willingness to risk employing a new and bold doctrine; allowing armor to emerge in an army traditionally dominated by infantry; delegating responsibility to lower levels so that units could operate with the autonomy that armor and radio communications could give them. The success of blitzkrieg went beyond technology. It even went beyond doctrine, beyond speed, beyond communications. It was when all these elements came together that blitzkrieg was born. It was a culture change from top to bottom.

We may draw other transformation lessons from changes in culture. The introduction of the all-volunteer force was certainly transformational. Throughout the Cold War, one measurement of the military balance was through end strength comparisons between Warsaw Pact and NATO forces. After Vietnam, the U.S. moved away from conscription. This bold move meant a smaller force, but a force that was better trained, better prepared, and more highly motivated. The end result is a peerless cadre of officers and NCOs who are dedicated to serving our Nation.

Another transformational development is in our unparalleled ability to conduct night operations. Particularly given our experiences in Vietnam, we knew we had to fundamentally reduce our vulnerabilities in this area. So, we acquired technology such as night vision goggles, that allow us to virtually turn night into day. We conduct extensive night training operations. We have turned a vulnerability into an advantage. Today, it is not hyperbole to say we "own the night."

The campaign in Afghanistan has planted the seeds of culture changes in other areas that will prove to be as significant, I think. Historically, Special Operations Forces have operated separately from conventional forces. But, this campaign necessitated their close integration with conventional forces, especially air forces. One of the results, of course, is the order of magnitude change in how precise we are in finding and hitting targets from just a decade ago. This is not only changing the culture of Special Operations Forces, but it is changing how the rest of the force thinks about Special Operations as well.

What it means to be a pilot today is undergoing a transformation as well. Not long ago, an Air Force F–15 pilot had to be persuaded to forego a rated pilot's job to fly an unmanned Predator aircraft from a location far from the field of battle. It was a difficult choice for this woman who was trained in the traditional cockpit. But, she received assurance from the most senior leadership of the Air Force that her career would not suffer as a result. Of course, UAVs have made a significant impact in the current campaign and promise even greater operational impacts—which is why the Air Force leadership is working hard to encourage others to pilot UAVs and become trailblazers in defining new concepts of operations.

Accelerating cultural change and fostering innovation

Some of the greatest military transformations in the 20th century were the product of American innovation—the development of amphibious warfare, aircraft carriers, stealth and nuclear-powered submarines, to name a few. Great names like Billy Mitchell and Hyman Rickover are associated with such developments, and it is no secret that the unconventional ways of some of these innovators were sometimes difficult for their large organizations to adjust to. But, less iconoclastic officers also had difficulties when they clashed with perceived wisdom.

In the period between the wars, one infantry officer began writing about the future of armored warfare, only to have his commander tell him that if he published anything contrary to "solid infantry doctrine," it would mean court-martial. The commander even tried to scuttle the officer's career. It took the intervention of Pershing's chief of staff to put the soldier's career on a new path. That officer, so interested in the future of armored warfare, was Dwight Eisenhower.

One of our fundamental goals is to encourage all the potential Eisenhowers who are thinking about war of the future. Instead of stifling those who seek to look forward so we can lean forward when necessary, we must encourage and reward them. We intend to accelerate the development of a culture that supports the sort of innovation, flexibility and vision that can truly transform the face of battle.

From my observations, the Armed Forces today are much more congenial toward innovation and innovators. Certainly the way in which the Commander of Central

Command, General Tommy Franks, has experimented in Afghanistan demonstrates an openness to change—an openness that is helping us win the war and transform the military. But, it will always be a challenge for a large institution like the Department of Defense to encourage innovation while, at the same time, allowing the organization to continue getting its job done. We have to work constantly to encourage that creative tension.

Another way we can support the acceleration of a more innovative culture is through the processes of experimentation and training. In an environment where real intellectual R&D takes place, intelligent risks don't produce failure. They produce insights and lessons. Taking risks is all part of a discovery process, captured by the Rumsfeld Rule that states: "When you're skiing, if you're not falling you're not trying."

Experimentation and Concept Development

One of the best arenas for encouraging our forces to try hard, lean forward and risk failure is through field exercises. Over the last century, military field exercises and experiments that were oriented toward emerging challenges at the operational level of war have been important enablers of military innovation and transformation.

Field exercises that incorporate experimentation—at both the joint and the service levels—provide an indispensable means for tackling emerging challenges. In the period between the wars, Marine Major Pete Ellis perceived that war in the Pacific was likely to come, and he proposed a landing concept that we now call amphibious warfare. The Marine Corps saw that the realization of this doctrine would require special training and special equipment. Over time, and through repeated exercises, the Marines perceived the need for three different types of landing craft: one for the first troop assault; a second for the second larger troop landing; and a third to put tanks ashore. Taking Ellis's idea from the drawing board to practice beaches resulted in success in the sands of Iwo Jima, Okinawa and others.

The ability of modern communications to integrate widely disparate forces puts a much greater premium on joint operations than we have already recognized with Goldwater-Nichols and the many innovations that flowed from it. Along with experimentation, the development of joint operational concepts and operational architectures will drive material and non-material transformation solutions and establish standards for interoperability, in much the same way that amphibious warfare was perfected. New operational concepts-the end-to-end stream of activities that define how force elements, systems, organizations, and tactics combine to accomplish military tasks—are critical to the transformation process. They may even reveal how we can accomplish our aims with fewer people and resources.

General Kernan can address in more detail how Joint Forces Command (JFCOM) is developing a joint experimentation plan that uses wargames, synthetic environment experiments, and field experiments to develop and evaluate joint concepts. This summer, JFCOM will conduct Millennium Challenge, an exercise that seeks to exploit our asymmetric advantages through joint operations.

Training

Secretary Rumsfeld has said that, if you were to give a knight in King Arthur's court an M–16, and he uses the stock to knock his opponent's head, that is not transformational. Rather, transformation occurs when the knight gets behind a tree and starts shooting. But, just because he starts shooting, that doesn't make him a marksman—only training can do that.

Likewise, training must go hand in hand with the fielding of new concepts and capabilities. We must train as we will fight. We must train as we will fight. Today, we will always fight with combinations of mission-oriented joint forces—selected from our services and those of our allies. We must therefore emphasize a culture that stresses joint sharing of information, concepts and awareness to ensure our troops can fight on day one of the battle with experience and confidence. At the conclusion of Desert Storm, when I visited the 2nd Armored Division inside Iraq with then-Defense Secretary Cheney, the Secretary asked a very tough Senior Master Sergeant whether the war had been difficult. The sergeant answered: "not nearly as tough as the National Training Center."

Recognizing how important such training has been to our operations, a centerpiece of our training transformation effort will be the Joint National Training Center, which will include a live training component connecting multiple live training exercises and allowing "best of" practices to circulate among the services. It will also include a virtual capability that will link main service training centers. Over time, we want to increase the amount of joint field training that our forces receive as well.

Ultimately, these practices will encourage all the services to fight jointly because they have trained jointly.

Organizational Redesign

We have seen the need in our transformation efforts to redesign some of our military organizations to harness the tremendous power of new technologies and exploit the synergy of joint forces. In the early 1900s, the head of the Royal Navy, Admiral Jackie Fisher, recognized a similar need. He understood that the British Navy was no longer arrayed for war as it was likely to unfold in the coming century. He initiated a dramatic reconceptualization of the Navy's organization, its missions and how it would carry out its tasks. His visionary strategy included both weapons and doctrines that would come on line over a period of time. His vision helped produce a revolutionary new battleship as well as an organizational structure more suited to the world as it was then.

In the same way, DOD is taking steps to realign its organizations to better integrate and deploy combat organizations that can respond rapidly to events that occur with little or no warning—the type of environment that characterizes our world today. Joint forces must be scalable and organized into modular units that allow combatant commanders to combine the appropriate forces to deter or defeat a specific adversary. They must be organized to enhance the speed of deployment, speed of employment and the speed of sustainment. The forces must be highly networked with joint and multinational command and control, and they must be able to integrate into multinational operations.

To strengthen joint operations, the Department is developing options to establish Standing Joint Task Force (SJTF) headquarters in each of the regional combatant commands. Each headquarters will be established under uniform, standard operating procedures, tactics, techniques, and technical system requirements, thereby permitting the movement of expertise among commands. Each SJTF headquarters will have the means to develop a common relevant operational picture of the battlespace for joint and multinational forces. It will also have mechanisms for a responsive integrated logistics system that provide warfighters easy access to necessary support without burdensome lift and infrastructure requirements. SJTF headquarters will also use adaptive mission planning tools that allow U.S. forces to operate within the adversary's decision cycle and respond to changing battlespace conditions.

Related to the development of such headquarters, the Department is also examining options for establishing actual SJTFs. SJTF organizations could provide the organizational means to achieve a networked capability. They would employ new concepts to exploit U.S. asymmetric military advantages and joint force synergies at lower total personnel levels. A single Standing Joint Task Force could serve as the vanguard for the future transformed military. It could undertake experiments as new technologies become available as well as offer immediate operational benefits.

Professional Military Education

We also need to ensure that the classroom education our senior military leaders receive includes military transformation. As these leaders go on to assume greater and greater responsibilities for military operations, personnel, acquisition and administration, it is vital that they appreciate the importance of transforming the military and that we instill in them a spirit that not only tolerates, but nurtures innovative thinking and encourages risk-taking and failure in the pursuit of new ideas and capabilities. We want to inculcate in them an entrepreneurial spirit and an understanding of how militaries have been transformed historically, as well as an awareness of how private companies have transformed themselves in the face of discontinuous change.

Conclusion

Even as we fight this war on terror, potential adversaries scrutinize our methods, they study our capabilities, they seek our weaknesses. They plan for how they might take advantage of what they perceive as our vulnerabilities. So, as we take care of today, we are investing in tomorrow. We are emphasizing multiple transformations that, combined, will fundamentally change warfare, in ways that could give us important advantages that can help us secure the peace. We realize that achieving this goal requires transforming our culture and the way we think. We must do this even as we fight this difficult war on terrorism. We cannot afford to wait.

PREPARED STATEMENT BY GEN. PETER PACE, USMC

INTRODUCTION

Mr. Chairman, thank you for the opportunity to appear before the distinguished members of this committee. Today is an excellent time to discuss the transformation of America's Armed Forces as we prosecute the global war on terrorism and prepare ourselves to face future threats. We've been working the issue of military transformation and welcome the additional emphasis placed on this critical process by Congress. We must pursue this effort aggressively. I would like to comment on two areas: transformation paths and the transformation process.

First, let me provide some context. In his remarks to the cadets at the Citadel this past December, President Bush made defense transformation central to winning the global war on terrorism. Subsequently, in January of this year, Secretary Rumsfeld outlined six key transformational goals in a speech at the National Defense University. The goals are: (1) Protect the U.S. homeland and our bases overseas; (2) project and sustain power in distant theaters; (3) deny enemies sanctuary; (4) protect U.S. information networks from attack; (5) use information technology to link up different kinds of U.S. forces so they can fight jointly; and (6) maintain unhindered access to space.

Using this framework, General Myers stated that his goal is to foster changes that result in a dramatic improvement over time in the way a combatant commander wages war. We must continually pursue this transformational goal because our enemies will persist in attempts to neutralize or erode our superiority and exploit perceived weaknesses. Transformation is key to finding better ways to perform the fundamental mission of the Armed Forces: fighting and winning our Nation's wars.

Pursuing a methodology to achieve these improvements includes the following key considerations: First, we must base the process for change on an overarching set of capabilities we believe our forces must possess to support our Nation's security requirements now and in the future. Second, we must develop joint operational concepts and architectures that drive decisions concerning materiel and non-materiel improvements to combat capabilities and to establish standards for interoperability. Third, since transformation involves more than fielding new systems, we must integrate requirements for new Doctrine, Organizations, Training, Materiel, Leadership and education, Personnel, and Facilities (DOTMLPF) into the transformation process. Fourth, we must find ways to modernize and integrate legacy systems when it makes sense. Finally, we must retain the ability to operate in coalitions. Fully exploiting these transformational objectives will require cultural change. This will be as much about "mindset" as it is about anything else.

TRANSFORMATION PATHS

Transformation is a process, the objectives of which will be achieved on two paths: revolutionary breakthroughs and evolutionary modernization. Both are necessary; both must be underpinned by transformed mindsets.

Revolutionary breakthroughs in the past have included new technologies, organizations and doctrine that have led to rapid, dramatic improvements in warfighting capabilities. Technologies and advances hold the potential to revolutionize certain aspects of warfare, profoundly shifting or making previous methods of warfare obsolete. Technologies, such as stealth and satellite surveillance, and organizational developments, such as Napoleon's use of independent corps formations, are examples of these breakthroughs. Significant transformational change has also been achieved through the cumulative evolutionary effect of modernization efforts. Both paths have the potential to dramatically improve the combatant commander's ability to wage war, particularly when the capabilities are applied across the joint force through new or innovative combinations. A case in point is the Global Positioning System (GPS). Originally conceived as an improved aid to navigation, GPS was not, in and of itself, transformational. But subsequent modernization efforts with GPS have enabled commanders to synchronize both communications and the movement of forces, as well as enable all-weather precision engagement. Although starting out as a modernization program, GPS has proven to be transformational, vastly improving the joint warfighting capabilities of all our combatant commanders.

A significant transformational example is the mindset change fostered by the Goldwater-Nichols Act. Fifteen years after its enactment we have a joint force producing outcomes on the battlefield that would not have been possible had we stayed in our Service-centric approach to warfighting.

Whether transformation comes in incremental steps or radical leaps, it must be balanced with the standing requirement to maintain readiness for today's conflicts

and threats. If we only prepare for the future we will find ourselves at risk for today's threats; if we only prepare for today's threats we incur huge risks in the future. Thus changes through modernization can provide a hedge against near-term risk, while experimentation can produce the breakthrough developments we must pursue to be properly positioned against future threats.

THE TRANSFORMATION PROCESS

In the past, transformational efforts—such as the development of strategic bombing, carrier aviation, combined arms warfare and amphibious operations—have been service-specific. Today we seek to enhance our military capabilities across the joint battlespace. Therefore, transformation requires proactively combining, synchronizing and integrating various transformation efforts. We must ensure that the transformation process is characterized by unity of effort based on clearly defined goals. The Secretary of Defense defines these goals in his Defense Planning Guidance.

The Joint Requirements Oversight Council (JROC) plays a critical role in this process. My predecessors put some teeth into the Joint Requirements Oversight Council and made it an engine for joint acquisition. The JROC now has front-end influence to ensure that major weapons systems are "born joint." With my seat on the Defense Acquisition Board and my role in the budgeting process I can help ensure that all major systems are validated as "joint" before they are procured.

We have already had some success with this newer process in program areas such as the Joint Direct Attack Munition and all-weather close air support. But the JROC must move beyond simply grading the services' homework. We must examine the Defense Planning Guidance, select specific goals that come properly within our purview, and be the driving force in attaining those specific goals.

As I mentioned, experimentation is a key element in the transformation process. We've tasked United States Joint Forces Command (USJFCOM) to develop and evaluate joint operational concepts and architectures, conduct and evaluate experiments, recommend legacy system integration, provide feedback from the field, and recommend emerging operational concepts for evaluation. This summer, as a part of this ongoing effort, USJFCOM will conduct the largest joint field experiment to date, called Millennium Challenge 2002 (MC 02). The goals of MC 02 are two-fold: (1) to seek improvements in C^4ISR by evaluating several joint warfighting concepts and related tactics, techniques and procedures; and (2) to seek improvements in our Armed Forces' ability to achieve rapid, decisive effects throughout the battlespace.

Combatant commands play an important role in the transformation process as well. Although their primary focus is on near-term warfighting, they have the inherent authority and responsibility to submit doctrinal, organizational, training, or other change recommendations. Combatant commands also provide lessons learned from operations and exercises, such as what U.S. Central Command is doing in Afghanistan. These lessons are fed to USJFCOM for evaluation. Finally, combatant commands provide their warfighting requirements to the JROC. In these ways, current and near-term warfighting readiness issues inform the long-term transformation process.

The services organize, train, and equip the force. Their efforts, as guided by the Defense Planning Guidance, will continue to be critical to the transformation process. They will develop and evaluate both service-specific and joint operational concepts and architectures; support joint concept development with service experimentation; support joint experimentation; provide feedback from the field; ensure future system development supports validated joint operational concepts and architectures; and also oversee integration of joint DOTMLPF recommendations. The Vice Chiefs of each service are members of the JROC and are ideally positioned to influence the transformation process.

CONCLUSION

Transformation is a process wherein we seek to make dramatic improvements in our warfighting capabilities. Breakthrough changes and modernization changes both contribute to the transformation process. To accomplish military transformation we must articulate goals, harvest ideas, modernize equipment, experiment, and change our mindset. The Nation's security demands that we pursue an aggressive and balanced approach to transformation. Thank you for the opportunity to appear before you and thank you for your consistently strong support of your soldiers, sailors, airmen, and marines.

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

Chairman Levin, Senator Warner, members of the committee,

I'm honored and grateful for the opportunity to appear before you. By virtue of the fact that you've called this hearing you recognize the significance of transformation in the Department's plans, and I look forward to a very robust dialogue on this matter of vital importance to the future of our Nation.

There are many perspectives on transformation—many lenses through which we can view the issues before us. However, first and foremost, the President and the Secretary have elevated transformation to the level of strategy, and that is probably the most important lens through which we should look at transformation. Strategy is about how one selects a competitive space and determines the attributes within that space which will lead to advantage. Strategy answers the fundamental questions of how one controls the scope, pace and intensity of a competition. So we begin our work with strategy and the elements of the strategic environment that create opportunity and drive the compelling need for transformation.

The current and future strategic environment has been described in terms of "chaos," "revolution," or simply "change." Because social, cultural, economic and technological change is an indelible part of the world in which we live, transformation naturally flows from the profound changes happening around us. Impetus for our current transformation lies at the confluence of three broad trends. The first, and most important is the transition of our society from the Industrial Age to the Information Age. This is a transformation we are all living, so we should not expect our military to be immune from its effects. The second trend is the appearance of an expanded array of threats in a more uncertain context, and the third is the vast technological opportunities available to friend and foe alike. Individually, these trends provide a host of relevant issues to consider as we examine a potentially transformed U.S. military. Taken together they provide the starting points for discussion of the strategic, threat, and technological issues that drive the compelling need for transformation. The barriers to competitive entry are falling. Ours is the team against which everyone measures themselves, and to the extent we do not transform we provide would-be adversaries a fixed target. The success or failure of this transformation will determine the degree to which we and our allies are positioned to meet the security challenges of the 21st century.

While many within the DOD acknowledge the need for transformation, it clearly means different things to different people. For some, it is synonymous with modernization and focused on material acquisition. Others more appropriately see transformation going beyond modernization to embrace innovation and fundamental changes in our theory of war. Specifically, Network Centric Warfare (NCW) is such an innovation. Last year, in the conclusions of the report to Congress, the Department of Defense said that NCW should be the cornerstone of DOD's strategic plan for the transformation of forces. To date we have barely scratched the surface of what is possible. However, early experimentation by Joint Forces Command and the services has provided significant justification for continued investment in NCW as the foundation of future force capabilities. NCW will provide increasing return on investment by providing our most important resource—our people—the high quality shared awareness necessary to speed mission accomplishment. NCW capabilities will accelerate our ability to know, to decide and to act. The benefits of NCW are not dependent upon a particular geopolitical future or set of scenarios. NCW is at the heart of military adaptivity—the ability to respond to uncertainty in dynamic situations, day-to-day, at every level of warfare, and across the range of potential military operations. Both experimentation and practice show that a given level of warfighting effectiveness can be obtained with fewer resources when the transformation resident in network centric concepts and capabilities is embraced.

How do we implement transformation? Transformation is not just about technology and "things". Rather, it is more about culture, behavior, and the creation and exploitation of promising concepts to provide new sources of military power. Creative concept development, combined with wide-ranging experimentation of various types is an essential element of the transformation process. A military bureaucracy does not squelch innovation by modernizing its forces; innovation is undermined when experimentation and prototyping of new ideas is prevented, and when newly developed and fielded systems are subordinated to outdated operational concepts. Effective concept development must yield new ways to accomplish critical operations, missions or tasks. Real experimentation must be at and beyond the margins of the doable. That may mean money spent on failures without remorse because there is often more knowledge gained in failure than in well-orchestrated demonstrations of success. Well-choreographed, well-rehearsed experiments and exercises are excellent venues to demonstrate promising new capabilities, but true ex-

perimentation must seriously push the envelope of military operations—often involving attempts to implement completely new ways to accomplish new missions and tasks. The experimentation process must foster innovation involving real risk of failure if it is to produce new concepts of operations that will drive military transformation.

To maintain competitive advantage in the information age, transformation must achieve a cultural change. Researchers note that culture is the last thing to change in an organization. Consequently, the work on cultural change must begin first. There are some tools for that. The schoolhouse is one starting place, but that tends to take a very long time. However, education is a long-term investment we will make. There are other examples that go much faster. Experimental articles provide military personnel the opportunity to work directly with new physical prototypes while developing new concepts. The key leverage in the use experimental articles is that they help people see the range of possibilities for performing operations in new ways that abstract discourses on innovative ideas cannot. This is crucial if the culture of change is to be widely adopted. When we introduce an operational prototype—when we put something in the hands of young operators—they have little trouble visualizing the potential of the system. They rapidly extrapolate from that experience to innovative ways to use a system or capability. That can be very powerful, and there are several examples of that happening right now. The lease of high-speed transport ships for experimentation with the Army, the Navy, the Marine Corps, the Coast Guard and the Special Operations Forces is one such example. Though these ships have been in the hands of operators for only a short period of time, creative minds are already projecting greater potential for these platforms. Another example is the Predator—exploration of its potential really began as an operational prototype. Recent experience in Afghanistan has demonstrated how far the idea has progressed since it was first used several years ago in the Balkans.

What we are attempting is incredibly difficult. Historically we have recognized transformation only in retrospect. Some people don't understand how incredibly messy, contentious, and filled with uncertainty previous transformations have been. Military history is rife with examples of cultural and institutional impediments to transformational change. But what makes that history relevant is that many present-day impediments were also evident in previous efforts to transform military institutions, culture and capabilities. Many of these impediments have metastasized in the core processes that shaped the forces that won the Cold War. While they remain functional for their intended purposes, many believe that these processes are incapable of delivering the transformational change that the strategic environment now indicates. Much of our operating doctrine and our sense of military power springs from a vanishing, industrial age, and now inappropriate, threat-based approach. Until we rebalance and revalue for the information age, we remain at risk.

In summary, the barriers to competitive entry are falling as a result of new technologies made possible in the age of information. The goal of transformation is not to establish a new end-state for U.S. military power. Rather, it is to create a continuous process that if vigorously pursued, can provide a solid foundation for sustaining the long-term competitive advantage of U.S. forces. The critics of transformation will cite various risks—operational, technical, organizational, and political. However, it is precisely for these reasons that a multifaceted transformation effort throughout the Department of Defense must be accelerated. The lessons of history regarding the maintenance of military primacy clearly demonstrate that should we rest on our laurels, time will not be on our side. We live in a competitive world, and to the extent we do not transform we area at risk strategically.

The President and the Secretary of Defense are committed to transformation, and I am committed to helping them make transformation a reality for our forces. I look forward to a continuing discussion with you on this vital subject.

PREPARED STATEMENT BY GEN. WILLIAM F. KERNAN, USA

Mr. Chairman, distinguished members of the committee, I am honored to testify on U.S. Joint Forces Command's role in the transformation of our Armed Forces.

Let me open by assuring the committee that U.S. Joint Forces Command is steadfastly supporting the global war on terrorism (GWOT), actively securing the homeland and aggressively pursuing military transformation.

U.S. Joint Forces Command is successfully executing a comprehensive set of missions, all of which are directly linked to readiness and transformation.

With over 1.1 million soldiers, sailors, airmen, and marines—some 80 percent of the Nation's general-purpose forces—U.S. Joint Forces Command is the primary force provider to our country's other Combatant Commanders worldwide. Head-

quartered in Norfolk, Virginia, our subordinate commands span the continental United States. In this role, Joint Forces Command provides trained and ready joint forces and many unique capabilities in support of operations at home and abroad.

Joint Forces Command is currently responsible for land and maritime defense of the homeland and provides military support to civil authorities including consequence management support to lead Federal agencies in response to weapons of mass destruction attacks.

Joint Forces Command is also responsible for joint training that includes support to all Combatant Command joint exercises and training our three star service headquarters to be joint task forces.

Additionally, I am the Supreme Allied Commander Atlantic for the North Atlantic Treaty Organization (NATO), with a separate NATO staff, also in Norfolk. This command is our trans-Atlantic bridge, promotes interoperability within the alliance and is responsible for the NATO Airborne Warning and Control System (AWACS) currently supporting Operation Noble Eagle under Article V of the NATO treaty.

Each of these roles is important, but my testimony today is focused on Joint Forces Command's essential role in transformation of our country's Armed Forces. Protecting our homeland, winning the War on Terrorism and preparing our Armed Forces for the future is inextricably linked to Joint Forces Command's mission areas. Indeed, each mission is essential to ensuring readiness today and transforming for the future.

THE GLOBAL WAR ON TERRORISM

Given this broad mission set, it is no surprise that the attacks of September 11, 2001 significantly impacted all aspects of Joint Forces Command. Simply put, those attacks placed our Nation and this command on a wartime footing. All elements of this command, Active, Reserve, National Guard, Civil Service, and contract employees are involved in this two-front war—at home and abroad. Indeed, there can be no more important mission than fighting terrorism overseas and simultaneously securing the homeland. Our Nation's offensive operations significantly enhance our homeland security.

Since I last appeared before this committee, Joint Forces Command has made solid progress in improving the military aspects of securing our homeland. Notably, Joint Forces Command has activated a provisional Joint Force Headquarters for Homeland Security (JFHQ–HLS). Commanded by a two-star general, the JFHQ–HLS oversees the planning, organization and execution of our homeland defense and military assistance to civil authorities responsibilities. Leveraging the insights and concepts gained from our joint training and experimentation work, we are employing emerging concepts to organize, train and operate this new organization as a highly functional command and control headquarters to conduct homeland security. Formed "out-of-pocket" and "out-of-hide," this headquarters has operational control of Joint Task Force-Civil Support (JTF–CS), our consequence management headquarters for chemical, biological, radiological, nuclear and high-yield explosive events (CBRNE), and Joint Task Force-Six (JTF–6), our task force responsible for providing counter-drug support to civilian authorities here in the United States.

Working with our key partners, including the services, National Guard, U.S. Coast Guard, Federal agencies, and the law enforcement community, our military capabilities deepen the homeland security bench, so to speak, behind the civilian first responders and the National Guard as it is employed under state control. While we clearly remain in a supporting role we continue to maintain active duty ground force rapid reaction forces, remain prepared to provide naval assets in support of the Coast Guard operations, provide Active and Reserve component tactical aircraft and AWACS to NORAD and, in partnership with Pacific Command, will provide maritime forces, if needed, to defend our coasts. We have identified additional support forces, such as chemical and biological detection and defense units, that are required to maintain the appropriate consequence management capabilities and are providing soldiers from the National Guard to augment border security operations. This necessary and robust support posture is not without cost. Current homeland security and force protection requirements demand nearly 10 percent of Joint Forces Command's assigned forces. Balancing readiness, operational deployments, and responsiveness requires careful and innovative management. Finally, the force requirements described above do not include the numerous and substantial employment of National Guard forces by the Governors, in state status.

Key to the homeland security mission is the integration of our efforts at the local, state and Federal levels. We have more work to do to achieve full intelligence and information fusion in order to produce accurate, actionable, predictive analysis. Once we are able to do this, the response community will be able to transition from

today's more reactive posture to a more proactive stance and therefore a more secure homeland.

Overseas, troops from all Joint Forces Command components are actively involved in support of operations in Afghanistan, comprising nearly 40 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. Nevertheless, these trained and ready forces are a proud reflection of the great capabilities found across your military—dedicated, hard working and committed patriots. Additionally, other less known 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 (JWAC), are providing critical support to the global war on terrorism and Operation Enduring Freedom in particular.

What we have witnessed in Noble Eagle and particularly in the execution of Operation Enduring Freedom has been truly extraordinary. Our forces have deployed halfway around the world, and under the superb direction of U.S. Central Command and U.S. Special Operations Command, conducted an exceptionally adept and precise campaign, defeated the Taliban and freed a nation, and dislocated the enemy al Qaeda base of operations and worldwide network. These deeds and ongoing operations reflect an agile mix of new capabilities and operational concepts with tried and true principles. All of our troops have performed superbly. This operation is replete with many lessons that, when balanced against the unique nature of the current fight, will inform future operations and shape transformation.

TRANSFORMING OUR ARMED FORCES

Overview

Building upon prior and ongoing joint and service concept development and experimentation and leveraging the warfighting innovations from ongoing operations, we are actively developing solutions that enhance the full range of joint warfighting capabilities needed to combat terrorism and sustain our dominance in the 21st century. This comprehensive effort includes aggressive experimentation, joint force training, and integration of joint warfighting requirements necessary to meet future challenges, all balanced by the need to sustain a trained and ready force for today's operations.

Meeting requirements at home and abroad, including maintaining the capability to deter and if necessary decisively defeat other threats, remains a manageable challenge. However, sustaining such a capability requires adequate resources to maintain warfighting readiness, ensure sustainable levels of personnel and unit activity, and afford our troops and their families with an acceptable quality of life.

These areas reflect the priorities of U.S. Joint Forces Command. Our forces are an integral part of the war against terrorism abroad. Here at home, our first priority is the defense and security of our homeland. As noted, transformation is critical to the success of both efforts. Our transformation efforts, a relatively new mission area for this command, are designed to achieve 21st century capabilities relevant to current and future threats. It is our intention to maintain and improve the Nation's battlefield dominance. Finally, none of this is possible without well-led, trained, equipped and motivated people.

It must be clearly understood that these areas are all inextricably linked to transformation. The ongoing war is a catalyst for innovation and acceleration of emergent capabilities as well as providing lessons for the future. As well, transformation efforts feed the needs of ongoing operations, with a number of innovations rapidly reaching maturity. Moreover, the readiness of our current forces is not only key to near term victory but trained and ready forces provide the necessary foundation for successful transformation.

The challenges of the 21st century require adaptive, flexible, rapidly deployable, and employable and dominant joint forces. Building on the readiness of our present force, the synergy of Joint Forces Command's varied roles is an essential transformation enabler.

As the force provider, our service components' forces, intellectual input, and operational experience shape, enable, and assess transformation activities, particularly concepts and experimentation.

Joint training provides the opportunity to assess the operational challenges facing the entire joint force, identify new ideas, examine promising concepts, and promote jointness—enhancing our principal asymmetric capability.

Joint concept development and experimentation builds upon these challenges and insights to develop the operational capabilities of the future joint force. Here experi-

mentation collaborates with joint training to complete the transformation of the force through the synthesis of personnel, doctrine, and technology in the crucible of a training event.

Finally, joint integration 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.

Leveraging Transformation

As the President stated, this is a war "unlike any other." It demands fresh approaches and new thinking. In that regard, the Secretary of Defense recently outlined six transformation goals: protect the U.S. homeland and our bases overseas; project and sustain power in distant theaters; deny enemies sanctuary; protect U.S. information networks from attack; use information technology to link up different kinds of U.S. forces so they can fight jointly; and maintain unhindered access to space. Furthermore, the Chairman of the Joint Chiefs identified key areas for improving joint warfighting capabilities, including interoperability and joint experimentation, as well as transformational capabilities such as establishing standing joint force headquarters for the combatant commanders.

Additionally, we welcome the creation of the Office of Force Transformation and look forward to strengthening our solid partnership with Vice Admiral Art Cebrowski. 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.

The Department leadership's intent and guidance establishes a clear transformation way ahead. Far more than new materiel, transformation is a comprehensive effort that touches on all aspects of the military. Transformation components include new ideas, concepts and new capabilities, developed and refined through aggressive experimentation, as well as evolutionary and at times revolutionary change that will sustain our military dominance in a rapidly changing world. These evolutionary and revolutionary components demand that we sustain the readiness and capability of our current forces or they will not be in a position to exploit those changes.

The priority placed on transformation is unquestioned. Within a month of taking office, the President visited Joint Force Command and noted, "Eleven years after the Cold War, we are in a time of transition and testing . . . We must seize this moment." Let there be no doubt that U.S. Joint Forces Command clearly understands the intent of our senior leadership, and we are seizing the moment.

Joint Forces Command, in partnership with the services and Combatant Commanders, has a number of programs and experiments already underway to achieve the President's transformation vision. Moreover, we are actively working to leverage the innovation seen in the war in Afghanistan in order to accelerate the ongoing transformation of our Armed Forces. Furthermore, the continued support of Congress for Joint Experimentation and associated effort will ensure that U.S. Joint Forces Command has the necessary resources to fulfill its key role in this extensive, Department-wide effort.

With our redesignation as U.S. Joint Forces Command on October 1, 1999, we assumed the responsibility to lead—as a pathfinder—the transformation of the U.S. Armed Forces to achieve dominance across the width, depth, and breadth of any battlespace. That means that anywhere on the spectrum of conflict, we will fight and defeat any adversary. For just over 2 years, Joint Forces Command has focused on achieving that objective. Further, the events of the past months, both at home and abroad, have shown that we must accelerate those efforts. We need today's forces to get to the objective area quicker, dominate the situation, and win decisively. Comprised of highly trained, competent units and leaders, those forces need to operate with agility, versatility, precision, lethality, and survivability.

Concept Development

Transformation is about thinking differently. Joint Forces Command started out with that as a guiding premise, developing new concepts based on new ways of thinking about warfare in order to frame the capabilities needed to ensure military dominance in the 21st century.

One of the most promising concepts that will help build the future joint force is called Rapid Decisive Operations (RDO). RDO can be summarized as "a rapid series of relentless strikes by a full-spectrum joint force operating in an inter-agency context to defeat a regional power" and takes the fight to the enemy, anywhere and everywhere, on our terms, under conditions uniquely to our advantage. RDO proposes an alternative to our legacy sequential, linear and predictable operations by

providing a construct for early, distributed, full-spectrum attacks against the enemy's ability to make war.

RDO leverages the unique asymmetrical advantages and capabilities of our Nation. These advantages generally span the elements of both national and joint military power and include our ability to project power, do so precisely, exploit space and integrate information into knowledge. Individually powerful, when those elements of national and joint military power are integrated and synchronized-we are unmatched.

Achieving this new level of integration and national power projection requires new operational approaches. The following supporting concepts inherent in the RDO concept allow us to better exploit these strengths:

- *Standing Joint Force Headquarters (SJFHQ)* exploits new operational and organizational concepts and technology to reduce the ad-hoc nature of current joint operations and planning times. This concept will significantly enhance integration, interoperability and operational execution.
- The *Operational Net Assessment (ONA)* comprises approaches and tools to understand the enemy as a system. This system synthesizes large, diverse databases, producing actionable knowledge that enables better, faster decisions. This will permit a precise focus of effort enabling more effective employment and protection of our own forces and more effective destruction of the enemy.
- *Effects Based Operations (EBO)* is a new way of thinking about fighting the enemy. Effects Based Operations seek to continually focus the full range of our military and inter-agency asymmetric advantages against the enemy's system break-points to destroy his coherence. Early inter-agency involvement enhances our influence, deterrent, and coercive effects over an adversary and our preparation and execution of operations. Effects Based Operations are transforming the art and science of war.
- The *Common Relevant Operational Picture (CROP)* is a tailorable, cross-echelon, cross-organizational, knowledge-based collaborative environment that creates situational awareness and agile unity of action. The CROP is about adapting the science of command and control to the evolving art of warfare-moving from operational design and execution away from the deconfliction of our joint forces to their integration.

Integrating these concepts within the RDO framework should allow us to decisively and rapidly defeat opponents ranging from a non-traditional enemy such as al Qaeda to a competent regional power employing competitive strategies and capabilities. We have seen and see today the asymmetric approaches and capabilities we must contend with, including Terror, Anti-Access, Information Operations, WMD, TBM, and Cyber Attacks as well as legacy threats. Joint Experimentation has been working to defeat the enemy we are confronting today and prepare for tomorrow's enemies as well.

Leveraging Transformation for the War on Terrorism

Combating terrorism, protecting the homeland, and transformation are intertwined. We are working today with Operation Enduring Freedom's joint warfighters to rapidly operationalize the innovative ideas emerging from our joint concept development and experimentation program. The war on terrorism cannot be won with legacy means alone. Development of advanced techniques, tools, and organizations for these challenges requires innovative thinking and aggressive experimentation to develop alternatives for the future joint force.

As the Secretary of Defense recently observed, transformation is happening now. Clearly, the war in Afghanistan is a catalyst for energizing promising capabilities such as precision weapons, accelerating developmental capabilities such as Global Hawk, and stimulating new and innovative operational approaches at the tactical and operational levels of war.

In that regard, U.S. Joint Forces Command has been working for over a year on proposals for transformation that can directly address the operational requirements we face today. Last May, in partnership with U.S. Central Command and U.S. Special Operations Command, Joint Forces Command conducted an advanced concept experiment, Unified Vision 2001 (UV 01). Unified Vision 2001 envisioned strategic and operational conditions similar to those we face today. The intellectual foundation for dealing with these new conditions should put us in the position to operationalize more rapidly our best concepts.

Converting these concepts into operational capabilities is now our challenge. Within this command, we are integrating many of our new ideas into our own organization and operations to execute the homeland security mission. Likewise, the fight against terrorism abroad will be enhanced by the doctrinal, organizational, training,

and technical findings that come from our transformational efforts. Some of these enhancements will take time, but some are in the hands of the warfighter today or will be very soon. Let me provide several examples based on UV 01. In addition, I expect more to follow from Millennium Challenge 2002 (MC 02), this year's major experiment.

- Our Joint Warfighting Analysis Center (JWAC) is already providing an important new capability to our Operation Enduring Freedom warriors. The *Research, Integration and Technology Environment (RITE)* capability makes use of JWAC expertise and advanced tools to provide a near real time fused intelligence product that is tailored to the user for kinetic or non-kinetic action.
- We have developed the *Joint Enroute Mission Planning and Rehearsal System-Near Term (JEMPRS–NT)* that will provide the warfighter with on the move, collaborative planning, command and control, and a first-generation common relevant operational picture. Leveraging commercial and government off-the-shelf technology, JEMPRS–NT was successfully demonstrated in airborne testing in January and March 2002. MC 02 will validate this capability and we expect to get it in the hands of the joint warfighters shortly after that. Our Combatant Commanders want this capability now.
- Our experimental insights on interagency coordination were a driving factor in forming interagency coordination groups for each of the regional Combatant Commanders.
- *Standing Joint Force Headquarters,* described previously, is the Chairman's number one transformation priority. Our experimental insights confirmed the way ahead. This capability will be a centerpiece of the MC 02 experiment, and, in partnership with the other Combatant Commanders, will be developed and refined in order to deliver operational organizations to the regional commands in fiscal year 2005.
- *Enhanced C⁴ISR for HLS Operations (ECHO)* is a new fast track initiative to identify solutions that provide assured crisis action connectivity from the first responder at the incident site to the highest Federal levels. This system will enable coordination and collaboration at all levels as well as information sharing and access across multiple information and security domains. This is an accelerated program designed to deliver a prototype system within four to 6 months using a spiral development process.

The operational demands that frame these flexible capabilities and the velocity of technological change demand an equally agile process of acquisition. At a minimum, as experimentation and other programs such as the Advanced Concept Technology Demonstrations (ACTDs) uncover new opportunities and capabilities, funding must be available to bridge the gap between discovery and formal acquisition. With business and technology horizons constantly compressing, a mechanism must be established to ensure our own capabilities are synchronized with the velocity of technological and operational change.

Joint Experimentation

These advances will greatly enhance operations in the near term. However, transformation is also a comprehensive, long-term effort that demands concerted effort. Many of the inter-war innovation models, including American aircraft carrier and amphibious warfare development, and the often-mentioned development of "blitzkrieg", were years in the making. In the latter case, historians note that the Germans' "lightning" victories in 1939 and 1940 were a surprise only to their opponents, as this "revolutionary" warfare was the product of some 20 years of effort. However, as successful as their initial efforts were, failure to follow through cost the Germans dearly on the Eastern Front. In that new environment, shortcomings in operational design (concepts) and failure to continue force wide transition to these new "blitzkrieg" capabilities contributed to their defeat. Innovation and transformation follow through must be continuous, flexible and resourced.

Likewise, prematurely capitalizing on new capabilities presents substantial risk as well. The Italian air force of the 1920s and early 1930s was state of the art, but was irrelevant as World War II unfolded. Similar examples can be drawn from our own experience with coastal defense, dreadnought battleships, dirigibles and, more recently, the Pentomic Army. These lessons are in part why we have undertaken robust joint and service experimentation programs.

The Joint experimentation program provides the framework for comprehensive examination of change. Notably, last year's UV 01 experiment, previously mentioned, was very successful. Unified Vision 2001 focused on the Joint Forces Headquarters organization and systems needed to execute RDO in a 2007 small-scale contingency.

Over 40 organizations and 350 personnel joined in this robust, wargame-style, model supported experiment. Unified Vision 2001 validated RDO as a sound operational concept and provides a solid foundation for MC 02, this year's major field experiment.

Key insights from UV 01 centered on leveraging inter-agency capabilities and joint organizations and operations. Examining combatant command and inter-agency partnerships through joint force staff integration, we confirmed that early and continuous inter-agency involvement is essential to mission success and enhanced our influence, deterrent, and coercive effects over an adversary and our preparation and execution of operations. Our examination of experimental organizations indicates that a core standing joint force headquarters (SJFHQ) is a high-value means to reduce the ad-hoc nature of today's JTF operations and increase the timeliness, effectiveness and efficiency of future operations. This joint-interagency capability developed an Operational Net Assessment (ONA) that affords comprehensive knowledge of opponent systems (political, military, economic, etc.), enabling compressed decision cycles, strengthened deterrence, and development of comprehensive strategic to tactical actions using all elements of national power. Exploiting ONA, the Effects-Based Operations process leverages the full weight of national power to create integrated effects tailored to rapidly defeat a specific foe.

Over the fall and winter, a number of follow-on experiments have built upon and matured these concepts as well as the insights and outcomes of last year's very productive UV 01 experiment. These experiments and ongoing preparation will establish a firm foundation for successful execution of Millennium Challenge 2002 this year.

With strong support from the members of this committee, this year's joint experimentation funding will ensure effective execution of MC 02. With great support from the services and participating agencies, MC 02 is suitably scoped to fulfill all experimentation objectives without taking away from the requirements of ongoing operations against terrorism.

Millennium Challenge 2002 is a major milestone towards transformation. Examining a high-end, small-scale contingency with potential to escalate MC 02 is based on a real-world military threat. Millennium Challenge 2002 will permit us to experiment with the RDO concept with both real and simulated forces, using a broad array of land and ocean training areas, facilities, instrumentation, modeling and simulations. The experiment will span the western ranges—Nellis Air Force Base, Twenty-nine Palms, China Lake, Camp Pendleton, Point Magu, the National Training Center at Fort Irwin—and our own Joint Training Analysis and Simulation Center facilities in Suffolk, Virginia.

Millennium Challenge 2002 will bring together around 13,000 personnel from all the services and incorporates the services' future concepts and capabilities—the Navy's Forward From The Sea, the Marine Corps' Ship To Objective Maneuver, the Air Force's Aerospace Expeditionary Forces, the Army's Interim Brigade Combat Team, along with Special Operations Command and other interagency initiatives—all within a joint operational context. Allied involvement consists of NATO observers this time; robust allied participation will take place during our next major experiment called Olympic Challenge 2004. In the area of multinational and allied experimentation, I would also note that the co-location of NATO's Allied Command Atlantic with Joint Forces Command makes cooperation in transformation much more effective.

We want to experiment to see how we can develop a common relevant operational picture that will allow us to fuse intelligence, do the collaborative planning, make decisions very quickly, and compress our decision-cycle to the point where we can prioritize and attack targets and seize objectives faster than the enemy can respond, achieving a rapid and decisive victory.

Coming out of MC 02, we expect to have some significant recommendations, backed by quantifiable data to develop the architectures, systems, processes, tools, and capabilities necessary to empower a standing joint force headquarters to execute high tempo, effects-based operations that employ agile, decision-based forces. We are already seeing the benefits of this conceptually based new way of war in Operation Enduring Freedom and joint concept development and experimentation efforts will continue to improve our capabilities.

Moreover, these endeavors set the conditions for unified transformation activities to take place across the services and the joint force. Our concept development and experimentation efforts over the past 2 years have established the common joint context, have facilitated collaborative concept development across the services, and have synchronized the joint and service experimentation programs.

I look forward to discussing with you further the power of these concepts and emerging capabilities and invite you and your staffs to visit Joint Forces Command and our Component forces in late July and early August to observe this experiment.

Trained and Ready Joint Forces—the Foundation of Transformation

Transformation is more than just experimentation, the interoperability of current and future systems or some new technology. Enhancing jointness—that is, the way our forces train to interact and fight the enemy—is a critical aspect of transformation. To that end, another benefit to the preparations and execution of MC 02 is the electronic linkage of many of the existing service ranges and training areas in the Western U.S. This effort, necessary to conduct a robust joint field experiment, will also provide us the opportunity to explore the benefits of establishing a Joint National Training Capability that provides the opportunity for the conduct of embedded, multi-echelon joint and service training that is live, virtual and constructive, using electronically linked ranges, simulators and simulations. Additionally, with the robust capabilities of the Joint Training, Analysis, and Simulation Center located in Suffolk, Virginia, the potential exists to make such a capability a reality, with smart investments that leverage existing capabilities and integrate them with means such as the Joint Simulation System (JSIMS).

Interoperability

To facilitate Department of Defense transformational efforts, USJFCOM develops, experiments on, documents, and submits appropriate joint doctrinal, organizational, training, materiel, leadership, personnel, and facility (DOTMLPF) changes for implementation as directed by the Joint Requirements Oversight Council (JROC), to which I have a standing invitation. These submissions, the product of joint experimentation, training, and operational lessons, include joint operational concepts, command and control structures, and capabilities that become joint requirements once approved by the JROC. To further discipline this process and better direct our efforts along the vector established by Secretary Rumsfeld's transformation goals and the Chairman's intent, we recently published a CJCS-approved 5-year Joint Experimentation Campaign Plan. This Campaign Plan describes the strategy, timeline, planned activities, and program goals necessary to realize near term transformation opportunities and sustain the effort for the future. Given the dynamic nature of transformation, this is a living document and will be updated annually or as required.

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. In addition to reviewing other organizations' requirements, Joint Forces Command also develops requirements that fill uniquely joint needs. The JROC has approved four Joint Forces Command Capstone Requirements Documents-Global Information Grid, Information Dissemination Management, Combat Identification, and Theater Air Missile Defense.

In our role as the chief advocate for jointness, Joint Forces Command identifies, collects, categorizes, and prioritizes warfighting interoperability requirements critical to the Combatant Commanders and then seeks solutions. Joint Forces Command also synchronizes JROC endorsed DOTMLPF solutions to interoperability and integration shortfalls in order to provide the joint warfighter with integrated remedies that enhance warfighting capabilities. In particular, Joint Forces Command is currently developing recommendations for infrastructure, information management and assurance, and joint data network enhancements for legacy joint task force command and control capabilities.

To speed exploitation of technological and other opportunity solutions stemming from experimentation, Advanced Concept Technology Demonstrations (ACTD) and other programs, Joint Forces Command established a stabilization fund program element line that will facilitate the rapid insertion of solutions to identified interoperability shortfalls. This funding provides programmatic support to the lead service or agency between Program Objective Memorandum (POM) cycles.

In addition to our review and implementation roles, Joint Forces Command established a training program for Combatant Commands, services and agency requirement developers to streamline the process and speed development of needed capabilities. This training greatly facilitates the identification and formulation of parameters that meet the interoperability requirements. These customers have embraced program and to date has involved over 50 organizations and 1,500 personnel.

Readiness

While working towards transformation, we have a big job right now that will demand attention and resources. We have to get through today to get to tomorrow. Risk management is necessary, but it must be prudent. Part of prudence is striking the right balance between readiness, transformation, quality of life, and operations. 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 adequate resources.

Readiness provides the foundation for not only our current security, but the transformation for our Armed Forces. Many pundits have held up World War II and the innovation that preceded that conflict as a model for our own age. The innovation exhibited by many nations, including the United States, clearly provides lessons for transformation today.

That era also provides paths to be avoided. In our own experience, the readiness of our forces was not on par with the capabilities developed from inter-war experimentation. Indeed, in the case of my own service, the Army learned many hard lessons in North Africa and the South Pacific because the pre-war Army was unable to match the demands of new capabilities and the realities of changing warfare. The realities of the 21st century counsel that we balance and co-evolve both the readiness of our forces and the transformational capabilities needed for the new century.

Our present joint forces are highly capable, as recent operations demonstrate, but they are overdue for recapitalization. Near-term modernization of our forces to capitalize on the many technological advances made over the last decade is necessary. We need these updated legacy systems to continue to fight today and bridge our modernization gap as we move forward with transformation.

While I have outlined a number of challenges and priorities for ensuring we sustain our edge worldwide, 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 reassuring. The challenges and requirements I outlined above remain, but we have a plan to address them and, due in great part to your support, our forces remain the best in the world. For that we are all proud and thankful.

Moreover, transformation is clearly occurring. Our efforts aim to accelerate these trends. Further, I think that these insights are compelling and have immediate application. As I mentioned earlier, these concepts guided the stand-up of our provisional JFHQ–HLS and the development of our Homeland Security Campaign Plan. Likewise, much of what we see in the war on terrorism is transformational-from tactical employment of armed unmanned aerial vehicles to integrated, effects based joint operations against an asymmetric enemy. Money can certainly influence the rate of transformation, but I regret to say that in many cases time is perhaps the more critical resource. Many aspects of transformation will remain evolutionary, even when the results are revolutionary.

I look forward to working with you to give our troops what they need today and for the future and reiterate my invitation to visit Joint Forces Command and see transformation at work.

CONCLUSION

In all of this, we have to remember the basics. War remains close, personal, and brutal. There are no silver bullets to change that. There have been revolutions in how we fight such as gunpowder, nuclear weapons, and computers. In the end, however, it still comes down to our national will and the commitment, training, and tenacity of our troops. It is never safe, easy, or risk-free. The enemy sees to that. Today while I speak our troops are flying, sailing, and standing in harm's way, under enemy guns, at night, and far from America and their loved ones. Our national will, combined with their spirit and tenacious commitment, will define our success.

In closing Mr. Chairman, the soldiers, sailors, airmen, and marines of U.S. Joint Forces Command are ready to defend our homeland and are deployed to fight terrorism abroad. Each day, we improve our capabilities, refine our plans and increase our homeland security capabilities while providing trained, ready, and-over time-fundamentally transformed forces for combat operations against terrorism and any other threat to our Nation. We are all very proud of them and privileged to serve with them.

Chairman LEVIN. Thank you, Secretary Wolfowitz.

Let me start with Admiral Cebrowski. Secretary Wolfowitz has mentioned the need for transformation of new operational concepts, new organizational changes, and I am wondering whether you agree with that, which I think you probably do. But more importantly, would you point to any new operational concepts or organizational changes that have been formally adopted or should be formally adopted?

Admiral CEBROWSKI. Mr. Chairman, I do agree wholeheartedly that transformation is really a broad spectrum of technology, organizations, culture, and processes. Key amongst this is of course operational concepts. Operational concepts flow from our understanding of the evolving situation in strategy, in technology, and with regard to threat. That indicates a certain way ahead for us.

Yes, I can say that some key operational concepts are emerging. First and foremost amongst this process is the transformation from the industrial age into the information age. In the Department we call that network-centric warfare. A report to Congress was submitted by the Deputy Secretary last summer with regard to that subject, and that is absolutely key.

If we do not succeed in transforming from the industrial age to the information age, then all of our other efforts in transformation will not likely bear fruit. This indicates certain features and some of those address the questions that you had raised in your opening remarks. For example, we see the moving to primacy of sensors and the appearance of something that we might call sensor wars. We have done very, very well with weapons, and weapons are indeed critically important and we have magnificent weapons reach. But in the dynamics of warfare, the enemy controls the sensor reach. So what is emerging in all of the services is the recognition that we have to have a robust, well-networked sensor capability which is capable of fighting in close, that is, that sensors emerge as elements of the maneuver force themselves.

We are seeing the enormous payoff from that. We are seeing the recognition amongst all the services that these capabilities must be networked to develop high quality shared awareness. So you see the terminology of shared awareness and self-synchronization appearing in all of the service documentation and concepts. That of course is good news as well.

You see an enhanced appreciation for speed. It shows up, for example, in collaborative planning. We can plan far faster now than we ever could before. But there is a wholesome dissatisfaction, and there always should be because it is never fast enough, and we need to keep working in that area.

You also see it in terms of speed of deployment, which shows up amongst all of the services. The most tangible form is the appearance of the high-speed vessel to help us deploy forces more quickly, the recognition that speed indeed counts a good deal. Not just tactical speed, but speed of deployment, speed of employment, and speed of sustainment. These things all integrate with each other.

We can see in the land forces, both Marine Corps and Army, the appearance of doctrine for fighting in the non-contiguous battlefield, that is moving away from front lines with a rather static and set piece form of combat to alternative concepts which would allow us to draw on the power of smaller units, higher mobility, and the

great information advantage which our Nation provides the military forces.

So there is a lot of good news here in the way things are going. This does not say that the work is done, however. Very, very far from that. A great deal more must happen.

Chairman LEVIN. Thank you, Admiral.

General Pace, your formal statement notes that your chairing of the Joint Requirements Oversight Council and your seat on the Defense Acquisition Board enable you to ensure that major weapons systems are "born joint" and validated as "joint" before they are procured. Then you go on to say that the JROC has moved beyond simply grading the services' homework and must select specific goals from the defense planning and be the driving force in attaining those goals.

I am wondering whether or not that will require a cultural change. You made reference to it in your opening statement when you said that this is all as much about mindset as it is about anything else. Do we need a cultural change? Do we need a change in mindset in order that the JROC be the driving force in attaining the goals that you referred to?

General PACE. Mr. Chairman, thank you.

I do believe that if we did nothing else other than change our mindset and apply those different thought processes to the assets we already own, that we would take a huge step in the direction of transformation. You can look at what General Franks is doing on the battlefield in Afghanistan right now. You can look back to the mindset change that Goldwater-Nichols instituted some 15 years ago.

Chairman LEVIN. If I could interrupt just for a second, could you be specific in terms of the changes in mindset that you think are necessary, the future changes?

General PACE. Yes, sir. With respect to the Joint Requirements Oversight Council, of which I am the chairman and each of the service vice chiefs is a member, our predecessors have given us a system that does a very good job of taking ideas that come from service laboratories and service experiments and determining whether or not the services have applied to those initiatives enough jointness so that when they bring that computer system to the joint battlefield it can plug and play along with others.

Over the past several years, we as the JROC have gone from taking systems that were already in the process of being developed and trying to adjust their final outcome to moving the gate forward in the process to where now no major program of any service even gets one dollar applied to it before the JROC blesses it as joint. That is good, but that is the point where we are grading other people's homework.

What I am saying, Mr. Chairman, is that we need to take the defense planning guidance, the capabilities that we want this Nation to have in the future, and as a Joint Requirements Oversight Council look at what we have right now, what are the gaps in those capabilities, and determine as a council whether we want a service to come up with the solution, or need to ask Joint Forces Command to experiment with some ideas so that instead of waiting for ideas

to come in the door from those around us, we become part of the initiative process and we take on that.

That is a mindset change of sitting back and waiting for or in fact being a part of the process. It goes to what Goldwater-Nichols did for the joint environment. My first 19 years in the Marine Corps, I knew that I was supposed to be thinking about the Marine Corps and I was not worried much about the Army, Navy, and the Air Force. My last 15 years in the joint world, I have seen a huge difference that the Goldwater-Nichols Act has brought about.

Look simply at Afghanistan. You cannot imagine the force in 1986 doing what the force did just several months ago, thousands of miles—from September 20, when Tom Franks got his first order to go until October 7, thousands of miles away, a landlocked country, joint and combined operations. That is a mindset change, sir, and the willingness to look at things differently and to take what we have and to apply it in a different way.

Chairman LEVIN. Thank you. Senator Warner?

Senator WARNER. Thank you, Mr. Chairman.

Really a fascinating presentation. I have been privileged to sit here for many years hearing successive presidents and secretaries of defense propose to Congress their vision for the future. I guess what is crossing my mind at the moment is concern about what I have heard thus far. I am not sure that we are coming to grips with the integration between our projection of forces abroad to deter and defend, and are we losing any emphasis on what I think is my main concern here at home.

I have not heard anyone discuss how we are going to secure our ports against the smuggling of weapons of mass destruction into the borders of our Nation, to the extent that any of this reflects the porosity of our borders. Then lastly, gentlemen, the Deputy Secretary, the Chairman, and I were just discussing that the crisis at hand in the world is the Middle East and the weapon of selection is one that, while there have been isolated chapters of its use in the history of warfare, we are now seeing it employed to where the human bomb has brought any discussions to try and solve the Israeli-Palestine crisis to a stalemate thus far. I hope it is soon broken—the ability of conscientious minds in both the world and everyone.

It is the human bomb that has brought about what appears to be an impasse and a stalemate. To what degree did this thinking of emerging threats and the isolated terrorism poised against our Nation and other nations enter your plans? We listened to Admiral Cebrowski talk about the battlefield. Battlefields now are isolated individuals bringing about enormous devastation utilizing weapons of mass destruction.

To what extent did that type of thinking go into the formulation of these various goals? Mr. Secretary, do you want to tackle it? Then General Pace.

Secretary WOLFOWITZ. We are all involved in this in one way or another. But in fact, we specifically identified defense of the homeland and defense of our bases as the first priority. There is a lot going on in this area, including the quite transformational work to stand up a new Homeland Defense Command, which will be some-

thing both in mission and in the way it is organized, I think, very different from the commands we have had in the past.

I do think in fact that this challenge of homeland defense and of dealing with the vulnerability of our bases involves a number of mindset changes. One of them is that we have to think not just joint, but inter-agency and inter-governmental. One of the biggest challenges in doing homeland defense is sorting out what is the right role of the military and what is the right role of civil authorities. Normally we have not had to think as deeply about that kind of issue.

When we engage in the war on terrorism overseas, we are as frequently in a supporting role for the CIA or for the FBI or for other agencies of the U.S. Government as we are actually engaged in military operations.

A second mindset change that is involved is understanding that the same ways in which our country can be vulnerable to attack, our bases can increasingly be vulnerable to attack. We have enjoyed the luxury for a long time of assuming that we operated out of a sanctuary, and that is not a luxury we can assume. That I think is a mindset change.

But I would also say that one cannot separate defense and offense. What we are doing in Afghanistan, I think, has contributed in significant measure to preventing other terrorist attacks here at home, and at the same time that we take all reasonable measures to increase our security here—we are not going to win this war simply going on defense. We have to go after the terrorists, and I know you agree with that.

Senator WARNER. I share those views. I want to make certain that we have an integrated plan for defending ourselves here at home, which has been a very low priority up until recently. I am not faulting anyone. We always felt the two oceans and our projection gave us the security here at home so that we did not have to devote the assets and the time. But that has changed.

Then we see on the battle fronts today the utilization of suicidal attacks as bringing about a transformation in warfare in the Middle East that I do not think any of us fully envisioned until this tragic chapter unfolded here in the last year or so. It has cost untold crises to a valued ally, Israel.

General Pace, do you have some comments to assure the committee that you and your colleagues are looking at the homeland defense as an integral part of all of this?

General PACE. Sir, we are, and I would echo two thoughts that you have. One is the need for an inter-agency approach to this, especially homeland defense. Each of the CINCs now has a joint inter-agency coordination group with his command element, which is developing in the inter-agency world what we have developed over the last 15 years in the joint world, meaning the trust, the understanding of the standing operating procedures of the groups, so that we are working together homogeneously across that spectrum.

With regard to homeland security itself, the recommendation from the Joint Chiefs to the Secretary that we stand up the Homeland Security Command now——

Senator WARNER. I am fully aware of that. As I looked through and listened carefully, I did not hear anyone mention homeland de-

fense. Now, maybe I missed it, but I listened carefully. I suspect it is in these documents and I will refer to it. But my time is up, Mr. Chairman, and I do not want to encroach on others.

Chairman LEVIN. Thank you, Senator Warner.

Senator Reed.

Senator REED. Thank you very much, Mr. Chairman. I appreciate it.

Welcome, gentlemen. I particularly want to welcome Arthur Cebrowski, who was in Newport at the Naval War College. Good to see you again, Admiral Cebrowski.

Admiral CEBROWSKI. Thank you, sir.

Senator REED. Mr. Secretary, a lot has been said about the new thinking, spiral development and capabilities-based development. But I am tempted to think this might just be new buzzwords, not new thinking. With respect to spiral development, we have in the past developed systems and then fully anticipated those systems would be improved as they were in the field.

Can you, for example, describe the difference between a block buy for an F–16, for example, and spiral development? Is there anything different there?

Mr. WOLFOWITZ. I will ask General Pace to help me on this also, but I think it is more in the degree of formality in the process in moving forward. Obviously, as you point out correctly, with the F–16 we have done what is in effect a spiral development. But I think there was a tendency at each step along the way to figure out what was the maximum technology we wanted and then put that on, whereas I think the thought with spiral development is to recognize that getting something out in the field quickly with less than perfect capability may be much better than increasing your requirements and thereby slowing down and increasing the cost of first fielding systems.

The F–16 has been around a long time and those changes have come gradually over time. I think the approach that Secretary Aldridge has in mind, for example, with the Joint Strike Fighter, would get systems out into the field more quickly, recognizing that as they are fielded, as we gain experience with them, we will have a much better idea what the requirements will be.

You have a fair point, that it is not a completely unknown process in the past. But what we are trying to do is to recognize it more specifically and try to have people ask consciously why are you not doing it that way.

Admiral CEBROWSKI. If I could, sir.

Senator REED. Sure.

Admiral CEBROWSKI. In spiral development or adaptive acquisition, the difference is toward the front end. The useful metric is capability cycle time. Right now the capability cycle time of the Department of Defense is considerably larger, perhaps two to ten times larger, than that of the commercial world. So we should be making efforts to move that forward.

What Under Secretary Aldridge talks about when he talks about spiral development is how we reduce that cycle time. So it is, rather than waiting until you have 100 percent of the requirement satisfied and you have suppressed all of the technical risk—that frequently results in your first article not appearing in the forces for

10 to 20 years—is to go ahead and start well short, if need be, of the requirement to put some things in the field, to start production.

Then in the process what happens is, because you have articles in the field sooner, you are getting concept development sooner and any appropriate organizational changes and doctrine much sooner. So it is a way of pulling things forward rather than a way of dealing with things once they are already in the field.

Senator REED. One other way to look at this—and Secretary Wolfowitz alluded to it when he said that there seems to be less formality in the spiral development—but that might also be described as not having the same type of very specific, well defined requirements that one can measure progress against and one can measure cost against. Is that a danger with this spiral development approach?

Admiral CEBROWSKI. Actually I would say, Senator, that it is laudable, because with the spiral approach we seek to have upstream influence on the national security environment. That is, upstream influence on the market, create a market by virtue of the fact that we are moving into it more quickly. It is more of a venture capital approach than it is an investment banker approach to acquiring systems. So the risk moves to different areas in this, and of course, because it is new, it will certainly have the appearance of being more messy.

Senator REED. Well, let me go to another aspect of this. I find this topic goes quite a bit beyond simply what systems we are going to buy and how we are going to buy them. When we emphasize the capabilities approach, which ties in, I think, to the spiral development, one of the dangers I see is that you do not consciously, or at least as we did in the past, integrate specific threats. There is a real danger, I think, out there of saying, listen, we have to build whatever we can build because some day we will need that capability, which makes it very hard then to come to decisions about budgets, about specific systems, about many other things. There is a limited amount of resources we can devote, even in this time of great danger to the country.

Without, I think, this touchstone of what is the real threat, we could go about building all sorts of systems, some of which we would never use, some of which we may use, some of which are always good to have. Frankly, the appetite of the Department of Defense for systems and building things, because of the nature of the business that you are in, is rather substantial.

How do we make those—and this is my final question because my time has run out. How do we anchor our decisions about what we are buying and building to the real world, which I would say comes to what the real threats we face now and project in the future?

General KERNAN. Senator, let me try to tackle that. You are absolutely right, the intellectual change has to drive the physical change and it has to be a relevant capability. We have moved toward a capabilities-based strategy in conjunction with the combatant commanders and the Office of the Secretary of Defense (OSD). We will do the strategy to task analysis, we will do the joint mission area analysis and determine precisely what is required in the region in the way of capability.

We will, obviously, then have to prioritize where we have deficiencies and work through those. But this is a very thoughtful process, and it is blast off at the Joint Requirements Oversight Council. It is also done in partnership with the combatant commanders, who are the employers of these forces, as well as the services which provide this force. So it is a very thoughtful process.

Senator REED. Thank you very much. It is nice to know that you are all investment bankers now.

Admiral CEBROWSKI. No, no. Venture capitalists.

Senator REED. They work together, I am told.

Thank you.

Chairman LEVIN. Given the recent condition of the stock market, I am not so sure that you are moving in the right direction. But nonetheless, Senator Sessions.

Senator SESSIONS. Thank you, Mr. Chairman.

Transformation is an important subject. I am glad we are having a hearing on it. There is this constant tension between those who committed many, many years to new programs and systems they believe deeply in and then the world we have changes and we have to say no to some of those. Maybe they were a good idea in 1980 when they came up, but maybe they are not a good idea today.

I think one thing we can see from this war in Afghanistan is we are transforming. Militaries around the world have been traditionally criticized and many wars have been lost simply because they fought the last war, they made no changes whatsoever in tactics, equipment, or doctrine during that period of time. Our military, more than any military I believe has ever existed, is challenging itself, bringing forth new weapons systems, new technologies, and actually employing them in a way that works.

The sergeant on the ground can call in the Air Force. That is a very significant thing and I think we should celebrate that. But that is not there yet. We have a $380 billion, $379 billion defense budget. Can we innovate more? Can we use more of that money effectively to integrate new capabilities and systems to be even more effective than we are today? I believe we can, and I salute you for moving in that direction.

I have saluted Secretary Rumsfeld from the day he came here as a person committed to transformation. I salute President Bush. He used the words "agile, lethal, readily deployable" at the Citadel, which reminds me of Coach Eddie Robinson talking about his defense department, the winningest coach in football history. He wanted a defense department that was agile, mobile, and hostile. That is pretty close to what we need.

So I think that is the right direction. I salute you for moving in that direction. I believe Congress has to support you in that and I want to do that.

This cycle time question, I believe Senator Reed asked about it. I just visited a Honda Motor Company plant in Alabama. There was a field there 2 years ago. Today they are rolling out brand new automobiles, in 2 years from ground to new automobiles. They pour the block, they build the entire automobile there.

Secretary Wolfowitz, do we not need to make some historic leaps forward in our ability to bring on new systems, and would that not save us money if we could?

Secretary WOLFOWITZ. Absolutely, yes, Senator. We need also to work very hard at transforming the way we do our basic business. We have to, particularly in this era when we are looking for more and more highly trained, educated people in our military, we have to be really rigorous about what functions are truly military functions and what functions we can afford to contract out to more appropriate civilian operations.

As you said in your question, we have to figure out how to bring systems on line faster. Part of that is what Admiral Cebrowski addressed in the context of spiral development. When it takes us 10 or 20 years to bring on a major weapons system, that is not a way to transform. That is a way to impose a kind of unilateral disarmament on this country, and we have to get out of that.

Senator SESSIONS. Thank you. I believe it is a critical thing. This Congress needs to confront it and figure out how we can help you be more capable in doing that. Many of the delays are because of procedures set in law. I know that to be a fact.

Admiral Cebrowski, do you want to comment on that, what we can actually do to bring these systems on sooner?

Admiral CEBROWSKI. I think the discussion about spiral development points to that. I think that this is tightly involved in our culture, which has developed over the last 50 years, focused on cost-benefit analysis and optimization, risk reduction. What has happened is we have become so focused on one particular area of risk that we have lost sight of the fact that risk is going out of balance.

While a 16- or 20-year program might do well in suppressing technical risk, it aggravates all of the other areas of risk, on which we had not been focused. So we need to refocus on some of those other aspects to do that.

I do think it is possible to bring on board very, very quickly sharp changes in our capabilities. Broadening our capabilities base is very important. I think the example of the high-speed transport is illustrative here. This did not exist as a program in any of the services, certainly not in the Navy where I was involved with it. But it became clear that this was the broad thrust of technology and of the marketplace, and so we went out and we just leased one and we put it in the hands of the operators.

Until we did that, the institutional Navy had no interest in this. But once they got their hands on it, it fired their imagination and they wanted to get on with it. People who objected to it after being on board for only 10 minutes wanted to take charge of it. It was a marvelous thing. Now we see that that experimental article is on its way to Central Command, where it will be used to support the U.S. Army.

All this happens in less than 2 years. So this kind of change does not have to take 16 years. From the first time that we started negotiating the lease until potential combat operations for a new capability, entirely new capability, less than 2 years. So its existence is proof that it can be done.

It shows up again and again in our history. For example, go-ahead for the Polaris missile program was in November of 1956. Just 48 months later, U.S.S. *George Washington,* the first Polaris missile submarine, goes out on its first patrol—4 years, something of the same degree of technical difficulty as going to the moon.

We can do this. It is a matter of courage and commitment to do it, and it takes a team effort. The four of us here at the table cannot do it alone. We need a lot of help and encouragement from Congress in that, and we certainly appreciate it.

Senator SESSIONS. You do need congressional support and it will not only bring the system on sooner, but save a lot of money, I believe, in the process of building it. These delays cannot do anything but run up costs.

Thank you, Mr. Chairman, for what you are doing and I appreciate the services. I do believe the weapons like the JDAM are critical and we need to make sure that our systems, production systems, are bringing them on soon enough.

Chairman LEVIN. Thank you, Senator Sessions.

Senator Bill Nelson.

Senator BILL NELSON. Thank you, Mr. Chairman.

Mr. Secretary, I want to compliment you and your team on the ways you are transforming the military, particularly what has been represented in the very successful military operations in Afghanistan. I have just returned from a second trip there in 3 months and I find the troops continue to be pumped. They know their cause is just. You are giving them the tools that they need to be successful. They are absolutely intent on prevailing.

There is one hiccup that I noted and that is the issue of hot pursuit in an operation such as Anaconda, where some of the enemy got away. It is like the old days of in the 1920s, Bonnie and Clyde robbing the bank and racing for the state line, where the local sheriff and the state police cannot cross the line. This was a concern that was expressed to us, and in our congressional delegation there at Bagram Airfield I raised this particular issue.

From there we went on to meet with President Musharraf in Islamabad and I raised the issue with him, and he did not say no. Upon my return, I have been somewhat perplexed to see contradictory comments being made in the press by both Musharraf and some of our leadership. However, I full well recognize that this is a matter of the most extreme delicacy, given all of the political sensitivities in that part of the world.

So if you cannot or do not want to address it directly, which I would certainly understand, I clearly want to give my encouragement to you to work it out with Pakistan. This is a part of the terrain that in some places are only goat trails going from one country to the other across those rugged mountains. But we have to be able to pursue them into that territory despite a political boundary.

Secretary WOLFOWITZ. Senator, with your agreement I would prefer to actually get into the details with you in private. But I think I can say confidently that we have had excellent cooperation from President Musharraf and from the Pakistanis. They do a terrific job on their side of the border. There are, as you correctly noted, these potential seams, but I think it is satisfactory and, for the reasons you properly noted, probably the less we say about it here in a public session the better.

You gave me an opportunity, though, if I might, to point out that what General Franks and his people did in responding so quickly is truly remarkable, for an organization that is sometimes accused of being ponderous and slow. People comment on how long we built

up in the Persian Gulf. Just think about these dates: General Franks got his orders to plan for operations in Afghanistan on September 20. That is 9 days after the attack on the World Trade Center and the Pentagon. There was no plan on the shelf.

Senator Reed, I am sure you would agree with me that if we had come up here saying we needed extra money because of a threat in Afghanistan, we would have thought we were silly and you probably would have also. It hit us brand new. The operations began barely 2 weeks later on October 7, and within 12 days of the start, on October 19, we had Special Operations Forces on the ground in the north with General Dostum.

I have to tell you, at the time it seemed like an eternity and I remember how impatient Secretary Rumsfeld was to get those guys in. When you actually look at the dates, it is amazing how fast we moved, and I think it is a tribute to the way in which our military has changed, has recognized what it can accomplish, and it is a tribute to Central Command and their planning capability.

Senator BILL NELSON. It is a tribute to other agencies of the government as well.

Secretary WOLFOWITZ. That is correct, yes, sir.

Senator BILL NELSON. Could you give us a report on the commander in chief down in SOUTHCOM? What is your plan for getting a four-star general in there?

Secretary WOLFOWITZ. We recognize it as an extremely important job. Secretary Rumsfeld has been spending literally hours over the last month or two in looking at all the senior commands that have to be filled and that is clearly one of the very important ones. I am sure we are going to have a very high quality person to recommend shortly.

Senator BILL NELSON. Well, there is a fellow seated to your right that can tell you a lot about that command and about the need for someone that has all those silver stars like his on his shoulder.

Secretary WOLFOWITZ. It may not surprise you to know that he has told me that several times already, Senator.

Senator BILL NELSON. I thought he had.

Thank you, Mr. Chairman.

Chairman LEVIN. Thank you, Senator Nelson.

Senator Bunning.

Senator BUNNING. Thank you, Mr. Chairman.

Secretary Wolfowitz, given our current commitments, such as Kosovo, Bosnia, homeland defense, Afghanistan, possible future operations in other countries that need not be named, and our extensive use of Reserves even before the global terrorism began, at what point will the Department of Defense consider a comprehensive increase in force structure?

Secretary WOLFOWITZ. Senator, each of the services has come forward to Secretary Rumsfeld with proposals for increasing end strength. The Secretary's reaction has been not to deny that there are new requirements—there obviously are a lot of new requirements—but to say that before we make that considerable investment and long-term commitment to increasing our force structure, let us make sure that, in addition to having new requirements, that there are not some old requirements that we could shed and that we have really looked and scrubbed thoroughly to make sure

that we are not doing things that we should have stopped doing a long time ago.

I think that process is underway right now and I think each of the services is taking a very hard look at where in fact they might reduce some of their personnel requirements, because it is very obvious that there are new ones that have to be added.

Senator BUNNING. You said reduce?

Secretary WOLFOWITZ. In some areas. It is well known that, for example, the Secretary has been trying for a long time to reduce our level of forces committed to the Sinai. Obviously, people say this is a bad time to do that, but that would be an example.

Senator BUNNING. In other words, you are talking more about moving personnel?

Secretary WOLFOWITZ. Well, also freeing up people from old jobs that do not need to be done anymore, so that we have the people available within our current force structure to meet those new requirements. It is only after we go through that very careful scrub that we would want to do the fairly expensive decision to add force structure.

Senator BUNNING. Well, I think your report and all the studying that you have done should have taken that into consideration a little more on top, rather than as an afterthought.

I want to get back to what Senator Reed was talking about, because I think he hit the nail on the head. The budget that you have sent up here takes care of legacy defenses more than anything else. Not much change. You are paying a lot more dollars for a lot more weapons systems. You also are spending certain amounts of money for old weapons systems that do not seem to work very well.

I bring the V–22 Osprey up as one that you have not been able to get on line. How long ago did you start that program? Not you, but the Department of Defense.

Secretary WOLFOWITZ. It started about 10 or 15 years ago, Senator.

Senator BUNNING. Do you not think you ought to have it worked out by now?

Secretary WOLFOWITZ. It is a revolutionary technology. It has encountered some serious difficulties.

Senator BUNNING. We are spending 1 point what billion in the current budget that you requested? Almost $1.5, not quite $1.5 billion?

Secretary WOLFOWITZ. We also are undertaking a very intense review of whether it can in fact meet its technical goals.

Senator BUNNING. But we also ordered 11 more, did we not?

Secretary WOLFOWITZ. That is basically to sustain a viable production base in case we do decide to go ahead with it.

Senator BUNNING. If you decide that, after all the studying and things, it is a waste, will you pull the plug or will you not?

Secretary WOLFOWITZ. Certainly if it is a waste, if it is a system that cannot work, then we will, and then we will have to look at an alternative for accomplishing that mission. It would be an alternative that will be less transformational technologically, but more reliable, more dependable.

Senator BUNNING. I think, in looking at your proposed budget for the year 2003, that more emphasis should have gone into, rather

than traditional legacy operations—I know we are fighting a war, so I know that takes precedence and we have to have the supplies and the technology and everything that our fighting people need in the field. But if we are going to upgrade the Department of Defense in an effective manner, we have to get very forward-thinking, in not 10-year periods, but 1 or 2 or 3-year periods.

If you are talking about getting something operational in 15–plus years, that is unacceptable. I will not accept that and I do not think too many people on this committee will accept the fact that we have been trying to make operational a weapons system that we have been dealing with for over 15 years. We cannot afford to do that.

So if we are going to look at a $370 billion-plus budget, I expect you and everybody in your Department to be a little more forward-thinking, and I mean not 10 years forward-thinking. Just looking at the request for the Navy, is that forward-thinking, four ships? We do not even get the 10, which is what is supposed to be the minimum that we are building.

Secretary WOLFOWITZ. As I mentioned in my testimony, we have about $21 billion invested in this year's budget in transformational programs. That is a very substantial amount. At the same time, this budget has to cover large increases for health care and retirement, large increases for pay raises, large increases to cover the costs of the war.

Senator BUNNING. We understand.

Secretary WOLFOWITZ. I think there is a lot of new investment here.

Senator BUNNING. We voted for those things. We understand that cost.

Secretary WOLFOWITZ. The Navy made some decisions about where its priorities were in light of the fact that our current fleet is relatively young, relatively new. There is a lot of money in the Navy budget, for example, for a brand new capability which will be converting Trident submarines into cruise missile carriers. I think the Navy has tried to strike a balance between near-term versus long-term shipbuilding needs and near-term versus long-term readiness needs.

Every place in this budget you will find difficult decisions have to be made and difficult tradeoffs have to be made. I think the services and we and OSD have done a very good job of making those balances.

I would point out that Vice President Cheney, when he was Secretary of Defense, tried to cancel the V–22 program. Congress in its wisdom made us go ahead with it. We now have some 10 years of investment in trying to get that capability to work, and I think it is prudent to continue at least until we are sure whether it works or not, and at that point we will have to make a very clear decision.

Senator BUNNING. Thank you.

My time has expired, but I would like to just add that we want to spend the $370 billion on defense, but you are going to have to sell it. You are going to have to sell it to the rest of the Congress of the United States. This committee supports you, but it is a tough sell right now.

Chairman LEVIN. Thank you, Senator Bunning.

Senator Akaka.

Senator AKAKA. Thank you very much, Mr. Chairman.

I, too, want to add my welcome to the Secretary and his team this morning. My questions will dwell around definitions of budget, financial management, oversight, and measurement for readiness. I also was interested in the statement by the Secretary that transformation can mean using old things in new ways. My question to you has to do with your very strict definition of transformation.

You also discuss other items in the fiscal year 2003 budget request that are considered by the Department to be transformational, but do not meet that strict definition, including funding for precision-guided missiles, C–17s, and F–22s. Do you have a total figure at least for the fiscal year 2003 budget request for the programs that contribute to the Department's process of transformation?

Secretary WOLFOWITZ. As I said in the testimony, in the strictly transformational category it is about $21 billion in 2003 and $136 billion over the whole FYDP. In the transformation-supporting category, it is roughly equal numbers.

Senator AKAKA. Mr. Secretary, you have discussed the Department's intent to invest more than $136 billion in transformational technologies and systems over the next 5 years, with $76 billion representing new investments, to accelerate or start new transformation programs. The Readiness and Management Support Subcommittee has held a hearing on financial management, as well as a hearing on acquisition reform. I am concerned about the Department's inability to properly account for all of its funding and have held a hearing on that.

With respect to the proposed investment in acceleration or beginning of transformation programs, what kind of oversight does the Department intend to implement regarding these developing technologies to ensure that the appropriate progress is being made in a manner consistent with the goals of the transformation process?

Secretary WOLFOWITZ. By the way, Senator, on your previous question, on page 7 of the prepared testimony I have both of those figures. In the strict transformation category it is the $21 billion in fiscal year 2003 and the $136 billion over the course of the FYDP. In the transformation-supporting category, the next paragraph, it is $25 billion in fiscal year 2003 and $144 billion over the FYDP.

On your question about financial management, we agree very strongly with you that that is a problem area that has to be addressed on an urgent basis. Under Secretary-Comptroller Zakheim is undertaking a whole effort to restructure the way we do our financial accounting systems. I think we made some significant progress in reducing this enormous and embarrassing backlog of accounts that we have had difficulty keeping track of, and we are looking at ways to introduce new technologies so that we are operating off of a single enterprise system and we can keep track of what we are doing in a way that is essential if we are going to transform.

I know the efforts that you have made to encourage that work and we look forward to working with you on it.

Senator AKAKA. Thank you for mentioning that. This has been a problem that we have been trying to resolve and I am glad that we are making a move on this.

General Pace, I have heard you as well as the Secretary mention the need for intergovernmental and inter-agency meetings of the mind. One of the keys to the United States' success in Operation Enduring Freedom has been the seamless joint effort between the United States and its coalition members. You have testified about joint operational concepts and architectures and the necessity of forces operating in coalitions.

What are the clearly defined goals regarding joint operations in the process of transformation? How do you plan to measure the readiness of troops to engage in these joint operations?

General PACE. Senator, first with regard to your comment about the mindset, I would say that the ability to experiment, the opportunity to experiment and fail, has been key to the progress we have made so far in the war in Afghanistan, and I would say that that will be a key in the future.

I mentioned in other forums, I think, that one of the main strengths Secretary Rumsfeld brings with him is the fact that he has a background which makes him comfortable with experimental failure, knowing that as we try we will find those leap-ahead opportunities that only experimentation can foster. That is one of the things that General Kernan's folks do very well.

With regard to the Joint Requirements Oversight Council, as our country looks out and as we are given our defense planning guidance from the Secretary for the types of capabilities that we want to be able to develop and apply worldwide, transformation can have a thread through all of that. What capability do you want to apply, in what time frame? You can then take current force and forward-base it or you can have forward access, allowing you to move your forces forward from the States, or you can have forward presence in the form of naval forces, or, as I mentioned, you can just straight deploy from the United States to the combat area depending upon the time lines involved.

The transformation part goes to the things Admiral Cebrowski was talking about. You might want to build more airplanes or you might want to build a 50-, 60-, or 70-knot ship that allows you to close that time line.

So as we look at the umbrella requirements and capability requirements of the things we want to be able to do on foreign battlefields and the umbrella operational concepts that tell us how we can apply to resources to provide those capabilities, we can then mix and match based on experimentation and experience whether we are going to move the assets we currently have more effectively or if we need to in fact seek a new solution, either in the way that we apply them or in the way that we build them.

I am not sure that that answers your question completely, sir.

General KERNAN. Can I just add onto that, Senator? The analytical piece of experimentation is extremely important and we recognize that. We have to take away as much subjectivity in our analysis as possible. We are baselining ourselves continually and applying metrics, so when we go and do an experiment we use the in-

strumentation or some prescribed methods to ascertain whether or not this is truly value added.

For instance, one of the things we are doing right now—because there is a tremendous emphasis on command, control, communications, and computers and downlinking and all the collaborative tools necessary to conduct distributed operations—is continually measuring bandwidth and seeing how we can maximize the use of that bandwidth, and also recognize when we are in surge capacity and what the impact may be on other people's operations during that period of time.

So this is a very deliberate process. We have an assessment and analysis branch put together, and as we move more toward the integration of the instrumentation in the western training areas I think we are going to get even more precise in our analytical skills.

Senator AKAKA. Thank you very much, Mr. Chairman.

Chairman LEVIN. Thank you very much, Senator Akaka.

Just before I call on Senator Nelson, would you complete for the record, Secretary Wolfowitz, your answer to Senator Akaka relative to the investments that you are making in transformation this year, next year, both directly and in support of tranformation? You have numbers in your testimony, you have given numbers here. Would you supply for the record the list of the programs which make up those numbers both this year, next year, and for the next 5 years? Would you give us your definition as well for the record of what constitutes transformation? Thank you.

[The information referred to follows:]

INVESTMENTS RELATIVE TO TRANSFORMATION

Transformation is a process or plan aimed at reducing future security risks to America. Transformation will enable the Department of Defense (DOD) to counter 21st century threats more effectively. It is fundamentally about redefining war on U.S. terms by harnessing an ongoing revolution in military affairs. Working with U.S. allies and friends, transformation seeks to shape the changing nature of military competition and cooperation. It uses new combinations of operational concepts and capabilities, imaginative application of old and new technologies, and new forms of organization. It seeks to exploit America's advantages and protect our vulnerabilities. The goal is to strengthen our Nation's strategic position, which helps underpin peace and stability in the world.

Transformation is likely to result in fundamental changes in military operations and, over time, a rebalancing of the U.S. portfolio of capabilities and forces. For example, the portfolio of capabilities will shift between manned and unmanned systems, short- and long-range systems, stealthy and non-stealthy systems, and unprotected and hardened systems.

The President's fiscal year 2003 budget included $21 billion in transformation funding, as determined by DOD leaders. The budget was based on plans that project transformation funding to total $136.6 billion for fiscal year 2003–2007.

Enclosed is a list of the programs DOD leaders identified as likely to provide new kinds of military capabilities to the force and their funding projected for fiscal year 2003–fiscal year 2007. This list will change as DOD leaders learn more about the direction that transformation will take and the technologies that will be needed to support the transformation of the force. Some of this transformation funding spans two or more program elements or is subsumed within larger programs.

Transformation Funding - FY 2003-2007 Future Years Defense Program
($ Millions)

	FY 03	FY 04	FY 05	FY 06	FY 07	FYDP
Protecting Bases of Operations	7,699	8,581	9,138	9,236	11,118	45,773
Conducting Information Operations	174	118	125	126	230	773
Projecting and Sustaining U.S. Forces	7,425	8,530	10,000	11,875	15,193	53,022
Denying Enemy Sanctuary	3,166	3,458	3,495	3,209	3,572	16,899
Conducting Space Operations	156	246	295	364	466	1,526
Leveraging Information Technology	2,480	3,342	4,088	4,198	4,456	18,565
Transformation Total	**21,100**	**24,274**	**27,141**	**29,007**	**35,037**	**136,560**

Protecting Bases of Operation

($ Millions)

SVC	Program	FY 03	FY 04	FY 05	FY 06	FY 07	FYDP
MDA	MDA (GMD / SBL / ABL / SBIRS-Low)	6,691	7,264	7,950	7,929	8,738	38,571
MDA	Army (PAC 3 / MEADS)	976	1,221	991	914	903	5,005
MDA	AF (ABL)	0	0	100	300	1,400	1,800
	MDA Sub-total	7,667	8,485	9,041	9,143	11,040	45,376
Army	Mobile Tactical High-Energy Laser	4	40	40	25	10	118
Army	JLENS	29	57	57	68	68	279
	Army Sub-total	33	96	97	93	78	397
	Transformation Total	7,699	8,581	9,138	9,236	11,118	45,773

Conducting Information Operations

($ Millions)

SVC	Program	FY 03	FY 04	FY 05	FY 06	FY 07	FYDP
	Air Operations Center	37	4	4	4	2	51
	Automated ISR	136	114	121	122	228	722
	AF Sub-total	174	118	125	126	230	773
	Transformation Total	174	118	125	126	230	773

Projecting and Sustaining U.S. Forces

($ Millions)

SVC	Program	FY 03	FY 04	FY 05	FY 06	FY 07	FYDP
AF	MC2C	191	402	514	730	646	2,483
AF	Long-Range Strike Aircraft (LRSA-X)	0	28	28	28	28	112
AF	LAIRCM	105	110	197	245	293	949
AF	Expanded/Upgraded GPS	756	711	857	866	859	4049
AF	CV-22	124	319	393	364	322	1,522
	AF Sub-total	1,175	1,570	1,989	2,232	2,147	9,114
Army	Interim Armored Vehicle	936	1,024	833	765	817	4,375
Army	COMANCHE	956	1,080	1,497	1,572	2,659	7,763
Army	FUTURE COMBAT SYSTEM (FCS)	185	516	885	1,786	2,033	5,405
Army	Hypervelocity Missile	83	99	101	59	50	391
Army	Countermine Programs	79	59	45	51	48	282
Army	Army Experiments and Demos	179	208	204	246	248	1,085
Army	Transformational S&T	607	586	570	602	625	2,989
	Army Sub-total	3,024	3,573	4,135	5,081	6,479	22,291
DoN	Advanced Amphibious Assault Vehicle (AAAV)	287	362	400	380	623	2,052
DoN	Advanced Deployable System (ADS)	36	24	103	133	165	461
DoN	MCM UUVs	76	68	71	104	164	483
DoN	Advanced Hull Forms	3	5	11	15	19	53
DoN	EOD UUV	0	0	3	20	17	40
DoN	Maritime Prepositioning Force - Future	10	15	10	10	708	753
DoN	Assault Breaching System (ABS)	5	5	10	20	30	70
DoN	E-2 RMP (radar only)	169	224	238	222	122	975
DoN	Joint Strike Fighter (STOVL only)	968	1,082	1,444	1,876	2,271	7,641
DoN	MV-22	1,526	1,473	1,439	1,655	2,188	8,281
DoN	Organic Mine Countermeasures	146	129	147	127	259	808
	DoN Sub-total	3,226	3,387	3,876	4,562	6,566	21,617
	Transformation Total	7,425	8,530	10,000	11,875	15,193	53,022

Denying Enemy Sanctuary

($ Millions)

SVC	Program	FY 03	FY 04	FY 05	FY 06	FY 07	FYDP
AF	X-45 UCAV	40	180	430	480	316	1,446
AF	Small Diameter Bomb (SDB)	54	80	89	158	318	699
AF	Global Hawk	412	586	563	538	1,046	3,145
AF	JSTARS	359	173	345	426	431	1,735
AF	Space-Based Radar	91	285	364	479	517	1,736
	AF Sub-total	956	1,303	1,792	2,081	2,628	8,760
Army	ATACMS	250	333	308	307	340	1,537
Army	Tactical UAVs	146	160	118	234	230	887
Army	Guided MLRS	56	85	103	99	89	433
Army	Long Range Advanced Scout Surv System	50	51	51	43	2	197
Army	Excalibur/Advanced Munitions	109	127	100	58	52	446
Army	Aerial Common Sensor	0	0	0	0	89	89
	Army Sub-total	611	756	680	742	802	3,591
DoN	SSGN	1,018	981	635	182	0	2,816
DoN	DD(X) Technologies	342	234	192	92	80	940
DoN	UAVs	208	143	156	102	62	672
DoN	TACMS-P	30	40	40	10	0	120
	DoN Sub-total	1,598	1,398	1,023	386	142	4,548
	Transformation Total	3,166	3,458	3,495	3,209	3,572	16,899

Conducting Space Operations
($ Millions)

SVC	Program	FY 03	FY 04	FY 05	FY 06	FY 07	FYDP
AF	Common Aero Vehicle (CAV)	0	0	0	34	100	134
AF	Space Control Systems	88	173	220	250	287	1,018
AF	Directed Energy Technology	68	73	75	80	81	376
	AF Sub-total	156	246	295	364	468	1,528
	Transformation Total	156	246	295	364	468	1,528

Leveraging Information Technology
($ Millions)

SVC	Program	FY 03	FY 04	FY 05	FY 06	FY 07	FYDP
AF	Link 16	243	261	734	834	779	2,850
AF	Advanced EHF	920	1,008	538	217	160	2,843
AF	Laser Communication Terminal	3	10	27	40	20	100
AF	NSSS-Polar MILSATCOM	20	81	221	200	125	646
AF	Advanced Wideband System	200	450	470	523	903	2,545
AF	Joint Tactical Radio System (JTRS)	17	13	54	235	566	885
	Air Force Sub-total	1,403	1,822	2,044	2,048	2,552	9,870
Army	WIN-T	61	44	125	176	131	535
Army	Network-Centric Information Warfare	88	82	87	98	107	462
Army	Joint Tactical Radio System (JTRS)	129	113	189	198	172	801
Army	Soldier Mod/ Land Warrior	77	147	153	177	178	732
	Army Sub-total	355	386	554	647	588	2,530
DoN	Cooperative Engagement Capability (CEC)	153	137	165	119	101	675
DoN	Naval Fires Network (NFN)	35	35	50	50	50	220
DoN	Deployable Joint Command & Control (DJC2)	40	130	80	75	70	395
DoN	MIDS / Link 16	65	50	47	43	47	252
DoN	MUOS	131	327	781	730	614	2,583
DoN	Transformational Comms	193	251	132	255	214	1,045
DoN	Common Aviation Command & Control System (CAC2S)	64	60	64	56	71	315
DoN	Unit Operations Center (UOC)	26	41	46	53	51	217
DoN	Joint Tactical Radio System (JTRS)	15	103	125	122	98	463
	DoN Sub-total	722	1,134	1,490	1,503	1,316	6,165
	Transformation Total	2,480	3,342	4,088	4,198	4,456	18,565

TRANSFORMATIONAL SYSTEMS

PROTECTING BASES OF OPERATION

Missile Defense Agency

Ground-based Missile Defense (GMD)
A program to defend the U.S. homeland against ballistic missile attack.

Space Based Laser (SBL)
Concept development for a space satellite-based laser system that would destroy enemy ballistic missiles during their initial powered ("boost") phase of flight while over the enemy's territory. The current program was transferred from the Air Force to DoD's Missile Defense Agency in FY 2002. Currently, the program is developing critical technologies and reducing technological risk factors. An entirely new technology; there are no existing operational, long range airborne or space-based laser weapons systems.

Space Based Infrared Radar System Low (SBIRS-Low)
First-of-a-kind satellite system, consisting of many, cross-linked satellites in low-earth orbits. Potential applications include support of ballistic missile defense, by providing mid-course tracking and limited discrimination capabilities, and space surveillance for space control.

Patriot Anti-Tactical Ballistic Missile (PAC-3)
PAC-3 consists of major upgrades to the Patriot's radar, launcher, and other system elements so that the system can kill both maneuvering and non-maneuvering tactical ballistic missiles (TBM) as well as advanced cruise missiles and aircraft. This provides a degree of force protection - especially against TBMs - that was unobtainable previously.

Medium Extended Air Defense System (MEADS)
This program will develop an air and missile defense system that is tactically mobile and transportable. This system will provide 360° defense protection against short range tactical ballistic missiles, cruise missiles, and unmanned aerial vehicles.

Airborne Laser (ABL)
Demonstration phase for an aircraft-based directed-energy weapon system. The initial system is being installed on a large, 747-type aircraft and is planned for an

initial demonstration shot against a ballistic missile in late CY 2003. If successful, a test aircraft could be able to provide some operational capability as early as CY 2005. Consideration is being given to deploying ABL weapons on unmanned aerial vehicles and space platforms, enabling worldwide operations on very short notice. ABL also will contribute to surveillance needs through its inherent combat identification capabilities. ABL and SBL can be expected to contribute to deterrence of adversary use of WMD as well. Aircraft-based ABLs are expected to engage enemy missiles over their territory, reducing risks to friendly interests.

Department of the Army

Mobile Tactical High Energy Laser
The Mobile Tactical High Energy Laser uses high-energy laser beams to shoot down enemy rockets, missiles and artillery. The system has been demonstrated in Israel against multiple missiles and has potential future development against aircraft, cruise missiles, and artillery. This capability would provide a virtual shield for our soldiers against incoming missiles and artillery rounds, the number one killer on the battlefield, and constitute a dramatic breakthrough in force protection.

Joint Land Attack Cruise Missile Defense Elevated Netted Sensors Systems (JLENS)
JLENS is an elevated, long endurance sensor system that provides over-the-horizon detection of very low flying, small signature land-attack cruise missiles for point defense of critical areas - a capability previously unavailable. It also provides detection and tracking of surface units, inputs digital data to the Single Integrated Air Picture (SIAP) and air defense weapons such as Patriot, and can be employed for both Homeland Defense missions and theater operations.

CONDUCTING INFORMATION OPERATIONS

Department of the Air Force

Air Operations Center (AOC)
Air Force Air Operations Centers are ground command sites that implement command and control of the air campaign. The Air Force has undertaken an initiative to upgrade the Air Operations Center concept into a "Weapon System," improving equipment and enhancing the personnel training process to enhance command and control capability. New AOC capability will integrate data arriving from all air and space forces to provide the commander a clear, coherent, real-time picture of the air and ground battle area.

Automated Intelligence, Surveillance, and Reconnaissance (ISR)
Fields the Distributed Common Ground System (DCGS) to support the employment and exploitation of surveillance operations and integrate intelligence information with U.S. offensive air operations. This system both directs and exploits the gathering of information on enemy activity gained through a wide range of Intelligence, Surveillance, and Reconnaissance (ISR) operations. It takes full advantage of joint service data links such as Link 16 and the Common Data Link (CDL) architecture to automate the exchange of intelligence, targeting, and operational data in support of dynamic combat operations. If successful, this will be the first system to enable the complete integration of real-time air and ground battlefield information for greatly enhanced situational awareness for combat leaders.

PROJECTING AND SUSTAINING U.S. FORCES

Department of the Air Force

Multi-Sensor Command and Control Constellation (MC2C)
Provides horizontal integration of manned and unmanned ground, airborne, and space systems for comprehensive Command, Control, Intelligence, Surveillance, and Reconnaissance (C2ISR) capability. Within the constellation, the Multi-sensor Command and Control Aircraft (MC2A) will be a manned aircraft with advanced sensors for Airborne and Ground Moving Target Indicators (AMTI/GMTI) and battle management tools to support time critical targeting. The Multi-Platform Radar Technology Insertion Program (MP-RTIP) radar included in the program provides GMTI and AMTI for the Cruise Missile Defense (CMD) mission from a single radar. Combining the MC2A advanced sensors and real time battle management on a single platform makes this a transformational capability not available with current ISR platforms.

MC2A is foreseen to replace the capabilities provided by a variety of different, specialized existing aircraft types such as the E-3 Airborne Warning and Control System (AWACS) and Joint Surveillance Target Attack Radar Systems (JSTARS), as well as potentially adding or changing other current functions in other air and ground systems. Further, the Air Force is exploring the potential for some MC2A functions to be conducted on future tanker aircraft—the so-called "smart tanker" concept – with its ongoing KC-X tanker replacement program. This new concept will allow the Air Force to integrate time-sensitive information with combat forces with minimal impact on the tanker's primary mission. Definition of the MC2A concept and development of analysis and acquisition strategies will be taking place during FY 2003.

Long Range Strike Aircraft (LRSA-X)
This long-term technology exploration effort is the first step in the evolution of the next long-range strike vehicle. Current thinking is aimed at creating a system that would deploy in about 2040, potentially replacing much or all of the current bomber force. Options include (but are not limited to) an air breathing, extremely long range cruise missile carrier; a large, supersonic, stealth air vehicle; or a hypersonic, sub-orbital vehicle delivering hypersonic weapons. Such a future long-range strike platform could revolutionize global precision strike through reduction of launch-to-strike times over vastly increased ranges while achieving precise effects.

Large Aircraft Infrared Countermeasures (LAIRCM)
A directed laser energy point defense weapons system that is expected to permit much wider employment of large transport and tanker aircraft into airfields where short-range, infrared-guided missiles are a serious threat today. Equips C-17 & C-130 transports and KC-135 air refueling aircraft with electronic countermeasures and a short range weapon to defeat man-portable infrared (IR) surface-to-air missiles. Unlike current IR defensive systems, which employ flares as decoys, LAIRCM detects and actively "jams" incoming missiles with laser energy.

Expanded/Upgraded Global Positioning System (GPS)
Major increase in capability for GPS, key to worldwide (civil, military, commercial and international) navigation and targeting efficiency. U.S. dependence on GPS and its relatively weak transmission signal makes GPS an attractive target. All transformational strike systems (e.g. Small Diameter Bombs) and most transformational employment concepts (e.g. smaller, more autonomous ground forces) require very precise, continuously available navigation and timing data provided by GPS. Adds six new satellites from 2007 to 2009 with greater signal power for selected anti-jam capabilities.

CV-22
Air Force Special Operations Forces transport aircraft to conduct operations through long-range clandestine infiltration/ exfiltration of special operations forces in denied/sensitive areas. Provides unique capability for conventional horizontal flight and transition to vertical takeoff and landing. Concept fulfills SOF goal to conduct long-range missions (500 miles or more) in a single period of darkness. Program plan includes 50 aircraft by FY 2016.

Department of the Army

Interim Armored Vehicle (IAV)
The IAV is a family of off-the shelf vehicles. IAVs will provide protected, highly mobile transport, and greatly increased lethality to light infantry forces so the Army can rapidly respond to an increased variety of crises with much more inherent survivability and capability than was available with the earlier force mix. The Army will no longer be "too light to survive, too heavy to get there in time". This system is the basis for a new kind of unit for the Army.

Comanche
Comanche is a low observable, next-generation helicopter designed to perform armed reconnaissance and light-attack missions. Its advanced electro-optical sensors and aided target recognition is netted through digitization directly to the shared situational awareness common picture for both targeting and maneuver. Because of its advanced design, it can conduct independent, deep, precision strike missions far behind enemy lines against time-sensitive targets, something no previous attack helicopters could do.

Future Combat System (FCS)
FCS is a family of advanced technology fighting vehicles that constitute the centerpiece of Army transformation. They are being designed as a synergistic force, rather than as a set of stand-alone platforms. The Objective Force, equipped with FCS, will be more deployable, lethal, survivable, agile, responsive, sustainable, and versatile than current forces. Transportable on a C-130, FCS also supports the Army's goal to deliver a division in 120 hours anywhere in the world.

Hypervelocity Missile
These high-velocity, high-mass missiles provide lethal and accurate fires against enemy armor and field fortifications at ranges exceeding tank main gun ranges. With these missiles, lightly armored forces will have the lethality of armor.

Countermine Programs
A variety of programs aimed at providing real-time detection of minefields, including radar, airborne multispectral analysis, and robotics. Collectively, these programs will enable assured and rapid maneuver on the battlefield unfettered by the previous vulnerability to mines.

Army Experiments and Demonstrations
These experiments and models provide critical insights for the rapid development of new systems and the proof of principle for tactics, techniques and procedures for the future forces. Advanced model development of sensors, digitization, and

other critical technology enables the rapid breakthroughs required for the fielding of these systems in the future. Since no model can be assured of capturing every critical element of new technologies, robust experiments using live forces complement the effort.

Transformational Science and Technology (S&T) Efforts
A variety of S&T efforts aim to develop leap ahead technologies for ground combat, communications, aviation and space operations.

Department of the Navy

Advanced Amphibious Assault Vehicle (AAAV)
AAAV is a high water speed, tracked, armored amphibious personnel carrier. Like the V-22, its increased speed, range, and feasibility of employment supports a transformational concept of operations in which their forces maneuver directly from amphibious ships to an objective.

Advanced Deployable System (ADS)
ADS is a passive acoustic undersea surveillance system designed for rapid covert deployment in littoral areas for the detection, classification and tracking of undersea and surface contacts. The use of distributed sensors, as distinct from sensors mounted on the employing platform, is a transformational concept. ADS will provide improved battlespace awareness, potentially over areas not reachable with current systems and at low cost compared to traditional underwater surveillance methods.

Unmanned Underwater Vehicles (UUVs)
The two UUVs currently in development will perform mine countermeasures (MCM) and explosive ordnance disposal (EOD) missions. The MCM mission will be performed by the production of high resolution bottom maps. UUVs can perform this mission in areas currently denied to submarine operations. Longer-term, UUVs will leverage the submarine force by controlling multiple UUVs, so that submarines will be able to perform several missions simultaneously, which cannot be done today.

Advanced Hull Forms for Littoral Combatants
Several programs aimed at developing unconventional or advanced hull forms may provide higher speed, decreased drag, increased survivability and automation, and greater stability in small surface combatants. This effort contributes to the transformation to a network-centric force by potentially increasing the warfighting capabilities of a small littoral combatant ship (LCS), now part of the restructured

DD(X) program's "family" of ships, giving it firepower previously limited to much larger combatants.

Maritime Prepositioning Force – Future (MPF-F)
The current MPF concept requires that MPF ships offload at a port (or in extremis, across a beach), where airlifted personnel join the equipment. MPF – Future would replace current MPF ships with new and innovative ships that use sea areas for maneuver, possibly yielding a capability to receive flown-in personnel and offload equipment at sea This will greatly expand options for employing MPF assets for missions ranging from rapid reinforcement of full-scale conventional combat operations to humanitarian assistance, and including interoperability with existing amphibious shipping. MPF – F will be a new kind of capability, bridging the gap between the current MPF and amphibious ships.

Assault Breaching System (ABS)
ABS is an undefined new kind of system intended to enable opposed amphibious assault operations by efficiently clearing mines in shallow water and the surf zone, which presents the most difficult environmental challenge for neutralizing mines. The only capability the US currently has to do this is very marginal at best, i.e., with manned systems that have a very low clearance rates. Thus, acquiring this capability would overcome a major US weakness.

E-2 Radar Modernization Program (RMP)
RMP provides new technology advances in the existing E-2 airborne warning and control aircraft's surveillance system. RMP has two transformational aspects. It will be interoperable with CEC, allowing shipboard missiles to be fired based information collected by the airborne E-2. RMP will also have a greatly improved capability to detect targets over land (analogous to the Air Force E-8 JSTARS capability), and so will significantly improve the Navy's capability to operate against difficult ground tactical targets.

Joint Strike Fighter, Short takeoff, vertical landing only (JSF STOVL)
The short takeoff, vertical landing version of the JSF will be a high-performance fighter aircraft that does not require large-deck aircraft carriers or full-length runways to operate. As such, it can potentially enable a transformation to more numerous and more widely distributed bases for naval aviation.

MV-22
Traditional USMC amphibious operations involve building up combat power and logistics support on a beachhead, and then moving inland to an objective. The USMC has a transformational concept of operations in which their forces

maneuver directly from amphibious ships to objectives inland. The MV-22 has the speed, range, and payload required to support this new type of operation.

Organic Mine Countermeasures
A family of advanced mine countermeasures systems that are under development. These systems will be employed by forward-deployed naval forces. Collectively they will allow "in-stride" detection and clearance of sea mines in littoral areas weeks or months earlier than can be accomplished today using "special purpose" mine warfare forces that have to be moved to forward areas from the U.S.

DENYING ENEMY SANCTUARY

Department of the Air Force

X-45 Unmanned Combat Aerial Vehicle (UCAV)
The Air Force UCAV program is intended to field a highly survivable, light attack aircraft system that will exploit the design and operational freedoms of relocating the pilot outside of the vehicle while maintaining control by a human operator. The UCAV weapon system transforms warfare by allowing personnel to apply force directly and precisely, in real-time, without entering the threat area or even the theater of operations. The Air Force UCAV design will be focused on performing the demanding suppression/destruction of enemy air defenses (SEAD/DEAD) role at the outset of a conflict when entry into enemy airspace will be most dangerous. UCAV also is expected to have a strike role for use against a wider target set. PB-03 introduces the commitment to field an initial Air Force operational combat squadron. Nearly $1.3B was added to the UCAV program to complete the joint DARPA/USAF System Demonstration Program and to accomplish the initial development effort and to procure the first 14 operational air vehicles for delivery by late FY 2008.

Small Diameter Bomb (SDB)
Develops a 250-pound class guided standoff munition. Permits greatly expanded aircraft loadout and the capability to attack multiple targets per sortie. Uses an Inertial Navigation System aided by the Global Positioning System (GPS) to provide adverse weather targeting capability and accuracy equivalent to the current Joint Direct Attack Munition (JDAM). The initial weapon will be an unpowered, winged glide weapon. Planned follow-on capabilities include a precision seeker and autonomous target acquisition. FY 2003 PB funds engineering and manufacturing development for phase I (fixed target attack) and phase II (vs. mobile/relocatable targets) and initiates phase I low rate initial production (LRIP) in FY 2005. LRIP for phase II is forecast for FY 2008. A

powered system with a loiter capability for sustained target search also is anticipated over the longer term.

Global Hawk
High-endurance, long-range Unmanned Aerial Vehicle (UAV) with imagery and signals intelligence payloads providing persistent, detailed intelligence on opposition forces. Expected to augment and then replace the manned U-2 aircraft, which is limited in numbers. Increased funding adds a fuller range of collection equipment and procures 16 more systems through FY 2007. Enables the complete integration of real-time battlefield information to provide greatly enhanced situational awareness and a clear, coherent, real-time picture of the battle area for commanders.

Joint Surveillance Target Attack Radar System (JSTARS)
Program that employs an advanced, multi-mode radar system to provide sustained, high-resolution, all-weather ground target search and targeting capability. Current application in a modified 707 type large aircraft (designated E-8) is being expanded to include the potential for deployment of advanced Radar Technology Insertion Program (RTIP) capability in smaller aircraft types. Wider application to additional, more affordable aircraft types (RTIP program) is considered Transformational. The Air Force also is currently pursuing modification of JSTARS in upgraded Boeing 767 airframes.

Space-Based Radar
Development of a new space-based capability to detect and track global targets around the clock, without risking personnel, without the need for overflight permission or access. Moves a mission performed in Desert Storm by E-8 JSTARS aircraft and in Afghanistan by Global Hawk and Predator UAVs into space, greatly expanding ISR detection and targeting capabilities. First launch planned in 2010 with an Initial Operational Capability in 2013 of 8 to 12 satellites. Notional full constellation is 21 satellites.

Department of the Army

Army Tactical Missile System (ATACMS)

Brilliant Antitank (ATACMS-BAT)
ATACMS-BAT is a very long-range missile that attacks mobile and stationary targets with precision – a new capability. Fired from any MLRS launch vehicle, similar to GMLRS above, it seeks out armored vehicles using acoustic and millimeter wave sensors and attacks them on their vulnerable top.

Penetrator Missiles (TACMS-P)
A standard- and extended range penetrator version of the Army TACMS missile system, TACMS-P provides a new capability against hardened and deeply buried targets (HDBTs), a category of targets that previously provided sanctuary to enemy forces.

Tactical Unmanned Air Vehicles (TUAV)
TUAVs provide platforms with a multitude of potential packages (sensor, radio relay, armed combat) that have both high loiter times and no concerns about pilot safety. TUAVs are integral part of the evolving, real time sensor-data fusion-shooter linkage that enables rapid engagement of a much wider array of targets, including mobile targets, than was possible previously.

Guided Multiple Launch Rocket System (GMLRS)
GMLRS is an extended range rocket guided by GPS and an inertial reference system. It gives previously area fire weapons, a precision fire capability, thereby greatly increasing the range of targets that can be attacked while reducing hazards to friendly forces. It can be fired from any MLRS launcher vehicle, including HIMARS, making this long range, precision capability available to both the legacy forces and the airborne/ IBCT forces.

Long Range Advanced Scout Surveillance System (LRAS3)
RS3 will provide scouts with a long range reconnaissance and surveillance system, that allows them to complete their mission outside the range of enemy systems.

Excalibur Advanced Artillery Munition
Excalibur is a long-range precision artillery munition that can be used by all modernized US 155mm artillery. With its extended range and GPS-guided accuracy, Excalibur virtually assures single round target effects. This changes artillery from an area weapon to a precision weapon. It also vastly reduces the number of rounds required for any fire mission, making the duration of fire missions much shorter, and reducing the logistical support required.

Aerial Common Sensor
This program will develop a system that merges and enhances sensor capabilities into a single fused multi-intelligence airborne system. This system will replace the guard rail common sensor and airborne reconnaissance low, the Crazy Horse, Airborne intelligence, and target acquisition systems.

Department of the Navy

Nuclear-Powered Cruise Missile Submarines (SSGN)
This program will convert Trident-class ballistic missile submarines to a configuration that can launch large numbers of land-attack cruise missiles and conduct long duration special operations forces (SOF) campaigns. The SSGN will have the capability to conduct precision strike operations without giving any prior warning (such as an observable bomber launch hours prior to an attack, or a carrier battle group entering an area), and, it will have stealth capability to conduct precision strike from within an area covered by enemy sea-denial weapons.

DD(X) Technologies
Many of the technologies being developed for DD(X) are transformational and will be applied to the whole family of 21st century surface combatants. Automated damage control and other labor saving concepts will dramatically reduce the manning required on all future surface combatants, and thus lower their operating costs. Signature reduction efforts will make surface combatants much more survivable against littoral anti-access threats. The Advanced Gun System will provide high-volume, low-cost precision strike for targets up to 100 miles inland.

Unmanned Air Vehicle (UAV)
UAVs provide platforms with a multitude of potential packages (sensor, radio relay, armed combat) that have both high loiter times and no concerns about pilot safety. UAVs are integral part of the evolving, real time sensor-data fusion-shooter linkage that enables rapid engagement of a much wider array of targets than was possible previously.

TACMS-P
These programs will provide a new capability against hardened and deeply buried targets (HDBTs), which previously had provided sanctuary to enemy forces. Currently, HDBTs can only be engaged by specialized aircraft-delivered munitions. TACMS-P is a standard- and extended-range penetrator versions of the Army TACMS missile system (TACMS-P) fired from naval ships to provide a significantly faster engagement capability against HDBTs.

CONDUCTING SPACE OPERATIONS

Department of the Air Force

Common Aerospace Vehicle (CAV)
A new concept for global, space-based reconnaissance and strike operations, capable of being placed into orbit on a wide variety of launch systems. It will carry multiple types of conventional weapons or sensors. CAV could deploy its payload to dramatically increase surveillance during a crisis or to precisely strike targets across a wide area – within hours or minutes – from orbit. Concept development is planned to begin in 2006, with fielding following perhaps a decade or more in the future. The Air Force envisions an eventual long term buy of 500 CAVs with a new command organization to employ them, likely replacing a variety of current land-based aircraft operations.

Space Control Systems
Greatly expands the capability to conduct surveillance of space objects and ensure the survivability of friendly space systems. Deploys the first operational capability to determine if satellites are under attack and determine the intent of adversary space systems. Also deploys several first-ever capabilities to deny an adversary's use of space against U.S. and allied forces.

Directed Energy Technology
Research on high-energy laser and high-powered microwave technologies for direct target attack at the speed of light, supporting ABL, SBL, and other potential future programs. Energy can be applied to a broad spectrum of targets from the air, from space, and on the ground. These technologies provide a range of capabilities from non-lethal protection of high-value aircraft to complete destruction of enemy targets.

LEVERAGING INFORMATION TECHNOLOGY

Department of the Air Force

Tactical Data Link / Link 16
Link 16 and related data link applications provide jam resistant, secure communications that can be relayed over long distances for integrated operations. The program greatly increases the fielding of data links in fighters, bombers, surveillance systems, and control centers to permit widely dispersed forces to share information and have a common picture of the combat environment. The uniform availability of common tactical data links would revolutionize

communications by aiding the reliable, secure integration of land, sea, and air force operations.

Advanced Extremely High Frequency (EHF) Capability
New satellite constellation that will provide over nine times the data throughput for global transmission to joint forces. Survivable, jam-resistant, worldwide secure communications will be available to both the strategic and tactical joint warfighter. Provides a new extremely high data rate capability that will support the Army's vision of a "Digital Battlefield." Three satellites will launch between 2007 and 2008, replacing the current "MilStar" system. Cooperative program with the UK, Canada, and the Netherlands.

Laser Communication Terminal
This initiative will develop an optical frequency (laser) terminal for transmitting data from airborne surveillance and reconnaissance aircraft to information relay satellites for rapid wider use. The laser would replace existing radio frequency data links that sometimes suffer from serious atmospheric propagation (and enemy jamming) limitations. The laser also will implement a global wideband communications network capitalizing on recent advances in technology. The new satellite communications architecture is key to fully integrating space, air, and ground networks to meet three goals: (1) extend the reach of our communications to all elements of the force; (2) fully integrate intelligence networks into the DoD integrated network; and (3) eliminate transmission bandwidth as a constraint. The Global Hawk endurance UAV is a leading candidate for use as an information collector that would benefit from laser communications to relay its data via satellite to distant users.

Polar Military Satellite Communications (MILSATCOM)
New satellite constellation that provides survivable, jam-resistant, secure communications to support the National Command Authorities and nuclear forces. Consolidates strategic capabilities of two existing systems into one for global coverage, including the polar regions. A total of six satellites are planned to be deployed between 2009 and 2012.

Advanced Wideband System (AWS)
Communications capacity is the limiting factor of the Information Age and a critical enabler. Most transformational concepts rely on global, high speed, high capacity communications links or networks to succeed. Laser communications applies advanced technology to achieve orders of magnitude increases in capacity, open up previously unavailable communications capability, and transform a piecemeal network of platform families into one consolidated system. It will provide high capacity and digitally channeled service at both X and kA frequency

bands. A detailed study of the prospects for this new technology is in progress with expected completion in July 2002.

Department of the Army

Warfighter Information Network Tactical (WIN-T)
This radio-electronic equivalent of the worldwide web provides a secure tactical networking capability throughout the theater, from CINC/JTF level to battalion level, interfaces with non-DoD allied and coalition partners, and connects the theater to command, control and support elements in the US. It is designed to work with on-the-move subscribers as well as with fixed locations. As a result it will provide a quantum jump in connectivity among all the elements of the JTF.

Network-Centric Information Warfare
Fundamental to the concept of network-centric warfare is the capability to dominate the electronic battlefield. This collection of programs provides both information and communications assurance, and denial of the same to the enemy.

Joint Tactical Radio System (JTRS) (all Services)
JTRS is a family of radios that are interoperable, affordable and scalable. This advanced technology radio, to be procured by all services, provides the greatly increased bandwidth required for transmission of the vast amounts of digital data inherent in the digital battlefield. (Army is lead service for the joint program.)

Soldier Modernization – Land Warrior
These programs develop greatly enhanced capabilities in the areas of survivability and netted digitization for individual soldiers, both mounted (Mounted Warrior) and dismounted (Land Warrior). In survivability, efforts include single clothing ensembles that provide camouflage, chemical, biological and ballistic protection, and monitoring by medical sensors. In digitization, efforts include flip-down screens for situational awareness, helmet monitor cameras, and personal communications devices providing net access.

Department of the Navy

Cooperative Engagement Capability (CEC)
CEC is an advanced data system that will allow one ship to fire an air-defense missile based on inputs from aircraft, another ship's, or shore based sensors. CEC enables all anti-air warfare weapons systems in a battle force to operate as a single distributed AAW system. This is a necessary capability in the transformation to a networked force of mutually supporting surface combatants

Naval Fires Network (NFN)
NFN is a command and control system for naval fires, especially naval gunfire. It will give the Navy a new kind of capability for managing fire support assets in a networked fashion, instead of the current practice of assigning each ship a specific ground unit to support. NFN is completely interoperable with the existing Army and USMC fire support system (AFATDS), so supported ground units will be able to call for fire using the same procedures they now use to request ground-based artillery.

Deployable Joint Command and Control (DJC2)
This program develops and fields deployable joint command and control centers for CINC and Joint Task Force headquarters. These command and control centers are both land and sea based and may be easily relocated as the tactical situation requires. Currently, CINC and JTF headquarters do not have this deployable C2 capability. The Transformation Study Group identified this program as "the most enabling transformation program."

Multifunctional Information Distribution System (MIDS) / Link 16
Link 16 and related data link applications provide jam resistant, secure communications that can be relayed over long distances for integrated operations. The program greatly increases the fielding of data links in fighters, bombers, surveillance systems, and control centers to permit widely dispersed forces to share information and have a common picture of the combat environment. The uniform availability of common tactical data links would revolutionize communications by aiding the reliable, secure integration of land, sea, and air force operations.

Mobile User Objective System (MUOS)
MUOS will be the primary beyond line of sight communication system for mobile users in ad hoc crisis situations, major conventional and theater nuclear war, and regional conflicts. MUOS will provide a 10-fold improvement in capability (megabits/second) and offer significant improvements in providing communications to small hand-held receivers in harsh jungle and urban environments.

Transformational Communications
These are miscellaneous initiatives aimed at transformational upgrades to the quality and reliability of communications for the Navy. These initiatives are not sufficiently developed to enable a detailed description of them.

Common Aviation Command and Control System (CAC2S)
CAC2S is a hardware and software modernization effort that will provide a new kind of capability for the Marine Aviation Command and Control System. Instead of dissimilar aviation command and control systems, CAC2S will be one system that provides the single air picture essential to support "Operational Maneuver from the Sea."

Unit Operations Center (UOC)
The Unit Operations Center (UOC) Program's Combat Operations Center (COC) will provide a centralized facility for command and control of all Marine Corps elements - ground, air, support. COCs will be an integrated package of shelter/tentage, power, cabling, Local Area Networks, and processing systems. For the first time, all elements will have a common operating picture.

Chairman LEVIN. Senator Ben Nelson.

Senator BEN NELSON. Thank you, Mr. Chairman.

I want to thank you all for being here today. In February when I visited the troops in Afghanistan, Uzbekistan, and Pakistan, I found the morale very high—people committed to the task, fully supported by the American people and by our friends worldwide. I believe that continues and they are doing a magnificent job.

I also found it to be a field where transformation was underway as we tried new things, fighting a current war with current technology. But it was pretty clear from many anecdotal stories that old technology still works as well. So when we are in this balance, trying to balance between new technology, old technology, what works today, what might work tomorrow, we ought not forget what worked yesterday, but we ought not rely solely on that, otherwise we will be in a position where we can only fight the last war.

I am struck by the challenge that you have and I do not envy you, but I want to assist in any way that I can in determining the technology, so that we are not looking at 10 to 15 years to develop something we cannot know whether it will be successful. We should not, though, move away from trying to think forward. Certainly we must do that.

But balancing the old and the new I think is going to be a continuing challenge for all of you and for those who work with you, whether you are looking at the kind of war that is being fought in Afghanistan today or whether you are taking a closer look, as we did in Colombia. General Pace, you were a gracious host and provided a lot of information. Maybe a lot of the new technology just is not appropriate for that kind of conflict.

So I think it is important that we prioritize the challenges in technology. I hope that you are looking at it in terms of prioritization, that maybe we cannot wait 10 or 15 years to decide if something does not look like it is going to be successful, because we are going to be putting a great deal of our asset structure, our resources, into that at a time when maybe it ought to remain on the drawing board.

I just do not know how long we can go with a product, with a project, with technology, research and development, before you pull the plug. Your challenge is to keep Congress happy if Congress wants a certain project, but I hope that as you do this you will be in a position where you can come back and deliver bad news and that there is no penalty for delivering bad news when something did not work.

Secretary WOLFOWITZ. You are absolutely right, Senator. I think it is what General Pace referred to earlier and Secretary Rumsfeld refers to all the time. You want to try things, recognizing that some of them will not work. In fact, in this year's budget, I think for the first time ever, Under Secretary Aldridge declared a program in breach of the Nunn-McCurdy rule, which has normally been waived every time a program has come up with those kind of cost overruns.

In fact, he has cancelled both the Navy Area Wide System and the SBIRS Low System, though we hope to replace them with other things that look to be working better.

We have said from the beginning, particularly in the area of missile defense, where we are trying a lot of different things, that some of them are not going to work. While you have to reinforce success, you have to also be prepared to kill failure.

Senator BEN NELSON. It is the old adage about not pouring sand down a rat hole. You have to figure out whether it is a rat hole or not. But the price to experiment and to try should never be so high that you cannot admit failure along the way or, if not failure, that the cost-benefit ratio is not justified, because unlimited resources will permit you to succeed, but it will also permit you to never have to admit failure.

Secretary WOLFOWITZ. That would be a mistake.

Senator BEN NELSON. Thank you.

General Pace, do you have any thoughts on making our transformation work for us, but not to the point of getting us so far ahead with technology that we cannot go back and do the traditional things that we still need to do? I do not know whether we want to keep our stable of horses, on the one hand; on the other hand, there may be occasion when that kind of ancient technology fits into the equation.

General PACE. Sir, I agree. I think we have the opportunity to dedicate a portion of our resources to the transformation process, to the experimentation process. We have been fortunate, thanks to many years of sustained bilateral support in Congress, to have a military that is second to none, that has no peer on the horizon. That is why we are being attacked asymmetrically and that is why we will continue to be attacked asymmetrically.

But in that time line where we have no peer competitor we can afford to take part of our resources and apply them to experimentation, to the trials and failures of looking beyond our current capabilities to what we might be able to do in the future. Again, this is filling out the specifics of the overarching operational concepts.

But clearly, some of the things we have in our kit bag right now are exceptionally versatile. The B–52 that the Secretary mentioned before, it is 50 years old, give or take a few years, and still now

providing close air support because of the transformational weapon that it is carrying to the battlefield.

So I agree with you, sir.

Senator BEN NELSON. Thank you. I think you all agree that successful transformation does require prioritization and a determination that some things that looked pretty good 10 years ago do not really fit into where we are today or where we are going to go tomorrow.

Secretary WOLFOWITZ. Right. I agree also that one of the most difficult pieces of balancing we have to do in this budget is between the large investment that goes into sustaining the current force and the actually smaller fraction that goes into preparing that force of the future, and you have to keep the balance.

One of the statistics I have heard about the German transformation of the 20s and 30s is that only 10 or 15 percent of the German army was in fact armored at the time that they developed blitzkrieg. I do not know if arbitrary percentages are a mistake, but certainly the goal is not to transform the entire force. That would probably lead to a general collapse.

Senator BEN NELSON. Thank you.

Thank you, Mr. Chairman.

Chairman LEVIN. Thank you, Senator Nelson.

Secretary Wolfowitz, the members of our second panel have reached different conclusions relative to the Army's Crusader artillery system. One of our witnesses points out its utility in a contingency such as a land war in Asia. The other witness will point out the drawbacks to Crusader, including weight, transportability on the C–130, and a shorter range than some of the other Army strike systems. Secretary of the Army White is reported to have described the Crusader as transformational.

I am wondering if you could give us a very quick assessment of the Crusader.

Secretary WOLFOWITZ. I think one thing to say about Crusader is that the Crusader of today is not the Crusader that people were talking about some 2 years ago. The Army responded to the appropriate criticism that it was much too heavy to move anywhere by redesigning the vehicle and reducing it so that the weight of the total system is down by about a third.

I think how you rank Crusader depends in part on whether you compare it to current artillery, in which case there are some technologies that are dramatic improvements over what we have with the Paladin, or alternatively if you look at where we might be able to go in the future with artillery systems that in some ways substitute for artillery systems that are still very much on the drawing boards, very much in the form of briefing slides rather than actual capabilities, that might allow us to really rethink the whole way in which we look at artillery.

Clearly, one of the things that we want to do is invest as much as possible in bringing forward those kinds of capabilities, the capabilities that are in the Future Combat System. A separate but important development is to accelerate the development of very accurate artillery munitions, particularly the Excalibur round. We saw with——

Chairman LEVIN. Given our time constraints, can you just give us your summary as to where you are?

Secretary WOLFOWITZ. I think my summary is that Crusader is a little bit in-between, and it is a system that brings us some dramatic new capabilities, but if we can bring forward some of the transformational capabilities more rapidly we might see ways to put that Crusader technology into a different system.

Chairman LEVIN. Thank you.

I would like to ask you a question about the so-called $10 billion contingency in the fiscal year 2003 budget. Does the Department support leaving that as a contingency to finance increased operational costs to continue the global war against terrorism, and that it not be diverted to other uses? Or have you changed that position?

Secretary WOLFOWITZ. No, that is our position very strongly. It is there as a contingency operating fund to allow us to continue operations into fiscal year 2003 without having to come immediately for a new supplemental on October 1st. We do not know what those operations will be or what level it will be at, but, as I think we have briefed in the past, that number gets us about halfway into the year on the assumption that operations are at their current level. It is impossible to predict what level it will actually be at, obviously.

Chairman LEVIN. Thank you.

General Kernan, your formal statement today makes a reference to the fact that our present joint forces are highly capable, as recent operations demonstrated, but that they are overdue for a recapitalization. When you were testifying before the House Armed Services Committee on March 14, you also added that "they are overstretched." That created something of a news article.

When you were asked about that, you said, "we are busier than we have ever been and we are stretched." Apparently, according to *The New York Times,* the Secretary was upset when he read about this testimony. I am wondering whether or not you stand by that testimony, that you believe our troops are stretched, because we need your own honest, unvarnished views on this. So are they stretched and was it in any way suggested to you that you modify your testimony as it appears in today's printed version?

General KERNAN. No, sir, nobody asked me to modify my statement at all. I welcome this opportunity also to clarify because, as you can appreciate, things are oftentimes taken out of context. The dialogue between myself and the Congressman had to do with manageable risk, and I believe what I said was that, yes, we are stretched, but this is manageable.

The come-back statement was: "I understand that the troops are getting pretty worn out." My comment was: "Yes, they are tired, but the commanders are doing a good job in rotating the forces through the theater of operation."

So really, I guess the bottom line up front is, sure, this is a challenge. Yes, we can manage it. But we are at war and we are going to do what is necessary. We will ensure that we maintain readiness and have the deployable packages our combatant commanders need when and if they are required.

Chairman LEVIN. Thank you.

Senator Warner.

Senator WARNER. Thank you very much.

Mr. Secretary, I offer an observation and a little bit of advice. These programs successively come before Congress with the best of intentions and then they are lost as the years go on. You talk about the intransigence in the military historically. It has been in Congress. We need look no further than the base closure struggle that the Chairman and I and our two counterparts in the House had in getting across the concept to allow basic efficiency of management and savings. Anyway, it is the law now.

I would hope that Admiral Cebrowski, as long as he is willing to serve in this position, is given the authority to keep working with Congress, because when these items come up they are buried in massive documents. Somehow there ought to be a red tag put on transformation so that when we make the deliberations—do we take this program or that program or cut this one or cut that one—we are conscious of what is an integral part of your transformation. There is a certain synergy between all the parts not unlike a chain, where due to the weakest link the whole thing fails to serve the ultimate goals that you have. If we let one or two pieces of it lapse and the others go forward, then I think it would be less effective.

So to get this through over the years to come, you have to put emphasis on it and flag it when it comes up to Congress .

I also have a concern, and we certainly saw this in Kosovo and have seen it in our Afghan operations, that we are so far ahead of our allies. Can anyone say that other nations are looking in a comparable way to their transformation? General Kernan, do you see a lot of it? You are the CINC right out there with our allies. What do you see? Do you see them working on transformation in any measure comparable to what we are trying to do?

General KERNAN. Comparable to what we are doing, no, Senator. Transformation, yes. The Secretary General of NATO, Lord Robertson, has been emphasizing continually the need to invest more in defense budgets so that the alliance would modernize, and he established 58 defense capabilities initiatives that he wanted us to focus on.

In my role as Supreme Allied Commander Atlantic, we have the lead for concept development and experimentation for the alliance and bringing forward with General Ralston recommendations for the military committee.

Senator WARNER. I want to move on to a couple other points. I simply say that coalition warfare is the key to the future. Not only does it bring our allies in to share the burdens, but also here at home I think the perception of the American people is we cannot go it alone always, time after time. So I would hope that our allies study these initiatives by the Secretary of Defense and yourselves and that they begin to generate within their own structures a comparable transition program.

Andy Marshall is a very celebrated and loyal public servant I think he dates back to my ancient days in the Department. I am not sure. I seem to have a recollection he was there. Hopefully, some of his concepts have survived all of the layers of review and so forth. Anyone wish to comment on that? Mr. Secretary?

Secretary WOLFOWITZ. I think he dates back to 1973, Senator.

Senator WARNER. I was there, yes.

Secretary WOLFOWITZ. I think he has had a very significant influence on the Department in general and I think played a major role in, going back a few years, getting people to appreciate that the transformations that are possible in this era really could have a revolutionary quality to them. That phrase "revolution in military affairs" was in many ways misunderstood, but—

Senator WARNER. Very well, I will accept your reply.

Secretary WOLFOWITZ. I can tell you also that Secretary Rumsfeld talks to him regularly and values his guidance very much.

Senator WARNER. Thank you.

General Kernan, how will the new unified command here in the continental United States—CINCNORTH, I believe that is the designation—how will that impact on your responsibilities? Will there be a transfer of some of your responsibilities to that command? Is it coming along smoothly? I am hopeful that that command can soon be designated, up and operative.

I continue to be worried about homeland defense I say this to you and each of the witnesses with deep respect. Our American public expects every action necessary to help that situation and strengthen it quickly.

General KERNAN. Yes, Senator, the plans are coming along very well. Both Joint Forces Command and NORAD collectively have worked together to form an implementation plan. When directed, we will put together the transition team to allow that CINC-dom to start standing up. In the interim, we will maintain the responsibility to do the land and maritime security of the homeland and NORAD the aerospace piece. It will be a seamless transition to NORTHCOM when they are ready to accept the mission.

Senator WARNER. Let me close out. How quickly, Mr. Secretary, do you anticipate the President and-or Secretary Rumsfeld or yourself will be announcing the details of that, so we can move forward?

Secretary WOLFOWITZ. I would hope fairly soon, Senator.

Senator WARNER. Has the location been decided yet?

Secretary WOLFOWITZ. That is also being studied.

Senator WARNER. Thank you.

Lastly, Mr. Chairman, the famous phrase "skip a generation" was often used by Secretary Rumsfeld and others when we began this process a long time ago. As I look through your documentation, I think probably the DD–21 program is an example of how we made a tough decision in moving on to another generation. Are there other examples in here? Perhaps, given that my time is up, you can just enumerate one or two and put in for the record the others that could qualify for this concept of skipping a generation.

Secretary WOLFOWITZ. To be honest, Senator, that is a harder concept to apply in practice than it is to conceptualize. You are absolutely right, the DD–21 is an example of that. It is the one that comes most to my mind. I will see if for the record we can provide you with others.

[The information referred to follows:]

While "skipping a generation" describes transformation activity in many ways, simply put, it is representative of significant change. It suggests a technological inflection point at which we forego incremental improvements to existing systems and capabilities in favor of those investments that potentially redefine the context of our competivitve advantage. Most recently, Global Positioning System (GPS) capabilities

are representative of such a redefinition. Historically, there are many other examples—the change from wind driven to steam powered ships, naval aviation, the tank, the helicopter, submarine-launched ballistic missiles, and night vision devices are just a few. As a consequence of the change that it brings, "skipping a generation" most importantly suggests an alteration in how we think, from the policy level through the tactical. While accepting modernization, it suggests that future forces are not necessarily a linear extension of current capabilities that potentially "skip a generation" include high-speed wavepiercing catamarans for both strategic and intra-theater lift, underwater unmanned vehicles for mine clearing operations, unmanned aerial vehicles for long-range precision strike, and space-based sensors for persistent surveillance of the battlespace.

Senator WARNER. Well, we skipped back on the cavalry one and I am all in favor of that. I think that is——

Chairman LEVIN. That is called skipping back a generation.

Senator WARNER. Well, that is what I said. It is my phrase. Do not steal it.

Secretary WOLFOWITZ. That is an interesting notion. We will explore it.

Chairman LEVIN. Senator Warner said: That is called skipping back a generation.

Senator WARNER. That is right.

Secretary WOLFOWITZ. It worked.

Senator WARNER. It worked.

Thank you.

Chairman LEVIN. Senator Lieberman.

Senator LIEBERMAN. Thanks, Mr. Chairman.

Thanks to the witnesses. I apologize for being so late. It is one of those mornings that I had other commitments that kept me from being here. But I am very interested in this subject. I thank you for all you are doing to move us forward.

As I said to General Kernan a while ago, I feel as if people in the Pentagon are really getting with the transformation idea, but it is hard to bring it all together and do everything else that all of you are being asked to do. Senator Santorum and I saw this recently in our Airland Subcommittee as we focused in on the Army and the difficulty with the amount of money that they are being given, which has been increased significantly in this year's proposed budget to both maintain the legacy force, get to the interim force, provide for an interim force, and then get to the objective force.

It requires a lot of very tough decision-making all around to make sure the transformation that I think we all want occurs both as rapidly as possible and as jointly as possible.

Just a few questions. General Pace, I recall a few years ago that Secretary Cohen and General Shelton talked about the importance of having the JROC get involved in making decisions about programs up front before the services made their decisions as a way of making sure that transformation was being expressed in the program decisions that were being made and that there was a unity of purpose and that we were not overlapping and wasting resources. I wonder if you could give us a sense of the work of the JROC in that regard.

General PACE. Senator, I think my predecessors in the JROC have in fact gotten the process to the point where now before a major weapons system or a major concept is funded, it gets the JROC stamp of approval on its forehead. But as I said in my writ-

ten statement, we are because of that currently in the "grading somebody else's homework mode" as opposed to being proactive in our own right.

What we need to do in the JROC is take the defense planning guidance that the Secretary puts out, seize on those two or three or four major concepts, and drive the train for bringing those concepts to fruition, taking a look at what capability we want to deliver on the foreign battlefield, in what time line, what are we capable of doing today, and where there is a gap, filling that gap, either through asking a service to experiment at the service level or Joint Forces Command to experiment at the Joint Forces Command or, if there is a technology fix already in place, getting a service to in fact take that on.

So we are not doing the part we should be doing as well as we should as far as being proactive, sir.

Senator LIEBERMAN. That is my concern. Do you have the intention to get the JROC in exactly the posture you have described up front?

General PACE. I do, sir. Quite candidly, I took this job on 1 October. We have been a little bit busy.

Senator LIEBERMAN. Sure.

General PACE. I have since been through JROC 101 and JROC 102 in the last 6 months, and I am dangerous now. But in the last month and a half we have gone through all 84 of the products and processes that the JROC is currently concerned with, and we have looked at each one to determine if we should still be doing that. We have taken about one-third of those off our plate because they are important, but not JROC business, and we have cleared up space on our plate for the things that I talked about, when the defense planning guidance comes out, that we can take and drive, sir.

Senator LIEBERMAN. Admiral Cebrowski, I want to give you a chance to speak a little bit. I have benefited a lot from your writing and thinking on all these issues. I know Secretary Rumsfeld is fond of saying, and I agree with him, that transformation is not just about new weapons, it is about new ways of thinking and new ways of fighting.

I was heartened by your appointment. I wonder if you could just talk for a little bit as to what you see as your priority as the Secretary has defined it for you in your position.

Admiral CEBROWSKI. Thank you very much, Senator. What sits at the top of my list is to assist the Department in moving toward the information age. Moving from the industrial age to the information age is the way to leverage the great power that we have resident in America. Also it is in recognition of the fact that the entire world is moving into the information age. To the extent that we do not do it or do it poorly, we will be at a decided disadvantage.

The next area of my thrust is to broaden the capabilities base. To the extent that we focus very well on a few capabilities and think in terms of depth or how much is enough, we in fact aggravate our risk. Risk in this age is better mitigated by addressing issues of breadth. So we need to broaden the capabilities base, the technology base, as well as our industrial base.

Senator LIEBERMAN. Let me ask you this question about the first two. Have you been given resources to carry out those two very important missions, or are you an advocate within the building?

Admiral CEBROWSKI. I am indeed an advocate, but I am also meant to be a catalyst. I asked for enough money to run my office and to catalyze experimentation and the development of experimental articles or operational prototypes, because of my conviction that change is most likely to be assisted if you can put some real experimental articles in a person's hand, and that is how you address the cultural issue.

I did not ask for a very large amount of money. As a matter of fact, I turned it away because I would rather see myself more as a venture capitalist, if you will. I do not want to spend my time administering a budget. Yet I have been assured that as ideas come forward the Comptroller will be responsive.

Senator LIEBERMAN. Very good.

My time is up. Thank you all. Thanks, Mr. Chairman.

Chairman LEVIN. Senator Akaka.

Senator AKAKA. Thank you very much, Mr. Chairman.

I have just one question for General Kernan. I know that your plate is full with the war that that we are waging now, as well as transformation. I am particularly interested in transformation, what is happening there. I know that in your statement you have mentioned the need for integration and its efforts between the local, State, and Federal Government people, and you talked about the fusion of full intelligence and information and the need for that.

In the process of transformation, how will the proposed changes in the UCP, Unified Command Plan, impact the Joint Forces Command in the process of transformation? For example, do the proposed changes fortify the Joint Forces Command in the execution of its mission to defend the homeland and provide military support to civil authorities? That is my question, with the civilian authorities and the civilians; how will the proposed changes bring about this process of working with the civilian authorities?

General KERNAN. I do not envision any change in that at all. What I do see is Joint Forces Command divesting its responsibilities of land and maritime security to this new command that will be called Northern Command. As far as I know, there will be no changes to laws, no changes to the statutes that will be affected whatsoever. Joint Forces Command will still have the responsibility to provide trained and ready forces for the homeland security and that would be, obviously, under the command of Northern Command, who would have that overarching responsibility for homeland defense.

Senator AKAKA. Thank you very much, Mr. Chairman. I just wanted to pick up for Senator Warner's question on the UCP. Thank you.

Chairman LEVIN. Thank you very much, Senator Akaka.

Let me ask just one question because I think that probably may make sense in terms of logic, but not reality. I just have one question, Secretary Wolfowitz, for you. Section 1010 of our National Defense Authorization Act for Fiscal Year 2002 provided that $1.3 billion was authorized either for ballistic missile R&D or for Depart-

ment of Defense activities for combatting terrorism and that these funds could be allocated only by the President for either purpose.

Do you know if that allocation has been made?

Secretary WOLFOWITZ. I do not believe it has yet, Senator.

Chairman LEVIN. Would you find out if it has, because when there is such an allocation, then of course the Secretary of Defense would be required under that same section to submit to our committee a report describing the allocation and the Secretary's plan for the use by the Department of Defense of funds that are made available pursuant to such allocation. So if you could keep that in mind, to let us know whether that allocation has been made or not.

Secretary WOLFOWITZ. Yes, thank you.

[The information referred to follows:]

Congress chose not to appropriate funds in a manner that would have required the allocation contemplated by section 1010 of the National Defense Authorization Act for Fiscal Year 2002. Therefore, the authorization has not been allocated.

Chairman LEVIN. That is the only question I have. Senator Warner is all set.

Senator Lieberman.

Senator LIEBERMAN. Mr. Chairman, I think we should let this panel have its liberty and go on to the next. I thank you. The questions could go on all day. It is a great group which is doing a wonderful job. I thank them and look forward to the next occasion.

Chairman LEVIN. We thank you all for coming forward. We thank you for your testimony. There will be some additional questions for the record, along with a written statement from Senator Thurmond. We will now move on to the second panel.

[The prepared statement of Senator Thurmond follows:]

PREPARED STATEMENT BY SENATOR STROM THURMOND

Mr. Chairman, as we complete the hearing cycle on the President's defense budget request for fiscal year 2003, it is appropriate that we close this morning with a hearing on the policies and programs to transform the Armed Forces. This transformation is the Department of Defense's most important under taking of this young century. Its impact on the Department will be equal to that of the 1948 restructuring of the War Department into the Department of Defense and the Goldwater-Nichols Act of the 1980s in regard to joint operations.

Although the transformation of our "Cold War" Armed Forces is long overdue, it will not be done overnight. Rather, because of its long term implications, it must be a deliberate process that fully considers the ramifications on not only the Armed Services, but also on the technologic base and industrial base. More important, the budget must support it.

Mr. Chairman, last year's Quadrennial Review recommendations and those of the various strategic reviews form a sound basis for the transformation. These recommendations also created expectations that the fiscal year 2003 budget would be a budget dedicated to the transformation. Although the President's budget request provides substantial seed money to initiate transformation, it is not the radical budget many of us expected. I urge the committee to be more proactive in funding the key transformation initiatives both in terms of technology and weapons systems.

I want to welcome Secretary Wolfowitz, General Pace, and the other distinguished panel members. I believe Chairman Levin has brought together an outstanding group of experts on the issue of transformation and I look forward to their testimony.

Thank you, Mr. Chairman.

Secretary WOLFOWITZ. Thank you for your interest in the subject.

[Pause.]

Chairman LEVIN. The committee will come back to order. We welcome our second panel: Dr. Krepinevich and Dr. Thompson. I

have given brief introductions of both of you. Dr. Krepinevich, why don't you begin.

STATEMENT OF ANDREW F. KREPINEVICH, PH.D., EXECUTIVE DIRECTOR, CENTER FOR STRATEGIC AND BUDGETARY ASSESSMENTS

Dr. KREPINEVICH. Thank you, Mr. Chairman. I have prepared, obviously, a written statement for the record and will summarize my remarks.

Chairman LEVIN. Thank you for that and it will be made part of the record.

Dr. KREPINEVICH. I would like to begin by complimenting the committee for focusing on this important issue, which at its core concerns how well we are preparing our military to meet the very different challenges that are now emerging or will likely emerge to our security over the next decade or so. I would also like to applaud Secretary Rumsfeld's team, which has provided us with a compelling answer to the question, why should the world's best military transform itself?

As the administration has noted, our would-be adversaries have an enormous incentive and, with rapidly diffusing military-related technology, increasingly have the ability to present us with very different kinds of threats than those we encountered in recent years, whether it is the Gulf War or operations as recent as Operation Allied Force. These emerging challenges are set forth in the administration's QDR as "critical operational goals for our military," which center primarily around our ability to project power in the face of anti-access and area denial threats and on our ability to defend the American homeland.

In the interest of time, I will focus my summary on the power projection issues, as the forces associated with them dominate the administration's defense program. Anti-access is simply the growing threat we face to our ability to access forward bases for military operations, whether they are ports or major airfields or air bases. We have seen this in recent years in Operations Desert Fox and Allied Force, where longstanding allies refused to allow us to conduct certain operations out of their bases, thus significantly limiting our military capability.

We have seen it in such places as Albania and Central Asia, where we have been given access to bases, but where the bases are so austere that our military forces have not been able to really exploit them to realize their full capabilities.

But perhaps of greatest concern, with the proliferation of ballistic and cruise missiles, is the fact that over time—and it is occurring in places like Korea already—increasingly these major ports, these major air bases, where we deploy our forces to and sustain them from are going to be put in the crosshairs of enemy missile forces. So if there is an Omaha Beach or an Anzio of the 21st century, it will likely occur not at beachheads, but at major ports and air bases.

As Secretary Wolfowitz recently testified, "U.S. forces depend on vulnerable foreign bases to operate, creating incentives for adversaries to develop access denial capabilities to keep us out of their neighborhoods." We must therefore reduce our dependence on pre-

dictable and vulnerable base structure by exploiting a number of technologies that include longer-range aircraft, unmanned aerial vehicles, stealthy platforms, as well as reducing the amount of logistical support needed by our ground forces.

The QDR adds to this in saying that these joint forces must not only be capable of conducting distributed and dispersed operations, the network-centric warfare that Admiral Cebrowski talked about, but also able to force entry in anti-access or area denial environments. They must have the ability to arrive quickly at non-traditional points of debarkation.

Linked to this anti-access threat is the so-called area denial threat. Basically what that speaks to is the fact that the mission of our maritime forces will increasingly be centered on the littoral, on seizing control of the green waters near the shore, in terms of being able to support the projection of forces ashore and their sustainment. As the anti-access threat matures, we are going to need maritime forces to provide early fire support and, quite frankly, fire support over the period of the campaign, but also to quickly open up the littoral for the sustainment through resupply of forces based on land.

Admiral Johnson, once the Chief of Naval Operations, and perhaps the first to see this threat, said: "Over the past 10 years it has become evident that proliferating weapon and information technologies will enable our foes to attack the ports and airfields needed for the forward deployment of our land-based forces. I anticipate that the next century will see those foes striving to target concentrations of troops and material ashore and attack our forces at sea and in the air."

This is more than a sea denial threat or a Navy problem. It is an area denial threat, whose defeat or negation will become the single most crucial element in projecting and sustaining U.S. power where it is needed.

Again, as our maritime forces move closer to the littoral, essentially they come more and more within range of an enemy's military capabilities, whether it is diesel submarines operating in the littoral, coastal combatants that can move with high speed and have stealth, anti-ship mines, or anti-ship cruise missiles. At the same time they are moving in, they also get less and less warning time because that protective bubble that we can put around the battle group begins to collapse as some of the picket ships reach shore.

Now, given these challenges, which the administration I think has quite correctly identified, as well as others, while the administration has provided a compelling reason to transform the military to address these critical challenges, it has done less well in terms of establishing a process to effect that transformation.

In fact, it is somewhat remarkable that, despite setting forth six new critical operational challenges, of which I have mentioned only two, the fiscal year 2003 defense program and budget envisions essentially the same force structure and modernization strategy as provided for in the Clinton administration's defense program. A key reason for this, it seems to me, is the lack of a plausible point of departure concept of how the military plans to meet these operational goals.

I am not talking about a vision here like rapid, decisive operations or network-centric warfare. I am talking about the warfighter sitting down and saying: The commander in chief has given us a new challenge to deal with; what is our best initial guess about how we are going to deal with that challenge, how we are going to defeat it?

For example, how do we plan to project power rapidly and decisively if we have no access to forward operating bases? How do we plan to quickly establish sea control of the littoral against an area denial force? The missing link it seems to me between identifying these threats and the defense program that you are asked to pass judgment on is how do we plan to use these tools, these new systems, these force structures, and so on, to achieve these ends, defeating an anti-access, area denial threat?

The missing link is the how, how are we going to do this. This is essential not just for you, it is essential for the officer corps. It is essential for the military so they understand, at least as a point of departure, how they are expected to accomplish this mission.

One of the problems institutionally, by the way, that you run into when you begin to face this issue of a new concept of operations is you begin to create winners and losers. Certain capabilities, systems, and elements of the force structure begin to look better and better. Certain systems, capabilities, and elements of the force structure begin to look less and less attractive.

Not only do we need these kinds of point of departure concepts in operation, we need to refine them in war games and in simulations. But ultimately we need a way of determining whether these warfighting concepts can work in practice. That is where service exercises and joint field exercises come into plan. That is our high fidelity, good feedback laboratory for determining whether we are on track with respect to transformation.

Despite the QDR's declaration that such experiments and such exercises are "critical" to validating the new war concepts, the fact of the matter is that a joint national training center, which was envisioned by the National Defense Panel on which I served, is not established. There is no provision made for a joint opposing force, despite the fact that our services swear up and down about the value of such a force, whether it is at Red Flag or at Top Gun or at the National Training Center (NTC). There is no significant increase in JFCOM's budget for exercises and experiments, and in fact the tempo of these experiments and exercises remains unchanged from that established under the previous administration.

I would note parenthetically that the Israelis, who seem to be a little bit stretched at the present, given the circumstances in the Middle East, are greatly expanding upon their urban warfare training center. It is something that the National Defense Panel recommended. It is something that we ought to seriously consider.

Again, once you begin to conduct these kinds of exercises, especially in a joint environment where the services are forced to compete with one another, once again you create the opportunity for winners and losers, and that is a often times difficult bureaucratic step to take.

I would argue that we need to do this before locking into large-scale production runs of new weapons systems. In a sense, if we

fail to do that we are putting the procurement cost before the strategy horse. We are filling up the CINC's tool box without really having an understanding of how we are going to do the job before us, dealing with these six critical operational challenges.

To put it in a perspective that people in DC can understand, it is akin to drafting players for a football team without having scouted them and without knowing what kind of offense or defensive schemes are going to be employed by the coach.

Having said this, there are several systems now in the defense program that seem such a poor fit and the alternatives so promising that the Department of Defense should, to quote President Bush, "seize the opportunity to skip a generation in weapons systems." These systems include a version of the Joint Strike Fighter, an element of the restructured DDX program, and the Crusader artillery system, again following the lead of Deputy Secretary of Defense Wolfowitz and his outline in previous testimony of the kinds of capabilities we ought to be looking for.

I would argue that areas where we ought to consider increased investment are accelerated development and fielding of a range of UCAVs, Unmanned Combat Aerial Vehicles, not just the current Air Force version, but an extended range version that gets you around the problem of access to forward bases. The systems that the Joint Strike Fighter, for example, is anticipated to replace dropped only about 5 percent of the ordnance in Afghanistan in this recent conflict. Over 70 percent was dropped by long-range bombers and another 25 percent by the maritime forces.

So not only an extended range version for the Air Force, a maritime version, which this administration with the Navy has initiated; and to take the Army's tactical UAV program and make it a tactical UCAV program as well.

In terms of network-centric operations, these are really the antidote to the anti-access area denial threat. That threat basically focuses on key nodes that cannot move, ports and air bases, or on large systems leading in early in the conflict.

The littoral combat ship that the Navy is now exploring—and I think the CNO has a terrific idea here—that is a great opportunity to experiment with network-centric warfare. Just as destroyers used to screen the battle fleet, these ships can screen the carrier battle groups and open up the littoral.

Secretary Wolfowitz mentioned UUVs which can be used to help counter the mine threat. The Army's Objective Force, which is really a network-centric operation, which right now is underfunded at the expense of some other programs, I think is another example of where network-centric operations can be promoted.

In addition to what I mentioned in terms of range and stealth, which Secretary Wolfowitz said was important, not only should the administration proceed with converting the four SSBNs that are coming out of service to SSGNs, but it should also strongly consider reopening the B–2 production line, the only immediate way we have of gaining long-range stealth in terms of air strikes.

Support for Comanche, an extended range ATACMS. Army forces can disperse the most. They also have great potential these days to strike at extended ranges. Then perhaps one of the orphans of this defense program will be a new means for deployment and

sustainment, which keep being emphasized by the services in their war game, but which really are not aggressively funded in this defense program, whether it is an advanced technology transport, the high-speed vessels that Admiral Cebrowski talked about—that is a good idea, and it should be accelerated.

The Army recently put on the very back burner its future transport rotor craft, which is key to its essential ability to fight on a non-linear battlefield. General Jones recently mentioned the possibility of resurrecting the mobile offshore base, an idea of Admiral Owens, who is renowned for his commitment to innovation and transformation.

In summary, I think we can say, to its credit, that this administration has performed a great service in providing us with a compelling set of reasons as to why we should transform our military. Unfortunately, in terms of the process and in terms of a program, I do not think we are quite there yet.

If the administration's diagnosis of these emerging threats is correct and we fail to begin to transform our force, we risk investing hundreds of billions of dollars in preparing our military to fight yesterday's threats as opposed to tomorrow's. Should that risk be realized, additional payments could be exacted not only in terms of our national treasures, but also in interests jeopardized and lives lost.

Thank you, Mr. Chairman.

[The prepared statement of Dr. Krepinevich follows:]

PREPARED STATEMENT BY DR. ANDREW F. KREPINEVICH

Mr. Chairman and members of the committee, it is a great honor to appear before you today to discuss the issue of military transformation.

Today we face a challenge that is arguably unprecedented in the Nation's history: transforming our Armed Forces into a very different kind of military, while at the same time sustaining its ability to play a very active role in supporting U.S. near-term efforts to defeat terrorism and preserve global stability.

WHAT IS TRANSFORMATION?

Transformation can be thought of as innovation on a grand scale. Transformation is undertaken by a military that believes major changes are occurring in the character of conflict. Periods of military transformation are typically associated with a revolution in military affairs, or an RMA, in which a combination of technology, warfighting concepts and organizational change combine to bring about a dramatic leap in military effectiveness.

Militaries are motivated to transform most often because they conclude either that very different operational challenges are arising that will greatly reduce the effectiveness of existing forces, or because they see an opportunity to develop new forms of operations themselves that will yield great advantage in future military competitions.

As important as it is to understand what transformation is, it is just as important to understand what transformation is not.

- Transformation is not a "monopoly" of the United States military. The rise of anti-access/area-denial threats and nontraditional forms of attack on our homeland, as well as the prospect of counter-space operations and electronic strike, are examples of emerging challenges to our military that did not exist until relatively recently. In short, in the face of U.S. military superiority, our existing and prospective adversaries are adapting to present us with different kinds of threats.
- Transformation is not solely based on introducing new technologies into the force. It also requires changes in the way the force is employed through major changes in doctrine and force structure.

- Transformation is not about enhancing our efficiency in existing warfighting operational concepts; rather, it is about developing new warfighting concepts.
- Transformation does not mean supplanting the entire force with new systems and force structures. Today our challenge is to identify what mix of existing and emerging systems and capabilities is required to deal with the new threat environment envisioned in our defense strategy, while also exploiting our sources of greatest potential advantage.

WHY TRANSFORM THE WORLD'S BEST MILITARY?

The Bush administration, in its Quadrennial Defense Review (QDR), has articulated a persuasive case on the need to transform the U.S. military. The heart of its argument is that the challenges and opportunities that confront the U.S. military are quite different from those they encountered during the Cold War and Operation Desert Storm, or even during the 1990s, and that greater change is clearly on the horizon. Consequently, merely improving upon today's capabilities will not suffice to meet tomorrow's challenges. Moreover, the administration argues that U.S. military also has the opportunity to make dramatic qualitative improvements in its capabilities, regardless of the threat's character. Finally, since the character of the threat is changing, improvements in U.S. military capabilities must be linked to addressing these changes.

The argument that the U.S. military needs to move beyond Cold War/Operation Desert Storm era forms of conflict—and the two-major theater war posture they spawned—to address new challenges to America's security (and to exploit opportunities to improve its capabilities) is outlined in the QDRs "critical operational goals," which can be summarized as:

- Protecting critical bases of operation, at home and abroad, and defeating CBRNE (chemical, biological, radiological, nuclear, and high-explosive) weapons and their delivery systems;
- Prevailing in information warfare, both in offensive and defensive operations;
- Projecting and sustaining U.S. forces in an anti-access/area-denial environment (A2/AD), and defeating A2/AD threats;
- Denying enemies sanctuary from U.S. attack;
- Preserving the U.S. ability to operate effectively in space; and
- Leveraging information technologies and innovative operational concepts to develop an interoperable, joint C^4ISR architecture.

What follows is a summary of what are, arguably, the two most formidable emerging challenges to confront our military—homeland defense and anti-access/area-denial.

HOMELAND DEFENSE

An enduring source of competitive advantage for the United States has been its geographic insularity. This has often enabled the United States to devote the vast majority of its defense resources to maintaining forces overseas in forward deployed positions, or to organizing CONUS-based forces for expeditionary operations. However, in recent years the global transportation network has made long-distance travel increasingly routine. This, combined with the rapidly growing access of small groups and even individuals to ever greater destructive power, has eroded the value of America's geographic remoteness and placed the U.S. homeland at much greater risk of significant attack, either from hostile nonstate actors, or from states employing nontraditional means of attack.

To be sure, the United States was, for much of the Cold War, under the threat of a catastrophic attack from the nuclear forces of the Soviet Union. However, a combination of faith in the U.S. nuclear deterrent and realization that effective defense against large-scale nuclear attack was not feasible led to a relatively modest effort on active (e.g., ballistic missile defense) and passive (e.g., civil defense) defenses. America now finds itself at risk of attack from a range of enemies, both state and nonstate, as well as from an array of new threats, to include the covert introduction of weapons of mass destruction (WMD) and attacks on the national information infrastructure. Moreover, the events of September 11 indicate that at least some of these enemies cannot be deterred through traditional means. The result is that now America must divert substantial resources to the defense of the homeland. While in some respects this mission is as old as the American Revolution itself, it is certainly new in both its form and intensity. A national strategy for defending the homeland has yet to be devised. Thus it is difficult to ascertain the role the U.S.

military will be asked to play, or to assess the Department of Defense budget and program priorities with respect to Homeland Defense.

ANTI-ACCESS AND AREA DENIAL

Despite all the uncertainties the U.S. military must confront in preparing for the future, two things seem certain. First, given the United States current military dominance, the incentive is high for would-be adversaries to present the American military with very different challenges. Second, the diffusion of military technologies and the rapid progression of military-related technologies will increasingly offer such adversaries the means to achieve this goal.

This possibility is particularly true with respect to the traditional form of U.S. power-projection operations. The United States' ability to maintain stability in key regions around the globe rests on its capacity to project power, rapidly and decisively, where it is needed. However, the U.S. military's traditional method of deploying and sustaining air and ground forces at or through major ports and airfields is almost certain to be put at risk as a consequence of major shifts in the geopolitical and military-technical environment.

Unlike during the Cold War, it cannot be assumed that allies will provide base access whenever it is needed. Instead *ad hoc* coalitions, or "coalitions of the willing," must be cobbled together depending on the situation. For example, during Operation Desert Fox in 1998, both Saudi Arabia and Turkey refused to allow U.S. air strikes on Iraq to originate from bases on their soil. Similarly, in 1999, Greece, America's long-term North Atlantic Treaty Organization (NATO) ally, refused to permit U.S. forces to operate from its bases during Operation Allied Force. Most recently, the United States has found unfettered forward base access difficult to come by in the war against al Qaeda terrorist forces and the Taliban regime in Afghanistan. States in the region have, for the most part, either denied the U.S. military access to bases, or placed severe restrictions on their use, especially in the case of strike operations.

Nor can the U.S. military be confident that adequate basing facilities will be available in any event. During the Cold War, the United States developed modern base facilities to optimize the military's ability to execute the strategy of containment of the Soviet Union. Correspondingly, the U.S. military developed forces that became dependent on these well-developed facilities in Western Europe and Northeast Asia. But the Cold War is over, and the U.S. military has confronted the harsh reality that basing facilities in many other parts of the world—in places such as Somalia, Rwanda, Albania and Afghanistan—are austere in the extreme compared to their Cold War era counterparts. Indeed, the Army's current transformation efforts seem driven, to a significant degree, by its recent inability to deploy forces rapidly to the Albania-Kosovo border during the Balkan conflict. Making matters worse, potential flash points, such as the Asian Subcontinent, Spratly Islands and Taiwan Straits, lie in regions that seem geographically bereft of even modest local basing facilities to accommodate the U.S. military's short-range fighter aircraft and medium/heavy ground forces.

Even more disconcerting is the growing proliferation of national and commercial satellite services and missile technology. Increased access to these satellite services will allow even regional rogue states both to pre-target key fixed facilities and to monitor U.S. deployments into forward bases. Unless one makes heroic assumptions regarding advances in missile defense effectiveness, these facilities can be held at risk through the employment of large numbers of ballistic and cruise missiles. Senior U.S. military leaders have already voiced strong concern over the ability to deal with such a contingency. General Ronald Fogleman, when Air Force chief of staff, observed that:

> Saturation ballistic missile attacks against littoral forces, ports, airfields, storage facilities, and staging areas could make it extremely costly to project U.S. forces into a disputed theater, much less carry out operations to defeat a well-armed aggressor. Simply the threat of such enemy missile attacks might deter U.S. and coalition partners from responding to aggression in the first instance.[1]

Admiral Jay Johnson, when chief of naval operations, expressed very similar concerns when he declared:

> Over the past 10 years, it has become evident that proliferating weapon and information technologies will enable our foes to attack the ports and airfields needed for the forward deployment of our land-based forces.

[1] Bill Gertz, "The Air Force and Missile Defense," *Air Force Magazine,* February 1996, p. 72.

> I anticipate that the next century will see those foes striving to target concentrations of troops and materiel ashore and attack our forces at sea and in the air. This is more than a sea-denial threat or a Navy problem. It is an area-denial threat whose defeat or negation will become the single most crucial element in projecting and sustaining U.S. military power where it is needed.[2]

Perhaps most revealing, however, are the comments of a retired Indian brigadier general, who observed that future access to forward bases:

> is by far the trickiest part of the American operational problem. This is the proverbial "Achilles heel." India needs to study the vulnerabilities and create covert bodies to develop plans and execute operations to degrade these facilities in the run up to and after commencement of hostilities. Scope exists for low cost options to significantly reduce the combat potential of forces operating from these facilities.[3]

As Admiral Johnson observed, U.S. maritime forces will also confront new challenges to their ability to project power. The Navy will increasingly find itself operating in the littoral, for two reasons. First, there are no navies that can challenge the U.S. fleet on the high seas. Second, with forward bases coming under increased risk of destruction from ballistic and cruise missile attack, the fleet will have to move closer to shore to support efforts to defeat anti-access forces and project power against other enemy forces ashore.

As this happens, the fleet will increasingly encounter so-called area-denial forces in the form of sophisticated anti-ship mines, coastal submarine flotillas, onshore high-speed anti-ship cruise missiles and other enemy capabilities that may place the U.S. carrier-centric fleet at significantly greater risk. In short, as the fleet moves from Cold War era blue-water sea control to focus increasingly on green-water littoral sea control, it will come within range of more and more of the enemy's military capabilities. Making matters worse, the screening elements that protect the carrier, the Navy's core strike element, will begin to collapse back on the carrier as they encounter the coastline.[4] Thus, not only will maritime forces come within range of more enemy systems, their warning time of attack will be reduced as well. The diffusion of weapon systems, such as high-speed antiship cruise missiles, will reduce warning time even further.[5]

These concerns have not been lost on the Department of Defense leadership. As Secretary of Defense Rumsfeld noted, "[P]otential adversaries . . . see that our ability to project force into the distant corners of the world where they live depends, in some cases, on vulnerable foreign bases."[6] Deputy Secretary of Defense Paul Wolfowitz, in expanding on Secretary Rumsfeld's observation, stated that:

> U.S. forces depend on vulnerable foreign bases to operate—creating incentives for adversaries to develop 'access denial' capabilities to keep us out of their neighborhoods. We must, therefore, reduce our dependence on predictable and vulnerable base structure, by exploiting a number of technologies that include longer-range aircraft, unmanned aerial vehicles, and stealthy platforms, as well as reducing the amount of logistical support needed by our ground forces.[7]

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[2] Admiral Jay Johnson, "Anytime, Anywhere: A Navy for the 21st Century," *Proceedings,* November 1997, p. 49.

[3] Brigadier V. K. Nair, *War in the Gulf: Lessons for the Third World* (New Delhi, India: Lancer International, 1992), p. 230.

[4] The anti-air warfare (AAW) and anti-submarine warfare (ASW) ships that protect the carrier obviously cannot operate on land. As the carrier maneuvers closer to shore in order to strike targets inland, the protective "bubble" provided by these ships will begin to collapse as they encounter the shoreline. It is important to note that these escorts typically operate at great distances from the carrier when in a warfighting environment. For the sake of example, if a carrier were positioned in Washington, DC, anti-air escorts (such as Aegis cruisers and destroyers) would be positioned as far away as Harrisonburg, Pennsylvania; Trenton, New Jersey; and Norfolk, Virginia. This example is taken from Admiral James D. Watkins, *The Maritime Strategy* (Annapolis, MD: U.S. Naval Institute Press, January 1986), p. 13.

[5] For a discussion of the area-denial threat, see VADM Arthur K. Cebrowski and Captain Wayne P. Hughes (U.S.N, Ret.), "Rebalancing the Fleet," *Proceedings,* November 1999; and Captain Wayne P. Hughes (U.S.N, Ret.), *Fleet Tactics and Coastal Combat* (Annapolis, MD: Naval Institute Press, 2000), pp. 145–68.

[6] Speech, Secretary of Defense Donald Rumsfeld, The National Defense University, Washington, DC, January 31, 2002.

[7] Testimony, Paul D. Wolfowitz, House Budget Committee, Washington, DC, February 12, 2002.

Their concerns are reflected in the QDR's critical operational challenges, and also in the document's elaboration on the kinds of capabilities required to defeat the challenge:

> These joint forces . . . must be lighter, more lethal and maneuverable, survivable, and more readily deployed and employed in and integrated fashion. They must be not only capable of conducting distributed and dispersed operations, but also able to force entry in anti-access or area-denial environments.[8]

> U.S. forces . . . must have the ability to arrive quickly at non-traditional points of debarkation to mass fire against an alerted enemy and to mask their own movements to deceive the enemy and by pass its defenses.[9]

Thus would-be adversaries have strong incentives to adopt this indirect approach to defeating, or deterring, U.S. power-projection operations. The effort, as noted above, seems well under way. According to a recent Defense Science Board (DSB) study, a regional power's development of this kind of anti-access capability by 2010 is quite plausible, even given relatively severe resource constraints.[10] A former commander in chief of U.S. forces in Korea declared that the problem of forward base access is not a problem for the U.S. military of 2010, but one has existed in embryonic form in Korea for much of the 1990s, and which will only worsen over time.

Defeating the A2/AD threat promises to be a very challenging proposition. States developing A2/AD forces are doing so in such as way as to make them more difficult to target. To this end they are emphasizing, or are likely to emphasize:

- Mobility and dispersion (e.g., mobile launchers for ballistic and cruise missiles);
- Stealth (e.g., diesel submarines; low-observable cruise missiles; mines);
- Hardening of fixed targets (e.g., WMD production and storage facilities; command centers; leadership facilities);
- Deception (e.g., coastal combatants masquerading as commercial vessels; terrorists posing as noncombatants);
- "Hostages" (e.g., positioning military forces in noncombatant neighborhoods);
- Geography (e.g., deploying forces far inland to stress U.S. forces' range and targeting capabilities); and
- Sanctuaries (e.g., neutral party space assets; the threat of WMD attacks to create a national sanctuary; positioning military forces in very close proximity to cultural landmarks, hospitals, and related structures to create a local sanctuary effect).

To the extent they must operate outside of the enemy's A2/AD envelope, U.S. forces will find their reconnaissance, surveillance, target acquisition (RSTA) timelines stretched, making destruction of enemy critical mobile A2/AD targets an even more difficult proposition. Indeed, a critical sub-competition of the A2/AD challenge involves enemy efforts to stretch U.S. RSTA and engagement timelines versus U.S. military attempts to compress its engagement cycle timelines. In response, it appears we will have to place substantially greater emphasis on long-range/long-dwell reconnaissance and strike capabilities.

Of course, such timelines can be compressed, and the opportunities for defeating the A2/AD threat enhanced, by U.S. forces operating underneath the enemy's A2/AD umbrella. This will likely require forces that can insert themselves in a distributed manner, and which can both operate and sustain themselves in highly distributed, highly networked manner. It also favors forces that further minimize their risk of detection through various forms of stealth—to include signature reduction; and cover, concealment and deception—as well as mobility.

In short, enemy asymmetric strategies—such as threatening nontraditional attacks on the American homeland and anti-access/area-denial—are designed to offset the U.S. military's dominance in traditional forms of warfare. They also represent cost-imposing strategies in that the U.S. military in general will likely incur substantially greater costs to offset these asymmetric strategies than America's enemies will incur to generate them.

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[8] Department of Defense, Report of the Quadrennial Defense Review (Washington, DC: DOD, September 2001), p. 32.

[9] Ibid., p. 43.

[10] DSB, Final Report of the Defense Science Board Task Force on Globalization and Security (Washington, DC: Office of the Under Secretary of Defense for Acquisition and Technology, December 1999), p. vi.

NEEDED: A TRANSFORMATION STRATEGY

Transformation is not synonymous with a revolution in military affairs. Rather, transformation is a process that a defense establishment undertakes if it believes a military revolution is under way, or is potentially under way. The Department of Defense therefore needs a strategy for transformation. It is not a warfighting strategy (although it would include a vision of what the transformed conflict environment would be like). Rather, it is a strategy for large-scale innovation, to include such major elements as changes in the personnel management system, in the selection of senior leaders, in procurement strategy, and in training—especially field exercises conducted at the operational level of warfare.

A Vision of Future Warfare

While the Department of Defense rationale for transformation is persuasive, its process for effecting transformation is more difficult to discern and, hence, to evaluate. A transformation process is needed to validate vision, to identify the best means for addressing critical challenges, and to determine if opportunities can be realized (and how soon, and to what degree). The process should enable feedback on transformation initiatives (e.g., new operational concepts, doctrine, systems, networks, force structures). This will enable senior Defense leaders to gauge whether the transformation path being pursued is, in fact, the correct path, or to make the appropriate adjustments if it is not. Such a process can help inform choices about investments in future capabilities—R&D, procurement, personnel and force structure—so as to reduce uncertainty in a resource-constrained environment.

Regrettably, the current joint vision statement does not present such a compelling vision. The Joint Chiefs of Staff's (JCS) vision, set forth in *Joint Vision 2010,* and sustained in *Joint Vision 2020,* speaks in general terms of the need to achieve positional advantage over an adversary ("dominant maneuver"), engage the enemy effectively ("precision engagement"), support such activities efficiently and effectively ("focused logistics") while protecting friendly forces ("full-dimensional protection").[11] While these are desirable qualities for the U.S. military to pursue, they offer little in the way of guidance as to how its missions (i.e., the character of key military competitions) might change over time (e.g., projecting power against an A2/AD; defending against asymmetric attacks on the U.S. homeland). Indeed, stripped of their adjectives, the characteristics of effective "maneuver," "engagement," "logistics" and "protection" would be those desired by *any* military organization, in *any* era.

JOINT CONCEPTS OF OPERATION

The next step along the transformation path is to identify "point-of-departure" concepts of operation that set forth, in significant detail, how the services see themselves achieving critical operational goals, to include their role as part of a Joint team. As Secretary Rumsfeld rightly noted, "Exploiting the revolution in military affairs requires not only technological innovation but also development of operational concepts. . ."

Why are such concepts of operation so important? Point-of-departure concepts of operation describe the military's hypothesis regarding how it intends to meet critical operational goals or exploit potential opportunities.

Although each critical operational goal requires a concept of operations, there are two in particular that merit attention, as the others are subsumed in them. The first is how we intend to defend our homeland from attack from ballistic and cruise missiles, the covert introduction of WMD, electronic attack on the information infrastructure, and terrorist attack.

The second concerns how the U.S. military is going to project power against the (A2/AD) threat, and how power-projection operations will deny an enemy sanctuary. These critical goals are interrelated, and are also related to the other critical goals pertaining to information operations, space control, and creating C[4]ISR architectures.

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[11] JCS, *Joint Vision 2020* (Washington, DC: DOD, 2001), pp. 4–5, 13, 20–27. To be sure, *Joint Vision 2020* notes the risks from changes in the conflict environment brought about by adversaries pursuing asymmetric strategies. The Joint Chiefs go on to say that such strategies are "perhaps the most serious danger the United States faces," that asymmetric advantages may be pursued on any level of warfare—strategic, operational or tactical—and that "adversaries may pursue a combination of asymmetries. . ." The reader is further instructed that "asymmetric threats are dynamic and subject to change, and the U.S. Armed Forces must maintain the capabilities necessary to deter, defend against, and defeat any adversary who chooses such an approach." Yet despite these general statements of concern there is little in the way of detailed discussion as to what form (e.g., anti-access, area denial) asymmetric threats might take.

At present, there is no point-of-departure joint operational warfighting concept for meeting these goals, either collectively (i.e., a grand integrated operational concept) or individually (e.g., an operational concept for defeating the A2/AD challenge). To be sure, the individual services have developed operational concepts (e.g., Global Strike Task Force; Assured Access) that purport to address how they would meet a single critical challenge (principally A2/AD). However, they are rudimentary at best.

Absent plausible concepts of operation oriented on the critical operational challenges, it is natural (indeed, perhaps inevitable) that the services will gravitate toward existing doctrine and view transformation essentially improving current methods of conducting operations.

Thus until the U.S. military devises a plausible joint operational concept (or, more precisely, concepts) for dealing with the critical emerging challenges, it seems very likely that transformation will be retarded. Moreover, absent such warfighting concepts and a process for validating them, it will likely prove difficult, if not impossible, to obtain a reasonably accurate measure of how the transformation process is unfolding.[12]

In short, to determine whether or not a new (or prospective) capability is "transformational," (and whether a "legacy" capability should be preserved, and at what level), you have to have some sense of how you are going to address the critical operational goals laid down in the QDR. Since such concepts have either not been formulated, or are severely flawed, it is difficult to assess the relative merit of DOD budget or investment priorities.

Leader Tenure

By its nature, dramatic change in large military organizations almost inevitably involves a long-term process that spans a decade or more. However, the U.S. military's institutional practices typically find senior leaders rotated out of their assignments every 3 or 4 years. This rotation cycle may work well for leaders whose responsibilities are near-term oriented (for example, the regional CINC who is responsible for the immediate warfighting mission in his area of operation). However, it is much less desirable in situations where a senior leader is tasked with the mission of effecting transformation.

Recent history shows that military organizations that have successfully transformed have almost always had a few key senior leaders—who both understood the new vision of the future conflict environment, and how to bring about change in large, complex military organizations—serve an extended tour of duty. This tour often runs double or even triple the length of a typical flag (i.e., general or admiral) officer tour in today's U.S. military. During the German army's transformation to blitzkrieg, for example, the head of its shadow general staff, General Hans von Seeckt, served 7 years in that position. The American Navy's exploitation of naval aviation was shepherded by Vice Admiral William Moffett, who remained head of the Navy's Bureau of Aeronautics for 12 consecutive years. The absence of extended tours of service for transformation-minded senior U.S. military leaders serving in key positions should give pause to those who are concerned about the U.S. military's prospects for transformation.

A New Modernization Strategy

Military revolutions complicate modernization strategies in that they typically find the effectiveness of certain military systems in rapid decline. The displacement of the battleship by the aircraft carrier is but one example. However, it is far from clear in advance which military systems, operational concepts, or new force structures will work, and which will not. Put another way, not only does a transformation strategy need to be initiated well in advance of the actual fielding of the transformed force, it also must take into account military-technical uncertainty. How might our modernization strategy account for this?

For a start, the services will have to tap into rapidly advancing technologies to develop new military systems that can be applied within the framework of new operational concepts executed by new kinds of military organizations. It is this combination of technology, emerging military systems, new operational concepts and force restructuring that often produces the discontinuous leap in military effectiveness characteristic of military revolutions.

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[12] Note that concepts like "rapid decisive operations" (RDO) and "effects-based operations" (EBO) do not, by themselves, inform us in any significant detail as to how the six critical goals are to be addressed. They might be more accurately described as visions, rather than operational concepts.

Given the above discussion, one would expect to see the DOD accord greater emphasis on R&D efforts in support of "wildcatting"—experimenting with a limited (but operationally significant) number of a wide variety of military systems, as well as operational concepts, and force structures. The goal here is to identify those that are capable of solving emerging strategic and operational problems, or exploiting opportunities, while eliminating those that are not.

This reveals a second element of a successful modernization strategy for transformation: to avoid being "locked in." Lock-in occurs when limited resources are spent to purchase a system in large numbers. The result both narrows the range of options (as fewer types of systems are procured) for dealing with emerging challenges, and risks locking the force into the current state of technological advancement. Resources that could have supported exploring a wider range of systems and sustaining continued advances in technology are, instead, locked into the existing force.

As noted above, the end result may be a happy one—if the U.S. military "guesses right" (i.e., if the fielded force serendipitously turns out to be the "right" force to meet the post-transformation challenges), and if the rate of technological advance slows. If not, the Department of Defense risks having committed itself to a single-point solution in a very uncertain world. It will have either bought the wrong systems, or the "right" systems prematurely—before the rapidly advancing technologies that enable them have matured.

The U.S. Navy understood this well in the 1920s and 1930s, during the transformation from a battle fleet centered around battleships to one focused on fast carrier task forces. Early on it was unclear whether naval aviation would be optimized by spreading it throughout the fleet (e.g., having a few aircraft on every surface combatant), or concentrated on aircraft carriers. Moreover, it was also unclear what kind of carrier would be optimal. Consequently, the Navy created options for itself by wildcatting. It invested in four different classes of carriers, but only produced six carriers in all. It also experimented with aircraft on carriers and on surface ships, and even tried working with air ships.

Not only has wildcatting been an effective element of a modernization transformation strategy within the services, but increasingly among them as well. Thus the Army, Navy and Air Force each had ballistic missile programs in the 1950s. The Air Force program led, ultimately, to the Minuteman ICBM, a key element of the U.S. nuclear strike mission force. The Army program was instrumental in the birth of the space program (its Jupiter rocket was used in the Redstone program), and the Navy program led to the Polaris submarine and the nuclear ballistic missile submarine force, a cornerstone of U.S. nuclear deterrence.

The end result of each of these wildcatting efforts was the creation of strategic "options" on a range of military capabilities. These options could be used both to dissuade prospective adversaries from resuming a high level of military competition and, in the event dissuasion or deterrence failed, exercising those options to prevail in the conflict itself. It is important to note that creating such options need not involve a defense budget "train wreck." Recall that the U.S. military developed the foundation for strategic aerial bombardment, the carrier navy, modern amphibious warfare, and mechanized air-land operations during the relatively lean budget years of the 1920s and 1930s. What it does imply, however, is visionary leaders, and a different set of strategic—and budget—priorities.

Unfortunately, the Department of Defense modernization strategy today remains much the same as it was during the Cold War era, with its emphasis on large-scale, serial production of relatively few types of military systems and capabilities. To the extent possible, we should avoid premature large-scale production of new systems, be they legacy or transformational, until they have clearly proven themselves helpful in meeting critical operational goals. With respect to systems that are characterized as transformational, it is important to avoid the pitfalls of "false starts" and "dead ends."

False Starts. In periods of transformation, military organizations run the risk avoid buying large quantities of a promising system too early, and the U.S. military is no exception. The risk of committing to a "false start" is demonstrated in the U.S. Navy's affection for its first carrier designed from the keel up, the *Ranger,* which was commissioned in 1934. Although some Navy leaders had pressed for construction of 5 *Ranger*-class carriers, wargame analysis and fleet problems soon indicated that, at roughly 14,000 tons, the *Ranger* was far too small to meet many of the demands of future fleet operations. As it turned out, the *Essex*-class carriers that formed the backbone of the Navy's fast carrier task forces in World War II each displaced nearly twice as much tonnage as the *Ranger.*

Dead Ends. Military systems or capabilities that appear promising, or even revolutionary, sometimes fail to live up to expectations. In this case, the challenge of

those leading the transformation effort is not to avoid buying them too early; rather, it is to avoid buying them at all. The experience of the U.S. Navy during the development of naval aviation in the interwar period again provides an example of how rigorous experimentation and field exercises can help avoid dead ends. In 1930 the Navy's Bureau of Aeronautics proposed the construction of eight 10,000-ton flying-deck (or flight-deck) cruisers. The ships—half cruiser and half flight deck—were subjected to war game analysis at the Naval War College and some experiments employing surrogates in the fleet. Both painted a distinctly unfavorable picture of the hybrid ship, and it quickly sank beneath the Navy's programmatic waves.

The Key Role of Field Exercises and Experimentation

Field exercises are especially beneficial during periods of high uncertainty and rapid change, such as confronts us today. Military field exercises that incorporate experimentation can play an important role in reducing the uncertainty about the future conflict environment and those capabilities, force elements and operational concepts that will dominate that environment. In so doing, field exercises better inform modernization strategies for transformation, such as the one described above, thereby enhancing their ability to employ limited resources more effectively. The QDR (quite correctly) declares, "Field exercises that incorporate experimentation—at both the joint and the service levels—provide an indispensable means for solving emerging challenges." Moreover, it states, "Exercises and experiments are a critical phase in developing new types of forces and operational concepts that can respond to emerging operational challenges and dominate opponents who effectively exploit aspects of the changing security environment."

The ultimate expression of such efforts will likely be the conduct of service and joint exercises at the operational level of warfare. This is because joint operations (i.e., operations involving two or more of the military services) will almost certainly dominate future military operations, and because the operational level of war is the level at which military campaigns are conducted.[13] Such exercises offer the best opportunity to obtain high-fidelity feedback on the likely value of new force designs, capabilities and operational concepts.

During the latter stages of the Cold War, the services invested in a number of high-fidelity training facilities that greatly enhanced the value of their field training. For example, the Army's National Training Center (NTC) at Fort Irwin, California, prepared brigade-size units for combined arms mechanized warfare against a Soviet-style adversary. Similarly, the Air Force and Navy put their pilots through Red Flag and Top Gun air combat training, respectively.

In terms of a process for enabling transformation, the Department has provided a great deal of verbal support for joint and service field exercises and experimentation. As Secretary of Defense Rumsfeld stated, "All the high-tech weapons in the world won't transform our Armed Forces, unless we also transform the way we think, train, exercise and fight."

The QDR also notes "the services invested in a number of high-fidelity training facilities that greatly enhance the value of their field training. Yet comparable facilities do not exist to support joint high-fidelity field exercises and experiments." Moreover, "joint and service field exercises oriented on military transformation have suffered from chronic resource shortages."

However, despite these numerous statements attesting to the value and importance of field exercises and experimentation to the transformation process, and pledges to pursue (indeed, expand upon) these activities aggressively, the fiscal year 2003 defense program and budget submitted to Congress provide for no significant change from the Clinton administration's policies, programs and funding levels. Specifically:

- A Joint National Training Center is not established; nor is a joint opposing force;
- Joint Forces Command has not had its exercise budget increased significantly over the FYDP; and
- The pace of joint exercises/experiments remains as established by the previous administration.

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[13] The Joint Chiefs of Staff have gone so far as to declare "The joint force, because of its flexibility and responsiveness, will remain the key to operational success in the future. . . To build the most effective force for 2020, we must be fully joint: Intellectually, operationally, organizationally, doctrinally, and technically." JCS, *Joint Vision 2020* (Washington, DC: DOD, 2001), p. 2.

Required Military Capabilities

To meet this critical operational goals, we will need to transform our military into a fighting force that, relative to today's force—and to the force that is currently envisioned in the QDR modernization program—places substantially greater emphasis on the following characteristics:

- Mobility
- Stealth (in all its forms, to include undersea forces)
- Electronic protection
- Highly dispersed, electronically networked combat forces and supporting elements (e.g., logistics)
- Highly distributed insertion through nontraditional air and sea points of debarkation
- Extended-range systems and strikes
- Precision, electronic, and nonlethal forms of strike
- Unmanned/automated systems
- Compressed operational cycle rates

Transformation and DOD's Investment Portfolio: Skipping a Generation

During his candidacy for president, President Bush attracted a great deal of attention when he declared that the United States should:

> modernize some existing weapon systems and equipment necessary for current tasks. But our relative peace allows us to do this selectively. The real goal is to move beyond marginal improvements—to replace existing programs with new technologies and strategies: to skip a generation of technology . . . I intend to force new thinking and hard choices.[14]

The president's call to skip a generation of weapon systems in order to both better prepare for newly emerging challenges to the national security, and to exploit the potential of rapidly advancing military-related technologies is consistent with a modernization strategy during a period of military transformation.

Given this framework, what systems stand out as prime candidates for "skipping a generation?" What "leap-ahead" systems or capabilities are sufficiently attractive as to warrant such a move? Finally, how might the administration hedge against the possibility that in pursuing a leap-ahead capability, it may discover that the alternative system or capability, however promising it may appear today, cannot be realized in anticipated the time frame, or perhaps not at all? The following discussion presents three candidates for "skipping" a generation, and responds to the questions raised above.

The Joint Strike Fighter (JSF) (conventional take-off and land (CTOL), or Air Force, version) [15]

The administration has decided to move ahead with the JSF program established under the Clinton administration. The current plan is to procure a total of 2,852 of these tactical fighters for the Air Force, Navy and Marine Corps, of which 1,763 would be Air Force CTOL fighters. To be sure, the JSF represents a significant improvement over each service's existing tactical aircraft. However, the buy of the JSF CTOL version assumes the U.S. military will continue to enjoy unimpeded access to forward air bases for the indefinite future. Yet, as both senior defense civil and military leaders have stated, such access is already problematic, and will likely worsen over time. Indeed, developing new capabilities to defeat the anti-access/area-denial threat is considered a critical operational goal.

Leap-Ahead System: Extended-range Unmanned Combat Aerial Vehicles, or UCAVs. The role of unmanned systems has increased in recent U.S. contingency operations in the Balkans and Afghanistan. Unmanned systems are also engaged in supporting U.S. air patrols in Iraq (i.e., Operations Northern and Southern Watch). In Afghanistan the CIA employed armed Predator Unmanned Aerial Vehicles (UAVs) with Hellfire missiles. In effect, this made the Predator, which had been designed to perform a reconnaissance mission, a UCAV.[16] The Air Force has in development a UCAV whose principal mission will be the suppression of enemy air defenses ("SEAD"). The Navy has initiated a UCAV program of its own.

The opportunity exists to move much more aggressively in developing a range of UCAVs. Since UCAVs are remotely piloted, they can utilize the weight and space

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[14] George W. Bush, Speech on Defense Policy, The Citadel, Charleston, SC, September 23, 1999.

[15] With the awarding of the JSF contract, the aircraft has been designated the F–35.

[16] Building on the CIA's success, in the just-submitted fiscal year 2003 budget, the Air Force proposes to procure 22 Predators configured to carry Hellfire missiles.

that would normally support the pilot for other purposes, such as to increase range or payload. They might also be designed to permit their launch and recovery from relatively austere landing strips. A combination of extended-range (and perhaps stealthy) Air Force UCAVs, sea-based Navy UCAVs, and distributed, land-based "tactical" UCAVs (for the Army and Marine Corps) would provide future commanders with a range of options for addressing the A2/AD challenge. Because they do not require pilots—or flight hours for pilot training and extensive ground maintenance—UCAVs also promise to reduce substantially manpower requirements, and operations and maintenance costs. Finally, UCAVs are also projected to cost between one-third and one-half the price of comparable manned combat aircraft.

Major Unknown Planning Factors: How many manned aircraft missions can be accomplished effectively by UCAVs, and how soon? While UCAVs have great promise, it is far from clear how many missions they can assume from the manned combat air arm, or how quickly they can be made to do so. It seems clear that UCAVs can almost certainly function as "reusable Tomahawks"; i.e., they can fly to a fixed target, drop a precision-guided munition (PGM), and return to base. As the Air Force program indicates, UCAVs also show promise in performing the suppression of enemy air defenses (SEAD) mission. Another promising mission for UCAVs is the one they performed in Afghanistan: exploiting their relatively long loiter time to play an important role in the destruction of critical mobile targets (e.g., mobile missile launchers, terrorists).

Hedge: The JSF is viewed primarily as an efficient deliverer of precision munitions. But the U.S. military has many options for delivering ordnance on targets over significant distances. The Department of Defense can avoid locking in to a large JSF buy while also hedging against a slower-than-anticipated development of UCAVs with the following capabilities:

- Reopening the B–2 production line to enable the Air Force to redress the imbalance between its short- and long-range manned strike platforms;
- Increasing substantially the number of PGMs carried in the long-range bomber fleet through accelerating programs focused on small, smart munitions;
- Accelerating Army deep-strike capabilities (e.g., Comanche, ATACMS Block IIA, in addition to a tactical UCAV) to provide more survivable forward operating forces; and
- Continuing "bridge" production of F–16 Block 60s (Air Force) to address near-term tactical air fleet aging issues (e.g., increased maintenance requirements).

Current Status: The new defense program essentially ratifies the Clinton administration's position to proceed with developing the JSF and purchasing 1,763 of the CTOL version for the Air Force.

The DD–21 Land-Attack Destroyer

The DD–21 Land-Attack Destroyer, with its large number of vertical launch systems (VLS), represented the navy's effort to enhance its capabilities to support the battle ashore. With the Soviet navy gone (and the "blue-water" threat with it), the Navy has rightly shifted its emphasis from open-ocean blue waters to littoral "green" waters. As it does, the Navy will encounter a very different threat environment. As noted above, the Department of Defense considers this area-denial threat, in combination with the anti-access threat, a critical operational challenge.

In this environment, the DD–21s, whose size seemed likely to approach that of the first modern battleship (*HMS Dreadnought*), might have been so few in number (32 were planned) and so costly to replace that we would have been increasingly reluctant to deploy them into the littoral until friendly sea control had been established.[17] This made the DD–21 a poor fit for a defense strategy that calls on the military to "deter forward" and, in the event deterrence fails, be "capable of swiftly defeating attacks . . . from a forward deterrent posture."[18]

Skip a Generation Objective: The streetfighter concept employing network centric warfare. The concept asserts that advanced information technologies are an asymmetric U.S. advantage that can enable highly integrated, yet highly distributed, maritime operations. An effort should be made to explore the potential of squadrons of much smaller, faster, stealthier and less expensive surface combatants. These combatants could be more effective in supporting the campaign to seize control of the littoral and strike targets ashore. Owing to their substantially greater numbers

[17] *HMS Dreadnought* displaced 17,900 tons. The DD–21 was projected to displace roughly 12–14,000 tons.

[18] *QDR,* pp. 20–21.

and lower cost relative to the DD–21, such combatants could be employed both earlier and more aggressively in the littoral at far lower risk.[19]

Major Unknown Planning Factors: Is it possible for information technologies to create a "distributed" capital ship, and, if so, how soon? The idea of violating the principal of mass to gain the advantage of reduced vulnerability, while at the same time avoiding the penalty of reduced military effectiveness brought on by dispersion, is undeniably attractive. However, although the concept has been percolating for a number of years, and has shown promise in some wargames, the Department of Defense has yet to produce small combatant prototypes that could be used to determine the potential of such a force. Introducing a squadron of such ships into the Navy's Fleet Battle Experiment (FBE) program could substantially increase DOD's understanding of the Streetfighter Concept and its viability for future maritime operations.

Hedge: As with the JSF, the DD–21 was viewed principally a strike platform. As noted, the U.S. military has many different ways to conduct strike operations. Two readily available near-term maritime force hedges are:

- Converting the four SSBNs coming out of the nuclear deterrent force to SSGNs; and
- Increasing the quantity of PGMs to support existing surface combatant VLS tubes.

The Bush administration's defense program exploits both options. Other strike hedges that should be pursued include those mentioned with respect to the JSF (i.e., Army deep-strike assets; increasing the PGMs aboard the bomber force; reopening the B–2 line, etc.).

Current Status: In November 2001 the Navy restructured the DD–21 program. In lieu of proceeding with the single DD–21 class of destroyers, the Navy has decided to develop a "family of advanced technology surface combatants," comprising a land-attack destroyer (DD–X), a guided-missile cruiser (CG–X), and a Littoral Combat Ship (LCS). It is far from clear, however, that this restructuring represents an effort to skip a generation in weapons development. Indeed, under the Surface Combatant–21 (SC–21) program, undertaken in 1995, the Navy planned to build both a land-attack destroyer and a cruiser variant. One potentially significant difference is the plan to build a Littoral Combat Ship (LCS), whose description generally conforms to the streetfighter concept. At present, however, it remains unclear how vigorously the Navy intends to pursue the LCS program, or the role it envisions such combatants playing in addressing the anti-access/area-denial challenge.

The Crusader Artillery System

The Crusader artillery system represents a major advance in capabilities over the Army's current Paladin artillery system. As with the Joint Strike Fighter and Land-Attack Destroyer, however, the issue is not whether Crusader represents a major improvement over similar systems currently in the U.S. military's inventory. Rather, it is whether opportunities exist to field a significantly different kind of capability that is more relevant for the new critical operational challenges the Bush administration sees confronting the U.S. military.

Today's Army finds itself challenged to become more of a rapidly deployable expeditionary force. Over the last decade the Army has had to deploy forces rapidly to areas where the service had little in the way of forward-deployed forces, such as in Africa, the Balkans and the Persian Gulf. This has posed problems for the Army, as its heavy units require enormous amounts of airlift to deploy quickly, in addition to well-developed bases at their point of debarkation. Unfortunately, strategic airlift is very costly and thus, hard to come by. It also is in great demand by the Air Force. Moreover, less-developed regions of the world typically have modest transportation infrastructures, to include air base facilities.

This has led the Army to undertake an ambitious effort to transform its force structure to enable it to deploy substantial combat power quickly to a threatened region by air. A major effort is underway to reduce the weight of Army formations (thus reducing the demand on strategic lift) while retaining as much of their combat

[19] For an overview of the network centric warfare and streetfighter concepts, see Wayne Hughes, *Fleet Tactics and Coastal Combat* (Annapolis, MD: Naval Institute Press, 2000), pp. 145–67; and Vice Admiral Arthur K. Cebrowski and Captain Wayne P. Hughes, Jr., U.S.N (Ret.). "Rebalancing the Fleet," *U.S. Naval Institute Proceedings* (November 1999). For a thoughtful opposing view of the littoral area-denial challenge, see Arthur H. Barber III and Delwyn L. Gilmore, "Maritime Access: Do Defenders Hold All The Cards?," *Defense Horizons,* October 2001.

punch as possible. Hence the Army's Future Combat System (FCS) initiative, which, in part, hopes to displace systems like the 70-ton Abrams tank with a 20-ton FCS.[20]

Beyond losing weight while retaining muscle, the Army must develop the capability to project substantial land power rapidly, and sustain it indefinitely, in the absence of access to forward bases and large, fixed logistics centers, as called for in the QDR. This implies an ability to effect a distributed insertion of Army forces into a threatened area, as well as an ability to conduct highly distributed, or dispersed operations, employing C4ISR systems to scout the physical gaps between Army formations and extended-range fires to cover them.

Furthermore, the Army also needs to exploit its advantages in accessing joint C4ISR capabilities to conduct precision strikes at extended ranges. In so doing it can minimize the vulnerability of lighter forces by exploiting opportunities to outrange enemy ground force strike systems (e.g., artillery, attack helicopters).

While few will contest that Crusader is a superior system to the Paladin it is designed to replace, it is also true that:

- Plans call for the Crusader to reach the field around the same time the Army plans to field its new Future Combat Systems—a variant of which is intended to replace the Crusader. This begs the question of why the Army would not pursue the FCS system more vigorously, especially given the likely spin-off benefits for other FCS configurations.
- The two Crusader vehicles are set to weigh about 80 tons, while the Paladin weighs 32 tons, and the FCS is planned to weigh no more than 20 tons. Given the great lengths to which the Army is going to enhance its forces' ability to deploy rapidly, it seems odd indeed that it would pursue an artillery system that weighed 150 percent more than the system it is replacing, while at the same time designing a replacement for the Abrams tank whose specifications call for a 70 percent reduction in weight.
- The greatest gain in Army artillery effectiveness will likely come from the Excalibur precision artillery round, now in development. But this munition can be fired from a Paladin system, as well.
- While it is true that the Crusader outranges the Paladin, the fact remains that other Army strike systems—to include the Army's multiple-launch rocket system (MLRS), HIMARS, Apache and Comanche helicopters, and prospectively Army UCAVs—outrange the Crusader. If greater emphasis on longer-range fires is needed, the Army has ready-made options for pursuing them other than Crusader.
- Even at its reduced weight (the system was originally designed at 110 tons), the Crusader will not fit on a C–130, violating a key Army design metric for both the Interim and Objective Forces.
- At a price tag of $11 billion (with $2 billion already having been invested), Crusader represents an enormous opportunity cost for an Army that cannot fully fund key elements of its Objective Force, to include support for developing strategic and intra-theater lift options, C4ISR capabilities, training facilities, and the Future Combat System.

Skip a Generation Objective: Army Deep-Strike Brigades (DSBs). The Army's challenge is less how to expand its traditional forms of fire support and more on how to deploy such firepower rapidly in an anti-access environment, and on how to exploit its unique potential among all the world's armies to see and strike at extended ranges. This is the direction the Army is headed in with respect to its vision for the Objective Force. Consistent with that vision, an Army Deep-Strike Brigade would emphasize long-range reconnaissance and strike assets. Such capabilities could include tactical UAVs and scout helicopters that can self-deploy and operate off of austere basing facilities; remote unattended ground sensors; long-range reconnaissance patrols; and support from sister service C4ISR systems such as satellites and UAVs. As its name indicates, the DSB would also have the means to strike at long ranges with such systems as tactical UCAVs, attack helicopters and rocket artillery (e.g. HIMARS lightweight missile launcher employing ATACMS munitions).[21] Over the longer term, Future Combat System vehicles could both screen the DSB from the close fight and provide air defense. Among the programs that could be accelerated with the cancellation of Crusader would be Army UAV and UCAV programs, the Comanche helicopter, and development of extended-range versions of ATACMS.

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[20] The Abrams weighs roughly 70 tons with its depleted uranium armor, and approximately 63 tons without it.

[21] ATACMS stands for Army Tactical Missile System, while HIMARS stands for High Mobility Artillery Rocket System.

Major Unknown Planning Factors: As noted above, it is not clear how quickly UAVs and UCAVs will mature. Nor is it clear to what extent they will be able to displace manned systems in performing the broad range of reconnaissance and strike missions. The Army's potential to see deep and to fight effectively at great range on a nonlinear battlefield has yet to be demonstrated in field exercises against an opposing force possessing the kinds of capabilities that might be encountered over the next decade in conflict against prospective adversaries.

Hedge: The Army can hedge against these uncertainties by upgrading or replacing its Paladin self-propelled howitzers with systems produced by our allies, such as the German PzH 2000. More importantly, perhaps, the Army can accelerate the procurement of the Excalibur smart artillery round.[22] As the experience of the last decade has shown, in terms of generating combat capability and military effectiveness, platforms are generally declining in importance relative to precision-guided munitions and to their ability to tap into the information provided by C^4ISR networks.

Current Status: The administration's defense program retains the Crusader buy as outlined by the Clinton administration.

Skipping "Skipping A Generation"?

To sum up, the Department of Defense should heed President's guidance and seize the opportunity to skip a generation in military capability. Such an approach offers the following advantages:

- Options can be created for dealing with an uncertain future—and the risk of putting too many eggs in the short-range tactical aviation, large surface combatant, or heavy field artillery baskets—can be avoided;
- If successful, skip-a-generation capabilities outlined above promise to be far more effective in meeting the QDR's critical operational challenge of maintaining the U.S. ability to project decisive military power to areas of vital interest in the face of the growing A2/AD threat;
- Would-be adversaries' knowledge that the United States is already moving to develop access to advanced military capabilities may serve as a powerful deterrent to their willingness to enter into a military competition with America—in short, skipping a generation can be a key element in the administration's dissuasion strategy; and, finally
- Relatively low-cost hedges can be put in place that guard against the uncertainty that the "leap-ahead" capabilities may not materialize as soon as forecast, or be as effective as anticipated.

THE PRICE OF FAILURE

The United States military must transform itself, and it must begin now. As Secretary Rumsfeld has said, "Transformation is not a goal for tomorrow, but an endeavor that must be embraced in earnest today. The challenges the Nation faces to not loom in the distant future, but are here now."

To its credit, the Bush administration has both clearly defined what transformation is, and provided a persuasive case as to why the world's best military needs to transform. Unfortunately, it has not yet developed either a transformation strategy or a process to ensure that transformation will come about. This is most clearly demonstrated in the absence of plausible service and joint warfighting concepts for addressing the new emerging critical operational goals, and finds its ultimate expression in the administration's program and budget priorities, which for the most part sustain the course set by the Clinton administration.

If we remain on this course—if the Department of Defense fails to seize the opportunity to transform our military—we run a very real risk of investing a substantial sum of our national treasure in preparing our military to meet the challenges of today, and yesterday, rather than those of tomorrow. Should that occur, payment could be exacted not only in lost treasure, but also in interests jeopardized and in lives lost.

Thank you, Mr. Chairman, for the opportunity to present my thoughts on this important issue before your committee.

Chairman LEVIN. Thank you so much for your very succinct and direct testimony.

[22] The Excalibur, or XM982, is a family of precision-guided 155mm artillery munitions. Like other precision-guided munitions, the Excalibur is far more accurate than traditional (or "dumb") artillery munitions. Just as PGMs have greatly enhanced the strike capability of aircraft, so too do artillery PGMs offer the promise of greatly enhancing the effectiveness of existing artillery systems. See the *U.S. Army 2001 Weapon Systems Handbook* at http://www.defensedaily.com.

Dr. Thompson.

STATEMENT OF DR. LOREN B. THOMPSON, CHIEF OPERATING OFFICER, THE LEXINGTON INSTITUTE

Dr. THOMPSON. Thank you. Mr. Chairman and members of the committee, thank you very much for inviting me to offer my assessment of military transformation.

"Transformation" is a tricky term. The current popularity of the word within the Pentagon suggests that it means different things to different people. For some it is a way of rescuing threatened ideas and institutions. For others it is a way of sweeping those ideas and institutions away. For many, it is a ritual incantation, the latest buzzword used to bless business as usual.

However, there is one point at which all of the various meanings seem to converge, and that is the potential impact of new technology on the way in which we wage war. The term first emerged from the uncertainty following the collapse of communism, when the threat that had driven America's defensive preparations for the last two generations was suddenly swept away by itself. With little clarity as to future dangers, policymakers turned to recent advances in technology for clues as to how the military could maintain its edge.

Not surprisingly, they got swept up in the enthusiasm for new information technologies that were then captivating popular culture and the financial markets. Thus it became fashionable to say that the military was pursuing a capabilities-based posture rather than a threat-based one, because we did not know what threats we would be facing, but we thought we knew which technologies would be decisive.

Experts such as Dr. Krepinevich correctly insisted that the technology would only be decisive if it were wedded to appropriate operational concepts and organizational changes. Nonetheless, there is little doubt that the concept of transformation the military is pursuing today is driven first and foremost by enthusiasm for emerging information technologies. All of the gains that military planners foresee in global awareness and precision and agility and survivability trace their origins in one way or another to these new technologies.

Now, I have no basic quarrel with the claims being made for military transformation. But because you have already heard what is so promising about transformation, I would like to focus in the remainder of my remarks on some of the concerns I have about its implementation. I have distilled those concerns to five points.

Point 1: The most important military lesson of September 11 is that we have little idea of what is coming next. During the Cold War we convinced ourselves that the threat was stable and predictable, but a review of recent history reveals that at least there was one major strategic surprise every decade. From Pearl Harbor in the 1940s to the North Korean invasion of the South in the 1950s to the Tet offensive in the 1960s to the fall of the Shah in the 1970s, then the collapse of communism in the late 1980s, we have a remarkable record for getting the future wrong.

Like the atrocities of September 11, all of these surprises looked predictable once we adjusted our way of thinking. The problem is

that that happened after the fact. So any concept of transformation that proposes sweeping programmatic changes based on presumed understandings of future challenges is doomed to failure. There are simply too many possible threats and the very act of preparing for some of them reduces the likelihood that those are the ones that we will face.

I give the Bush administration high marks for acknowledging this uncertainty in its transformation plans. That is the reason why weapons that looked like candidates for cancellation, such as Crusader, survived the administration's strategic review, because once policymakers understood its capabilities they could not dismiss its utility in a range of plausible contingencies.

Just last week an Air Force general was explaining to me how the presence of a system like Crusader in Afghanistan would have enabled his service to deploy its bombers more effectively. I guarantee you that a year ago that general was not anticipating a land war in Asia any time in the near future.

Point 2: The lessons of the past are seldom obvious. Proponents of particular approaches to transformation frequently refer to history in making their case, but the inference that they draw for our own preparations cannot be proven. For example, a favorite case study is the German success in adapting new technologies such as radio, air power, and tanks to overrun France in a few weeks during 1940. But Germany was facing a long-time enemy, an enemy whose terrain, whose strategy, whose formations were well understood. That is not the situation that we are facing today.

Moreover, the French strategy of static fortifications was a response to the failure of its offensive strategy in the previous war. In other words, the French were trying to learn from their own history. Unfortunately, they learned the wrong lessons. We have to be careful that in implementing transformation we do not do the same.

Point 3: Our future adversaries will not always be fools. Every enemy we have faced since the end of the Cold War has been less capable than the one that came before. Iraq was less capable than Russia, Serbia was less capable than Iraq, the Taliban was less capable than Serbia. The incompetence of our adversaries has given us an exaggerated idea of how much progress we have made in transforming our forces.

Now, U.S. forces exhibited impressive synergy in Operation Enduring Freedom, but that should not be hard to achieve against a primitive nation with no intact air defenses and deep ethnic divisions. If we try to fight a unified and capable adversary using 40 year old bombers, unprotected aerial vehicles, and free-roaming Special Forces, we will probably have our head handed to us.

Even if we believe that future adversaries will be marginal in their military capabilities, we ought to be asking ourselves how Operation Enduring Freedom would have fared in a country that was covered with jungles or with cities in which our enemy could have mingled with noncombatants. It is essential that our transformation efforts include realistic training and realistic experimentation that exposes new warfighting concepts to the rigors of combat with truly resourceful enemies, not the crew that we have been facing lately.

Point 4: Because our adversaries will not be fools, we need to understand the weaknesses of our new technology. At the rollout of the Navy's new Hawkeye 2000 early warning aircraft last fall, Rear Admiral Philip Balisle made a startling admission. He said that once the fleet transitions to network-centric concepts of operation, loss of access to the network could actually make it more vulnerable than it is today.

That is not the only instance in which new technology potentially brings new problems. The satellite-guided munitions that provide our pinpoint accuracy rely on weak signals from thousands of miles away that in some circumstances can be jammed with only 20 watts of power. The networks that facilitate next generation naval warfare will have no hardening against electromagnetic pulse because the Navy has written that requirement out of its architectures, which makes asymmetric attacks using nuclear weapons a very potent threat to fleet effectiveness. The on-board logic of unmanned combat aerial vehicles will not begin to approach the computational capacity of human brains, making those vehicles highly vulnerable to attacks by manned aircraft.

So before we get rid of all the laser-guided bombs because they cannot see through clouds or begin dumbing down our platforms because they are networked, we need to understand how clever adversaries might exploit weaknesses in new technology. Here again, the need for realistic training and experimentation is obvious.

My final point is that realizing the potential of military transformation requires a greater commitment to procurement. The level of procurement that the administration proposes for 2003 is only two-thirds of what the Joint Chiefs estimated is needed every year to sustain existing forces. Since 1990 the average age of Air Force planes has increased from 13 to 22 years. There is not a single year since 1993 that the Navy has bought the number of warships it must buy every year to support a 300-ship fleet. The Army is buying less than 20 percent of the helicopters it needs to maintain its military edge.

I have for the record two tables reflecting how decrepit our air fleets have become. It is too soon to criticize the Bush administration for underinvesting in new technology because it inherited a raft of readiness and personnel problems that had to be addressed immediately. But if it does not stick to its plan to raise procurement spending in the future years, the resulting erosion in military capabilities will undercut any claim of transformation.

Thank you.

[The information referred to follows:]

USAF "Revolution in Museum Affairs"

- Average age of fleet has increased from 13 years in 1990 to 22 years today.

USAF Aircraft Age in Years			
	Maximum Safe Operating Age	Maximum Acceptable Average	Average Age Today
Fighters	30	15	14
Bombers	60	30	25
Electronic	50	25	24
Tankers	60	30	37
Intratheater Lift	50	25	23
Intertheater Lift	50	25	24

- If entire fighter modernization program executed as planned, tacair average age still rises to 18 years in 2020.

Navy Aircraft Older Than Ships

PLATFORM	INVENTORY IN 2002	AVERAGE AGE IN 2002
CH-46D	81	35
CH-47E	228	32
CH-53D	46	31
S-3B	113	25
KC-130	78	24
P-3C	228	23
DD-963	24	22
EA-6B	122	19
F-14A/B/D	206	17
FFG-7	27	16
SH-60B	161	13
F/A-18A/B/C/D	766	11
C/MH-53E	196	11
CG-47	27	11
E-2C	68	10
AV-8B	140	8
HH-60H	40	8
DDG-51	30	4
F/A-18E/F	39	1
MV-22	12	1

Chairman LEVIN. Dr. Thompson, thank you. Both of you have really given us a lot to think about and a lot to chew on. I want to thank you both for the very thoughtful, very thorough presentations. They are extremely helpful to this committee. We will make sure that each of our members actually gets a copy of it as delivered, as well as the prepared testimony. I thought it was extraordinarily useful testimony for this committee and we are grateful for it.

Senator WARNER. Mr. Chairman, could I associate myself with your remarks. I followed the testimony very carefully and I share your views. I intend to follow up on one or two of these issues and ask the Secretary of Defense what his comments are on them.

Chairman LEVIN. Let me start with you, Dr. Thompson. You have given us very thoughtful limits on some of the hopes for transformation and some of the realities that we ought to think about and worry about. What changes would you make in the current transformation direction to address some of the challenges that you have outlined for us? In other words, how would you change our current course to take into account those challenges, those problems?

Dr. THOMPSON. Andy and I had the opportunity to help the Department in shaping the process to some degree, the Defense Planning Guidance (DPG) and the other factors supposed to drive transformation. I guess I am a little troubled by this notion that transformation is a journey and not a destination. If you do not know where you are going, it is a little hard to sort out when you are headed in the right direction.

I think that one of the ways in which this process could be made more rigorous and more goal-oriented is if the services were given some quantitative goals. I mean, if I look at the list of major goals that they have, protecting critical bases of operations, denying enemy sanctuary, projecting power in denied areas, the only numbers I see associated with those goals are the increases in the budget. I would like to see some performance goals, some quantitative metrics that tell the services what they are expected to be able to achieve.

If I take the Crusader as an example, which frankly I do not know that much about, but the Army claims the Crusader is a 300 percent increase in capability over Paladin in one of the key performance parameters. I would like to see the office of the Secretary of Defense (OSD) establish some clear performance goals that are denominated numerically, rather than in words, that the services have to try to achieve, rather than simply saying, you are headed in the right direction.

Chairman LEVIN. Is there anything that you would do legislatively to try to address some of the problems that you have outlined for us this morning?

Dr. THOMPSON. Probably not at this point. The reason why is because, although——

Chairman LEVIN. Excuse me for interrupting. When I say legislatively, I am including dollars as well as concepts and programs and requirements and reports.

Dr. THOMPSON. Andy may have better suggestions on that than I do. I personally think that if there are dollars that need to be

added they are in the procurement account, because that is where I think we are falling short. But as far as transformation is concerned, one point I would like to make as to why I do not think it is necessary at this point to second-guess the administration on where it is putting the money on transformation is that, notwithstanding a lot of the political rhetoric, there is a remarkable degree of continuity between what the new administration is doing and what its predecessors did in terms of fostering and pursuing transformation.

The concept of future threats is similar. The processes that they are adopting, the goals they would like to undertake, it is all very similar. I would like to see them have a little more time at the Pentagon to see where they are going before they start being second-guessed.

Chairman LEVIN. Dr. Krepinevich, let me pick up right there, because your testimony also suggested that the administration's programs and budget priorities sustain the course of the last administration, which is what Dr. Thompson just stated. What changes in course, if any, would you recommend at this time specifically in our transformation program? Prioritize those for us, because there were a lot of them. You gave us a lot of suggestions.

Dr. KREPINEVICH. All right. I think first of all there has to be some sense that you do not get in Joint Vision 2010 and the service vision documents, of how we plan to conduct operations in the future. The officer corps needs that, the people who are establishing defense priorities in the Pentagon need that, you need that. There is no joint warfighting concept right now. We have a vision that talks about precision engagement and other pillars, but no sense of how we are going to operate.

I think it is essential in terms of getting validation and fidelity to establish a joint national training center, and maybe the linking of the western training ranges, as Secretary Wolfowitz said, is on the path of that. But I think we need at the joint level an analogue to what we have at the service level, which is a training center. We need a joint opposing force.

We need regular exercises. Loren knows my fondness for history. Our Navy conducted a major fleet exercise every year between 1921 and 1941 and what they learned won World War II. Our Marine Corps was doing the same thing along that time frame.

We need an opposing force. Right now what we do in the way of exercises at the joint level—and I have been told this by people at JFCOM—is essentially we do demonstrations. We do not do experiments. How do we expect to find out whether we are failing or not failing when in fact we do not go up against anybody?

So as a way of beginning to get people to think about how we are going to fight, how we are going to deal, let us create that joint opposing force that has the ability to present that anti-access threat, that area denial threat. If you have a joint urban warfare training center—as Loren said, what if in Afghanistan we had had to go into urban areas? Certainly the Army has confronted this problem in its war games. That is a different kettle of fish. How would we perform?

In terms of our own homeland defense, an urban warfare training center would also, I think, give us an enormous opportunity to

bring together not just the military forces, but other elements—local, State, Federal elements—to work together to deal with how would we confront a non-traditional threat to an American city and deal with the consequences if we failed to deter or defeat that threat before it was able to exercise an attack.

So I think in that area that is the area of greatest opportunity and greatest need, Mr. Chairman.

Chairman LEVIN. Let me just finish my own role here, because I am going to have to leave and turn this over to Senator Warner. I would like to follow Senator Warner's suggestion here and ask staff to do two things relative to your testimony: to extract the specific suggestions that you have made both in your prepared testimony and here; and to ask the Department of Defense for their reaction to those suggestions.

I think Senator Warner is really on target here. In a way, it would have been better to have this testimony as the first panel. It would have been interesting.

Senator WARNER. We should have kept them seated.

Chairman LEVIN. We would have had perhaps an opportunity then for our first panel to react to it. But we cannot do it both ways and this is the way we chose.

But I think what we will do is follow that suggestion of Senator Warner and ask our staff to extract from your testimony the specific suggestions, and there are many of them, and ask the first panel to react to those suggestions as well as to send along the entire testimony.

With that, I thank Senator Warner and turn it over to him. Thank you both.

Senator WARNER [presiding]. Thank you, Mr. Chairman. We will do that jointly.

I think we fail here in Congress to avail ourselves of the enormous amount of work going on in, as I call it, the quasi-public-private sector. You are neither one. You are out there as individuals and organizations trying to do a conscientious job guiding America, that is Congress and the Executive Branch, in new directions. You are doing the introspective thinking and analytical reflection on history and using history as a rear view mirror to guide us today as we go into the future.

I want to pick up, Dr. Krepinevich, on your statement about homeland security. This is my major concern, major major. There is not a day that goes by that I do not reflect on where I was and what I was able to do just as one person on September 11. I just fear that comparable—maybe not comparable, but other incidents could strike this Nation, and are we taking the right steps here at home to prevent such incidents.

I would like to see more of a balance between expenditures and the efforts to protect us here at home, our cities, in particular our ports and our military installations and forego maybe some of the most extraordinary high tech, far-reaching concepts of the military programs that we have to be employed elsewhere.

Dr. KREPINEVICH. Senator, I would say right now, unfortunately, there are many more questions than there are answers. I think the administration is bringing together what it needs to do to develop

a comprehensive strategy for how we plan to go about defending homeland. Hopefully, a lot of those questions will be asked.

For example, as you point out, there are a number of ways to threaten our homeland. There are the traditional ways we have worried about, ballistic and cruise missile defense. Deputy Secretary of Defense Wolfowitz will tell you that those are two different problems and in fact focusing on ballistic missile defense only gets you part of the way in that area.

There is the concern about non-traditional forms of attack by weapons of mass destruction, the growing proliferation of access to chemical or biological agents, radiological agents. Other novel forms of attack such as we saw on September 11.

I think we need to get some answers. The administration, as I understand it, is supposed to produce its strategy some time in early summer.

As you point out, what is the weight? How much weight do we put on actively or passively trying to erect defenses here versus going out and conducting preemptive strikes? I think for myself the most remarkable statement in the President's State of the Union was not about the axis of evil, but the statement that time is not on our side. If you think time is not on our side once these people begin to move to attack you, then you have to be able to go out and hit them before they get to this country.

What is the weight of emphasis between the various threats to this country? What is the role of the military? Does the military, for example, even have a major role in defending the national information infrastructure when so much of the commercial sector is reluctant to share that information with government?

Then there are issues with respect to the force structure, because there is going to be a homeland defense tax on this defense budget. As a number of people have said here, we have really not had to invest very much in defending our homeland. How much is that going to take away from our ability to project power overseas?

I think we are going to find that because of this we need our allies more at the very time that they are investing less and less in defense.

Senator WARNER. I agree with that statement wholeheartedly. Coalition warfare is essential, not only from the standpoint of bringing them to an accountability for incidents overseas which affect them as much as they do the United States, but also to get the support here at home.

Dr. THOMPSON. Senator, I drive home every night from Arlington to Alexandria and it is a rare night when I am driving by the city and looking across the river——

Senator WARNER. Looking at what?

Dr. THOMPSON. When I am driving down that road in the evening, and I look across the river and I see the city. It is a rare time that I do not imagine this city gone. It is very believable to me that a generation from now it will not be here or it will be substantially different than it is now. I think we are in great danger and I do not think we have our act together on homeland defense at all.

If you just look at the arrangements that we have today, ATF and Customs are in the Treasury Department, INS and FBI are in

the Justice Department, Coast Guard and FAA are in the Department of Transportation. We are really not postured for the threat. Now, culturally it would be very difficult for us to adapt. It will take more attacks before we get the point that we are in great danger.

But even on an organizational and administrative level, I think we have barely begun to scratch the surface of what we need to do. I think you are entirely right.

However, I would offer one word of caution. I am not certain that the Department of Defense has a big role to play in homeland defense. I think we need a division of labor here. We already have dozens of organizations that are involved in homeland defense. We only have one organization that is mandated to do forward defense against the sources of the danger to our homeland. I would not want to see our Active-Duty Force diverted from that critical mission when there are so many other people in the Federal Government who are supposed to be responsible for securing our homeland.

Senator WARNER. But there is an extent to which our Nation can foot the bill of these conflicts. From Bosnia to Kosovo to Afghanistan, it was our airlift, it was the smart weaponry. I do not mean to demean in any way the courage of the men and women in uniform of other nations, but their central governments simply have not kept pace with the necessary investments to modernize them. We are paying the bill.

Now all of a sudden here at home we experience on September 11 a catastrophe that none of us could have envisioned, in the magnitude of the devastation of loss.

Dr. THOMPSON. I think the nicest thing we can say about the situation in which we find ourselves today that before we were paying the bill for their defense, now we are paying the bill for ours.

Senator WARNER. Well, I hope that is true.

Yes?

Dr. KREPINEVICH. Senator, I was about to say that I was fortunate to accompany Senator McCain and Senator Lieberman on the delegation to Europe for the Wehrkunde Conference. If you had been there your concerns would have been magnified, because after Operation Allied Force in 1999 there seemed to be this resolve among a lot of our European allies that, by golly, we are going to get serious now. This time around, it was an air of resignation: We made the try and we realized that we are not going to be able to do anything near what we had hoped to be able to do even to try and keep pace with the Americans.

So again, at least I think for the short term there is much to be concerned about in terms of the direction of our allied involvement.

The other point I will make is, since Andy Marshall's name was mentioned, he has a phrase that he calls "cost-imposing strategies," things that your enemies can do at relatively low cost to impose enormous costs on you. I think if you look at this administration's list of these critical operational challenges, what you see is a series of cost-imposing strategies.

How much did it cost al Qaeda to conduct the attacks it conducted on September 11, how much did it cost whoever it was to develop that form of anthrax, versus how much have we spent just

since then to try and recover from that? How much will it cost an enemy who fabricates hundreds of ballistic and cruise missiles to threaten our forward ports and air bases versus how much will it cost us if we proceed to stick with some of these programs that are at high risk in that kind of environment to create a different kind of capability?

We have to deal with this cost-imposing strategy problem. Otherwise, as you say, we are just not going—well, we just do not have the resources to pursue a rich man's strategy in every possible area where we are threatened.

Dr. THOMPSON. The answer to that challenge is not not to defend our homeland. We have to do that. The real answer, though, is to go and to find them and to kill them, and that is what the military is there for. We have been complaining as long as I can remember about the inadequacies of our allies, but if they were not willing to step up to the Soviet threat they are sure not going to step up to this one.

I am told that the leftists in France today cannot even win an election without the Moslem vote. If that is the case, we are going to have to do this pretty much all for ourselves.

Senator WARNER. Well, gentlemen, we will close out on that note. I did want to ask you a question on shipbuilding, though, Dr. Thompson, which is a matter that I have had a keen interest in for many years. So many people say we are not building enough ships. It is always the numbers. When I was privileged to be in the Department of the Navy, we were at 800 to 900 ships. Today we are bordering a little above 300 or a little below 300 and teetering around in that area.

Of course we recognize that a ship today, certainly a modern ship, has capabilities far above what we had in yesteryear. Is there a better formulation than just the number of ships that is needed to have a convincing and effective maritime force projection credibility?

Dr. THOMPSON. Well, if not the number, then the modernity of the ships, the currency of the technology that is on them. I was rather distressed by something my friend Gordon England said in his testimony introducing the 2003 budget proposal. He said that the current distribution of the ship population was nearly ideal because it was 16 years old and that is the middle of the average service age. I could not believe he said that.

There are things other than corrosion or fatigue life of metal that are better ways of judging how old you want your ships to be. Imagine how many generations of technology in computers and fiber have come and gone in the last 16 years. Yet we are getting ready to keep our cruisers at sea for 40 years. The Navy is not only looking at extending the Los Angeles class to 33 years, but maybe to 40 years in terms of refueling, far beyond their intended design life.

If we are not going to be concerned with whether it is 600 or 300 ships, we ought to at least be concerned with the currency of the ships we are buying.

Senator, if I could say one other thing about that. Some internal Navy charts were shared with me a couple of months ago at a briefing by an admiral and what they showed is if you make a se-

ries of ahistorical, optimistic assessments of how long the fleet is going to last—in other words, things that are radically inconsistent with past experience—we can keep ourselves at 300 ships with the existing shipbuilding program. But if you use the past as a guide as to where we are really headed, we are down to less than 60 major surface combatants within a decade, because the ships simply retire at a faster rate than we are able to keep up.

I think what is going on with shipbuilding is a scandal. I mean, fortunately it is a bipartisan scandal, but it is a scandal. If we do not get our act together soon, we are not going to be able to cover the world with the latest technology even by the standards of the British or the Germans.

Senator WARNER. Well, you do not see a lot of active shipbuilding in those nations as far as I am concerned.

Dr. THOMPSON. Well, that is certainly true. But of course our missions——

Senator WARNER. The Royal Navy is now——

Dr. THOMPSON. You are right, but our missions and our responsibilities are so much greater.

Senator WARNER. Beg your pardon?

Dr. THOMPSON. Our responsibilities are so much greater than theirs are. I mean, where would we have been if we had not had carriers in the Indian Ocean early on?

Senator WARNER. I doubt if we could have operated the Afghan campaign as we did.

Dr. KREPINEVICH. Senator, if I could just add a couple of things to what Dr. Thompson said. I think you made an excellent point about the ships we have today being far more capable than those that were in the fleet even 15 or 20 years ago, and all the reasons why.

One of the things that is characteristic of a period of military revolution or transformation is the metrics by which you gauge performance change. For example, if we had judged aircraft carriers according to battleship standards, we would still have battleships, because it was not the volume of fire, it was the range that made all the difference.

If you are looking, for example, at strike today, the Navy has done a terrific job in proliferating its strike capabilities. It is astounding to think that submarines can now strike targets in Afghanistan, incredible.

So in a sense you could say, well, that should bring the number perhaps in the fleet down, because the ships are more capable. On the other hand, you have Admiral Cebrowski saying network-centric warfare, we have to get into the littoral quickly, we need a class of combatants that can do that. Maybe it is Admiral Clark's littoral combat ship class, which would drive the numbers back up again.

A lot of it has to be linked to what the threat is, what the competition is, and how you are going to beat that competition. One of the metrics being used by the Navy staff right now is they are looking at this issue of helipad space because of what is called the naval NORAD, the ability to intercept ships on the high seas that we think might be carrying damaging cargo to the United States.

With respect to foreign shipbuilding, it is niche, but it is very impressive in some respects. The Navy right now is experimenting with a joint venture, this high-speed vessel that was built in Australia and is showing a great deal of promise. The Marines are using another version out in the Pacific. The Swedes, whom Andy Marshall has been in contact with, are building a class of coastal combatants called the VSBE, which are highly stealthy ships.

Now, these may not be the kind of ships that we want as combatants, but they may be the kind of ships that our Navy confronts in 10 or 15 years in large numbers. So important to keep an eye on what the other guy is doing as well.

Senator WARNER. I think our record should reflect a little bit about your organizations, how they were brought to being, where the sources of income are to support then. I think that it is necessary that we have that in the record, because you have well-known distinguished organizations which you are representing today. So if each of you would put a half a page in the record, we would appreciate it.

[The information referred to follows:]

Dr. KREPINEVICH. The Center for Strategic and Budgetary Assessments is an independent, policy research institute established to promote innovative thinking about defense planning and investment strategies for the 21st century. CSBA's analytic-based research makes clear the inextricable link between defense strategies and budgets in fostering a more effective and efficient defense, and the need to transform the U.S. military in light of an emerging military revolution.

CSBA provides timely, objective and credible information to policymakers, opinion leaders, the media, analysts and others in the United States and abroad. CSBA's outreach includes an aggressive research and publishing program, seminar activities for senior policy officials and other decisionmakers, briefings for congressional staff, the media and industry executives, and lectures before academic, civic, and other professional groups nationwide.

CSBA funding comes from a wide range of sources, ensuring impartiality and independence. The majority of funding comes from a diverse group of charitable foundations to support CSBA's academic and education programs. Further financial support comes from directed government contracts, primarily focusing on preparing studies and sponsoring targeted meetings. CSBA on occasion will provide academically rigorous and independent programs for defense industry.

Dr. THOMPSON. The Lexington Institute is a non-profit, non-partisan public policy research organization headquartered in Arlington, Virginia. It was established in 1998. Its Chief Executive Officer is Merrick Carey, a former congressional aide to Rep. Jack Kemp (R–NY) and Rep. Jim Courter (R–NJ). Its Chief Operating Officer is Dr. Loren Thompson, former deputy director of Georgetown University's Security Studies Program. The institute has a staff of 12 people and an annual budget of about $2 million. Lexington's revenues are drawn from four sources: foundations, corporations, private individuals and the Federal Government.

The Institute sustains a diverse research and education effort focusing on five major areas: national security, education policy, tax reform, international business, and regulatory policy. Its largest program is national security, which is concerned mainly with issues of strategy, resources, and technology bearing upon the capacity of the United States to defend its homeland, allies, and vital interests. In general, the institute seeks to further a public policy agenda based on limited government, scientific merit and the furtherance of freedom.

Chairman WARNER. The hearing is concluded.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

SCIENCE AND TECHNOLOGY

1. Senator LEVIN. Secretary Wolfowitz, the Department's science and technology (S&T) programs are one of the engines of military transformation. The Defense Science Board and the Secretary of Defense have embraced a goal of 3 percent of the Department's total budget being invested in S&T programs. The current budget request only requests 2.6 percent of the budget for S&T, and reduces this percentage each year out until 2007, when it falls to 2.3 percent. How is this reduction in the commitment to S&T consistent with the goals and visions of accelerating the transformation of the military?

Secretary WOLFOWITZ. It remains our goal to gradually increase funding for science and technology (S&T) programs to a level of 3 percent of the Department's total budget. However, we also need to ensure that the funding levels of the various components in the Department's total budget are balanced based on our assessment of the most urgent requirements at any given time. The fiscal year 2003 request for S&T is $9.9 billion; which includes $9.7 billion of base S&T programs and $213 million in Defense Emergency Response Funds for combating terrorism technology. This is a 12.5 percent increase over the fiscal year 2002 S&T request of $.8 billion. However, because of the significant increase in the Department's total funding in fiscal year 2003 and the need to add dollars to fully fund acquisition programs and health care etc. the percentage of the budget request devoted to S&T is less than 3 percent. The fiscal year 2003 budget request begins transformation by including funds for classified space S&T programs, along with a substantial increase in funding for combating terrorism technology.

ARSENAL SHIP

2. Senator LEVIN. Admiral Cebrowski, in his campaign speech at The Citadel on September 23, 1999, candidate George W. Bush stated that "On the seas, we need to pursue promising ideas like the arsenal ship—a stealthy ship packed with long-range missiles to destroy targets from great distances." What has happened with the arsenal ship idea?

Admiral CEBROWSKI. The arsenal ship idea was exactly that—an idea. The concept evolved from a fairly narrowly defined answer into a range of very important questions about what a family of future surface combatants might look like. The idea of a family of ships is an alternative that offers the potential to broaden our capabilities base and technology base. The Navy should be very much larger than it is if you consider only numbers of ships. However, the economics suggest that the Navy must explore transformational ways to embrace the future. Changes underway in warfare also allows us to examine the implications of shifts in key relationships such as the cost of speed and increased payload fractions from smaller displacement hulls.

KREPINEVICH PROPOSALS

3. Senator LEVIN. (Also on behalf of Senator John Warner) Secretary Wolfowitz, on pages 14 to 21 of his prepared statement, Dr. Krepinevich discussed transformation in the context of "skipping" a generation of technology. He proposed three candidates for "skipping" a generation; the "leap-ahead" systems or capabilities that would warrant such a move; and how the Department might hedge against any of the proposed "leap-ahead" systems not working out. Could you provide the Department's views on each of Dr. Krepinevich's proposed candidates?

Secretary WOLFOWITZ. The Department's position on the three candidates for "skipping" a generation (DD(X), JSF, and Crusader) is provided in attachments 1, 2, and 3.

Attachment 1

The DD(X) destroyer is being designed specifically to establish and maintain maritime dominance in the operationally complex littoral battlespace—a capability that Dr. Krepinevich suggests will be fundamental to meeting 21st century warfighting requirements. The DD(X) technologies will create new capabilities while optimizing crew size and yielding significant combat advantage. DD(X) is part of a family of surface combatants that includes a future cruiser (CG(X)) and littoral combat ship (LOS), and will offer a balanced set of warfighting capabilities to meet the national security requirements in the 21st century. The DD(X), CG(X), and LCS will operate

as a networked, distributed force achieving the network centric warfare construct Dr. Krepinevich identifies in his "skip a generation objective."

To ensure DD(X)'s ability to perform littoral missions, the ship will incorporate advances in stealth and survivability. The first: surface combatant with multi-spectral signature reduction, DD(X) will possess significantly reduced radar cross-section, infrared, magnetic and acoustic signatures compared to the DDG 51 class and make the ship much less susceptible to mine and cruise missile attack: in the littoral environment. In addition, the hull is being designed to reduce the effects of weapons detonation, and the automatic containment and damage suppression systems will improve the recoverability of the ship from a casualty event.

Dr. Krepinevich states that converted SSGNs and/or increasing the inventory of precision guided munitions would provide an effective "hedge" for DD(X). While either of those assets would provide additional Vertical Launch System (VLS) cells, only DD(X) will fully meet the Marine Corps' requirements for naval surface fire support. DD(X) will have the capacity to carry the variety and volume of offensive, precise, all-weather firepower that will enable our Marine Corps and light mobile Army forces to complete their littoral missions.

Lastly, DD(X) is completely aligned with the, "Required Military Capabilities" needed to transform our military, which Dr. Krepinevich emphasizes on page 14, as detailed below:

- Mobility: DD(X) will have the range, speed and sustainability to be forward deployed for extended periods and operate with carrier battlegroups and expeditionary strike forces. In addition, DD(X) will employ in-stride mine avoidance, which will enable the ship to operate in the littorals.
- Stealth: The advanced technology employed by DD(X) will reduce the ship's signature to that of a fishing boat with quieting nearing that of a submarine. These attributes will better enable DD(X) to survive in the littorals.
- Electronic Protection: DD(X)'s reduced signatures will enable electronic protection and deception technologies to be markedly more effective.
- Extended-Range Systems and Strikes: The DD(X) advanced gun system range of 100nm provides extended-range as compared to 13nm achieved today. Most importantly, DD(X) features responsive and all-weather strike capability with "on-station" sustainment facilitated by underway replenishment capability.
- Precision, Electronic and Non-lethal Forms of Strike: The DD(X) strike weapons include both gun launched and vertical launched ordnance whose guidance systems enable very precise targeting for long-range interdiction.
- Unmanned/Automated Systems: DD(X) makes extensive use of advanced automation to reduce workload and improve survivability. DD(X) is expected to significantly reduce the crew size, possibly to one-third the crew of a DDG 51 resulting in significant life cycle cost savings. Automated damage control and command and control data fusion are just a few examples of functions that will be automated on DD(X). In addition, DD(X) will be capable of launching, recovering and servicing unmanned air, surface, and underwater vehicles.
- Compressed Operational Cycle Rates: In support of improved readiness, DD(X) is being designed to meet an operational requirement for a 3-year deployment. This will be achieved in part through the application of systems and materials requiring limited maintenance. In addition, the automation of resupply and the ability for underway replenishment on DD(X) are expected to facilitate increased "on-station" availability compared to existing fleet assets.

Attachment 2

From a broad perspective, the Department must reconcile the competing demands of modernization and current operations. We must modernize smartly and maintain readiness to address threats to our country's national interests, today and in the future. In the aftermath of the September 11, 2001 attacks on our homeland, Operation Enduring Freedom, and the current tension in the Middle East, this balance has become particularly difficult. We must consider fiscal realities. We face a major challenge in modernizing our aging aircraft fleet because many current aircraft were built at high rates during the 1980s, when spending levels were at their Cold War peak, and because most of the aircraft planned for the future feature more costly, improved capabilities to meet projected threats. With the constraints of threats and fiscal realities in mind, the Department recently conducted detailed analyses to ensure that we recommended the best force mix possible. These analyses, which in-

cluded B–2s, F–16s, and UCAVs, as well as other alternatives, formed the analytic basis for an affordable and balanced force structure modernization plan.

From a more specific perspective, the Department has thoughtfully considered the options presented by Dr. Krepinevich and found them less attractive in both the near and long term. First, additional B–2s would provide more technology from the 1980s, at a very high cost. Our analysis suggests that unless the budget were dramatically increased, our money would better be spent on the current modernization plan. While B–2s do offer stealth, with impressive range and payloads, we have enough of these aircraft to do the job that they were designed to accomplish. In addition, the Department has funded a program designed to increase the "smart munitions" carriage capability of our existing B–2 fleet as suggested. Dr. Krepinevich's paper also indicates that ". . . the JSF CTOL version assumes the U.S. military will continue to enjoy unimpeded access to forward air bases for the indefinite future." In fact, the JSF combat range was designed to be substantially longer than legacy fighters and clearly supports even the most stressing proposed threat scenarios. Air refueling tankers extend that range even farther.

Similarly, F–16 Block 60 aircraft were not included in our modernization plan because, in part, our vision is to transform into an all-stealth fighter fleet in the years to come. Purchase of new F–16s, even with advanced avionics, extends the life of the less-capable, less-survivable legacy aircraft well into the future at the expense of a faster transformation.

UCAVs do offer incredible potential, and the Department has embraced the concept with the funding necessary to develop it as quickly as possible. Dr. Krepinevich indicated that "[t]he opportunity exists to move much more aggressively in developing a range of UCAVs." In fact, this program is already on an aggressive schedule and technical glide path. Examples of technical difficulties include the ability to automatically identify and target in the "fog of war," overcoming bandwidth and line-of-sight communications issues, and re-targeting flexibility. The UCAV offers the potential to transform the Air Force and Navy further, but it remains experimental. The Department will attempt to develop the UCAVs capabilities, but it would be unwise to wager our country's ability to dominate in the air until we better understand what is feasible, in terms of schedule, cost, and capability.

The services and the Department continue to reevaluate force structure requirements. Our in-depth review and analysis suggest that the Department's proposed plan is more effective and affordable than the alternatives that Dr. Krepinevich has offered.

Attachment 3

When the Secretary of Defense announced the decision on May 8, 2002, to recommend to Congress that the funds for Crusader be redirected, the Army will be foregoing their next-generation, 155mm, self-propelled howitzer. The Army has, literally, skipped a generation of self-propelled howitzers and is focusing on the Objective Force indirect fire variant of the Future Combat System.

On May 13, the USD(AT&L) issued direction to the Secretary of the Army to take all necessary and prudent actions to implement this decision, and to only obligate additional funds for Crusader after consulting with him. The Army is working toward an orderly termination of the program as directed by the Secretary of Defense. The contract will soon be terminated and a settlement will be negotiated with the contractor concurrently, a budget amendment for fiscal year 2003 has been submitted to reflect the Secretary's decision. The Department is studying alternative investments in the indirect fire missile area to accomplish the transformation desired by the Secretary.

QUESTIONS SUBMITTED BY SENATOR BILL NELSON

TRANSFORMATION OF MILITARY SPACE

4. Senator BILL NELSON. Admiral Cebrowski, recent issues of *Aviation Week* and *Space Technology* magazines feature excellent articles on "MILSPACE" highlighting the important role space systems played in Afghanistan enabling the collection, processing, and dissemination of time-critical information to help combat forces find and destroy terrorists. We have also recently heard Under Secretary of Defense Pete Aldridge testify that getting space-borne capabilities to our warfighters provides them with the best communication coverage. Currently, the National Security Space Architect is conducting a study to provide us and the military space community with an integrated roadmap of deliverable transformational communication capability. In light of the significant advantages gained from the employment of space technology, how will these pertinent findings be incorporated into the transformation process?

Admiral CEBROWSKI. One of the things we've learned well from the conflict in Afghanistan, is that while the intelligence collection capabilities have been excellent, we need to add persistence to the equation. That is to say, satellites in low-Earth orbit circumnavigate the globe about every 97 minutes, but operationally you'd like to have longer dwell time over likely targets. You'd like to be able to have a focused view of hot spots on the face of the Earth that is not intermittent, but more continuous, in order to achieve universal situational awareness. Universal has a temporal component; you'd like to know all the time what's going on around the globe. One way to achieve that is with more satellites in stationary orbit—a very expensive solution, or—a more transformational way—develop new technology which allows us to have excellent collection capabilities through a triad approach of space-based systems and sub-orbital platforms.

5. Senator BILL NELSON. Admiral Cebrowski, how will you ensure that these results will be shared across the military services and DOD agencies?

Admiral CEBROWSKI. To ensure we share results across Services and DOD agencies, and to make sharing of results smoother and transparent for national and military customers, many of the recommendations of the Space Commission have been implemented.

With respect to better integration of space, a new office has been created, the Directorate of National Security Space Integration. This office is tasked to exploit the best practices of the military space and the NRO communities to make the world's best space forces even better.

SUPPORT FOR SPACE PROGRAMS

6. Senator BILL NELSON. Secretary Wolfowitz and Admiral Cebrowski, the Department of Defense budget request indicates a range of support for increased or improved capabilities in space to support military operations-particularly in intelligence, geo-location, and communications. This is clearly a "payload-centric" view of military space. Yet there is significant risk to assured access to space given available technology and the cost of space lift. What is the role of space lift in military transformation?

Secretary WOLFOWITZ. The Department is addressing the assured access to space risk through the Evolved Expendable Launch Vehicle (EELV) program coupled with developing a joint technology development/demonstration effort with NASA for reusable launch vehicles. The EELV with the two launch service providers provides the Department and the Nation assured access to space. In addition, the EELV program is reducing the costs associated with space launch by 25–30 percent over current U.S. capabilities. Space lift provides the means with which to achieve the Department's transformational goals and objectives while maintaining assured access to space for critical national security payloads that support current and future military operations.

Admiral CEBROWSKI. The United States must have assured and affordable access to space in order to expand or even sustain space operations. Assured access to space is crucial to military transformation for many reasons: to enable future innovative ways to support combat forces; to counter threats from unfriendly space-capable nations; and to create the conditions for a commercial market that may ultimately support and drive rapidly evolving space technologies. This means being able to place useful payloads in all relevant Earth orbits with high probability of launch success and operation-on-orbit within hours—instead of months or years. It also means the ability to operate flexibly in and through space to accomplish both manned and unmanned missions in support of U.S. national and military objectives.

Any alternative architecture of space lift and sub-orbital and on-orbit vehicle capabilities, that truly enables military transformation, must allow the Nation to: Perform new missions in space; provide a responsive and resilient space lift/operations capability that is increasingly acknowledged as militarily essential; permit an escape from the current vicious cycle of cost-weight-size-complexity-risk-delay that frustrates the current development process for space systems; offer the potential for future commercial exploitation that not only would result in vast new commercial opportunities, but would also drive development of even better space system capabilities.

7. Senator BILL NELSON. Secretary Wolfowitz and Admiral Cebrowski, what role will greater DOD–NASA cooperation and costs sharing play in achieving this transformation?

Secretary WOLFOWITZ. The Department is currently cooperating with NASA in a number of critical space technology areas to include environmental sensing, hypersonics, rocket propulsion, etc. These continued cooperative efforts, which include cost sharing, will enable the transformational technological advances to be achieved in a more timely manner. This is done through the use of the two organizations' strengths in a manner that maximizes the technological advancement achieved while minimizing the cost and time associated with developing new capabilities.

Admiral CEBROWSKI. DOD and NASA are forging an important partnership in the development of a new reusable launch vehicle program, the Space Launch Initiative (SLI). No national vehicle can or should be developed without factoring in military needs, mission models and rapid launch capabilities for national security. The rapid access to space typified by military launch needs could have a direct bearing on future follow-on vehicles that could have commercial cargo-carrying capabilities.

An integrated technology plan between the Air Force and NASA will help spur the development of a second generation reusable launcher. As DOD's executive agent for space, the Air Force will take a lead role for partnering with NASA in the SLI program. A fully reusable vehicle would have a significant role in both military space applications as well as civil human space flight missions. This makes a partnership and cost-sharing arrangement between DOD and NASA a good fit.

FIELD EXERCISES/RESOURCING

8. Senator BILL NELSON. Dr. Krepinevich, in your organization's report titled: "Lighting the Path Ahead: Field Exercises and Transformation", you highlight the critical role that field exercises and experiments contribute towards evaluating military innovations during the transformation process. Of specific interest is your assessment in that report of the shortage of facilities to support comparable joint field exercises that enable experimentation in support of transformation. Could you please highlight your concerns and the impacts that you have identified as a result of your study and provide some recommendations?

Dr. KREPINEVICH. During the latter stages of the Cold War, the U.S. military invested in a number of high-fidelity training facilities that greatly enhanced the value of its field training. For example, the Army's NTC prepared brigade-size units for combined arms mechanized warfare against a Soviet-style adversary. Similarly, the Air Force and Navy put their pilots through Red Flag and Top Gun training, respectively.

Comparable facilities do not yet exist to support high-fidelity field exercises focused on the anti-access/area-denial threat discussed in this report. A Joint National Training Center (JNTC) is needed to enable both service and joint transformation field exercises. In 1997, the National Defense Panel (NDP) recommended that this facility be established as part of its transformation strategy. The recently completed Quadrennial Defense Review (QDR) promises to "explore the need" for such a center.

A principal barrier to creating a JNTC involves acquiring a sizable expanse of land along the U.S. littoral. Current efforts to train at the operational level find Joint Forces Command (JFCOM) and the services attempting to link together various individual training centers (e.g., the western training ranges in Millennium Challenge 2002) along with computer simulations. Even if such a tract of land could be made available, the U.S. military would likely experience restrictions on its ability to radiate along the radio frequency spectrum, due to the potential for disrupting commercial electronic activity.

Several potential concerns arise from the absence of training facilities capable of supporting field exercises focused on preparing U.S. forces for emerging challenges at the operational level of warfare. One is that it promotes emphasis on training at the tactical level of warfare. To be sure, such training is both necessary and desirable. But that training should be strongly informed by the warfighting concepts that are developed based on what is learned while training at the operational level of warfare. Absent significant training at the operational level-especially in a period of transformation—there exists the danger that tactical-level training will suffer.

A second concern rests with the U.S. military's ability to determine the feasibility of operational concepts in which information architectures play a major role. If the military is precluded from exercising its command, control, communications, computers, intelligence, surveillance, and reconnaissance (C^4ISR) architectures at the operational level of warfare, it may prove difficult to determine, with any great degree of confidence, the progress being made (or not made) in realizing such critical concepts as NCW or in campaigns against threats that involve C^4ISR efforts spread

over large areas (e.g., extended-range strikes against critical mobile targets). Nevertheless, there is some cause for optimism. The Commander in Chief (CINC) of JFCOM's efforts to link the western training ranges together to support field exercises and experimentation may represent the first step toward creating a JNTC.

As for urban operations, current training centers, such as the Joint Readiness Training Center at Fort Polk, Louisiana, offer facilities more characteristic of the terrain found in small towns. They possess neither the size encountered when operating in an urban environment, nor many of its unique terrain features (e.g., high-rise buildings, sewer and subway systems, etc.). A Joint Urban Warfare Training Center (JUWTC) should be created along the lines called for by the NDP. Such a center could also be employed to conduct high-fidelity exercises to prepare a wide range of government and non-government organizations to deal effectively with terrorist attacks on U.S. urban centers, especially those involving the covert use of chemical, biological or radiological weapons.

It will also be desirable to conduct transformation field exercises that address the growing challenge of maintaining space control or defending against an attack at the strategic level on the U.S. national information infrastructure. Yet it is far from clear how this might be accomplished. There seems to be no comparable training infrastructure for these missions that might provide the kind of high-fidelity training for anti-access/area-denial and urban operations that could be available at a JNTC or JUWTC, respectively. Enabling these kinds of field exercises represents another major challenge for the U.S. military's transformation effort.

9. Senator BILL NELSON. Dr. Krepinevich, how important in your view is joint simulation?

Dr. KREPINEVICH. Early in the transformation process, joint war gaming and simulations can be excellent means for identifying new systems and force elements and developing new operational concepts as well as weeding out those that have serious flaws. For example, the war games conducted at the Naval War College in the early 1920s proved extremely useful in developing promising operational concepts for the use of naval air power, as well as the associated measures of effectiveness. Given the perennial environment of limited time and resources under which military organizations must operate, well-designed and executed joint war games and simulations can provide an invaluable service to those charged with developing a program of field exercises as part of a larger transformation strategy.

SPACE TRANSFORMATION/FIELD EXERCISES

10. Senator BILL NELSON. Admiral Cebrowski, for non-space systems, the military regularly trains the way it expects to fight. That same adage has to apply to space. How do you intend to incorporate military space systems into the transformational training exercises and the joint operational battlefield exercises?

Admiral CEBROWSKI. As a result of the recommendations of the Space Commission and the Secretary of Defense's memorandum directing the Chairman, Joint Chiefs of Staff to promulgate guidance directing CINCJFCOM to establish a Space Applications Experimentation Cell at JFCOM, CINCJFCOM has created a Space Applications Experimentation Cell with the goal of overseeing the innovative experimentation of space programs with joint applications. Further, both JFCOM and U.S. Space Command routinely include space systems in the conduct of training exercises and joint operational battlefield exercises.

To support joint battlefield training exercises and transformational training exercises, the Department must explore a variety of methodologies that employ modeling and simulation tools based on measures of merit and effectiveness that will help quantify the effects of space-based capabilities. The military currently uses a variety of tools to simulate space environments in support of exercises, experiments and wargames. These tools must be modernized to take into account the missions and tasks that space systems can perform. Robust modeling and simulation tools can help military commanders learn how to cope with the loss or temporary interruption of key space capabilities, such as the Global Positioning System (GPS), satellite communications, remote sensing or missile warning information.

QUESTIONS SUBMITTED BY SENATOR STROM THURMOND

RAPID TRANSFORMATION OF ARMED FORCES

11. Senator THURMOND. Secretary Wolfowitz, last fall, in your opening statement for the hearing on Quadrennial Defense Review, you indicated that: "To meet the

challenges over the horizon, we must transform our Armed Forces more rapidly, more creatively, and even more radically than we had previously planned." The current thinking appears to be that the transformation is a long-term process. Do you still believe that transformation must be done quickly? If not, what has changed since last fall?

Secretary WOLFOWITZ. In addition to the thinking articulated in DPG 2003 and the QDR last fall, it was clear that the tragic events of September 11th would provide additional momentum for the transformation of our military forces. Those imperatives for transformation suggested by the strategic environment remain in force today, and compel our sense of urgency. However, we recognize today as we did last fall that transformation will not occur overnight. Transformation is a continuum and not a discrete event or envisioned end state. As indicated by the actions of our forces in Afghanistan, we have clearly made progress toward transformation. However, the effort to prepare our forces for the future remains a long-term endeavor. The capabilities demonstrated in Afghanistan are just a glimpse of how far we still can go. Transformation of the U.S. military is not just a single transformation, but a host of transformations that, measured in the aggregate, will radically alter the size, shape, and capabilities of our forces over an extended period of time.

SCOPE OF TRANSFORMATION

12. Senator THURMOND. Secretary Wolfowitz, although the focus of transformation is on the military capabilities, we must also consider the transformation of the technology base and industrial base to support the transformation. What is the Department doing to address the transformation of the technology base and industrial base?

Secretary WOLFOWITZ. Our defense transformation clearly requires a strong and innovative technology base; and a healthy, competitive, and efficient industrial base.

We must continue our commitment to science and technology (S&T) programs which generate leading edge technologies. We are aligning our S&T investments with the desired capabilities stated in the Secretary's Quadrennial Defense Review. Our objective will be to stimulate more innovative thinking on "war winning" technologies and concepts, and transitioning these to the warfighter. Funding issues notwithstanding, the challenge in maintaining the technology base is the balance between a program that takes the long-view with broad investments and a program that remains responsive to immediate needs such as combating terrorism technologies.

As we improve the network-centric warfighting capabilities needed for the 21st century, DOD needs to attract a broader industrial base—particularly those grounded in information technology and telecommunications and networking—to our business. We also must continue to evaluate key industry sectors and subsectors to identify capabilities needed to meet current and future defense requirements. We will continue to work with industry to explore and promote improvements to policy and procedures. We will continue to implement business practices that result in more effective and efficient government/industry collaboration.

ELIMINATING DUPLICATIONS

13. Senator THURMOND. Admiral Cebrowski, our military forces are based on historical precedences. Today, if a nation were building an army from scratch, there probably would not be four distinct military services each supported by distinct medical, logistical, and intelligence groups. Admiral Owens, our former Vice Chairman of the Joint Chiefs of Staff, suggests that combining the medical, logistical, and intelligence groups should be the first step in transforming our military service. What are your views regarding the consolidation of the support services?

Admiral CEBROWSKI. I believe there are significant organizational implications to be examined as the Department implements transformation initiatives. As the Department transitions to information age operations it is no longer clear what constitutes support functions versus combat functions. Those lines are increasingly blurring to such an extent that traditional support roles of intelligence and logistics can no longer be divorced from pure combat operations. All of these elements are increasingly interrelated. This change is being driven by the robust networking of the force and the resultant high level of shared awareness that will increasingly characterize information-age operations. This is an area amenable to additional research and examination to understand the implications that Network Centric Warfare offers to traditional tenets of warfare. From this research effort will likely follow new organizational constructs we cannot now envision.

CULTURAL CHANGE

14. Senator THURMOND. Admiral Cebrowski, as you indicate in your statement, the most difficult challenge to transformation is to change the culture in an organization. Historically, we have used education as the focal point to implement change, but as you indicate it takes a long time. What changes, if any, are you advocating to the military education system to begin the change in the mindset of our future military leaders?

Admiral CEBROWSKI. A number of changes are planned to transform the Department's military education and training system. First, the CJCS, the Commanders of Combat Commands, and services will develop an initial set of joint core competencies linked to service core competencies. Second, the Joint Staff, National Defense University, USJFCOM, services, and senior service colleges will develop a core curriculum for Joint Military Leader Development and begin distribution of those courses on line. Third, the CJCS, USD (P&R), and the services will establish service requirements to track joint education, training, and operational experiences of military personnel. Fourth, USD (P&R), USD (AT&L), ASD (C^3I), the CJCS, USJFCOM, and DOD components will develop a common operational architecture that provides interoperability of live, virtual, and constructive training systems across the Department, leading to the creation of a joint national training capability environment that meets service, interoperability, and Commander of Combat Commands training needs. This will include accelerated development of common standards, implementation guidelines, and digital libraries for Advanced Distributed Learning (ADL) and Job Performance Technologies, as well as methods to adapt distributed training to multi-language and multi-cultural environments. Fifth, USD (Policy), the CJCS, USJFCOM, and USD (P&R) will develop a common set of interagency, interagency, intergovernmental, and multinational "Joint" Mission Essential Tasks. Military education and training are an integral part of the DOD transformation initiative. In order to respond efficiently and effectively to the emerging dynamic, capabilities-based environment, education and training form the foundation for the long-range transformation process by changing the culture of DOD.

INSTITUTIONAL MINDSET

15. Senator THURMOND. General Pace, a frequent criticism of the Department of Defense is that each of the military departments focuses on its service and not on jointness. If the Department truly wants to transform the manner in which it operates, it must overcome this institutional mindset. In your view, have the services abandoned their parochial view on the modernization and transformation of the Department of Defense? What are examples of this change?

General PACE. The institutional mindset of the services is not necessarily something that is entirely bad or that must be abandoned in order to facilitate transformation. Each service has the responsibility to develop and maintain distinct capabilities in support of our National Security and National Military Strategies. These distinct capabilities help to ensure that the United States remains dominant across the full spectrum of military operations anywhere on the globe.

Elimination of these service unique core competencies should not be the goal, rather their integration into a fully interoperable joint force. To do this, we need to develop a new mindset with respect to the way we operate. In the past, we compartmentalized the battle area into sea, air and land sections and then proceeded to fight as though each section belonged exclusively to a specific service. We now need to think in terms of a joint battle space. This joint battle space will be populated by systems from each service that are designed to operate seamlessly—based on shared joint operational concepts.

The work we have been doing with the Joint Requirements Oversight Council (JROC) over the last 2 years is one example of how we are balancing the services' need to create and maintain unique capabilities with the Department's need to advance joint warfighting. For years, the JROC validated individual service requirements without the benefit of an overarching concept it could use to help fit the pieces together. As a result, systems were designed, built, and modernized to optimize individual service needs. The ability of these systems to operate efficiently in a joint environment was not always the up front priority. Consequently, we've had to back into system interoperability and "jointness."

We are transforming the military by changing the mindset that the best solution is the one that always optimizes individual service requirements. We are changing the mindset by advancing joint capabilities and assessing all systems against a set of "joint" standards for interoperability at the front end of the requirements generation process. The JROC is working to advance DOD transformation by shifting its

focus from merely validating individual systems to developing joint operational concepts and architectures that establish objective standards for assessing system interoperability. These standards will facilitate realization of joint capabilities over service-centric solutions.

ROLE OF THE JROC

16. Senator THURMOND. General Pace, as the Vice Chairman of the Joint Chiefs of Staff, you also chair the Joint Requirements Oversight Council (JROC). In my view, the JROC plays a critical role in determining the pace of transformation in terms of enhancing our military capabilities. What general area of the technology transformation do you consider the most critical to improving our long-term warfighting capability and how can the JROC influence this effort?

General PACE. In his annual Posture Statement to Congress, General Myers stated that: The area offering the greatest promise for significant transformation in the near term is information sharing. The U.S. military is an "information intensive" force. Much of the military superiority we currently enjoy rests in our ability to achieve and maintain a decisive advantage in accessing, gathering, exploiting, and acting on information. Our ability to arrive at and implement better decisions, faster than an opponent can react, rests on the accumulation, processing, and understanding of vast quantities of operational and tactical information.

We have taken the first steps toward fully integrating our capabilities to find and strike targets of all types, using networks of sensors and shooters to achieve desired effects. Our goal is to allow dispersed forces to collaborate on operations and give our warfighters the ability to achieve effects rapidly and decisively—with a speed and accuracy that will overwhelm an adversary's ability to respond. This goal is achievable if we creatively use existing and planned information technologies.

The JROC is working to achieve this goal by supporting the Chairman's priorities to address shortfalls in joint command, control, communications, computers, intelligence, surveillance, and reconnaissance (C^4ISR). Although we have made significant recent improvements, current deficiencies in joint C^4ISR result in gaps and seams between the combatant commands and between the services, which must be eliminated. Integrated C^4ISR will give our Joint Task Force Commanders the necessary tools to fully integrate their combat power.

One of the concepts we are exploring to help work this issue is the idea of a Standing Joint Force Headquarters (SJFH). This operational level headquarters unit will serve as a tool to help push greater interoperability. It will have a robust C^4I architecture that all future weapons platforms or communications systems, and any upgrades to existing systems would have to plug into. The JROC is currently working to establish these architectures, which it will use to drive the development of joint interoperable systems as well as integration of current (legacy) systems. An example of one materiel solution the JROC is currently working to support the SJFH concept is the Deployable Joint Command and Control (DJC2) program. DJC2 is an acquisition plan to field a command and control headquarters in support of the joint commander's need for a scalable, modular, rapidly deployable (air/sea) command post with reach-back capability, and protection from chemical and biological agents. These types of solutions are designed to advance the joint capabilities of our forces by enhancing our ability to gather and process information required to support better, more timely decisions.

LEGACY FORCES

17. Senator THURMOND. General Kernan, you state that we need to update legacy systems to continue to fight today and to bridge our modernization gap as we move forward with transformation. Since funding is already a constraining factor in the transformation effort, what legacy systems would you update to provide us the most critical capabilities while we transform to the next generation of weapons systems or technology?

General KERNAN. The interoperability and integration of prioritized legacy fielded capabilities is critical to joint, coalition, and allied operations and we work closely with all ClNCs/Services/Agencies (C/S/A) to ensure critical warfighting deficiencies are identified and prioritized for JROC endorsement and resolution. Currently, identification and comprehensive solutions to resolve critical JTF C2 Legacy interoperability shortfalls is a priority. Specifically, system improvements which would enhance situational awareness, intelligence processing and distribution, combat identification, shared common operational picture, Information Management/Information Assurance and Joint Data Network are examples of specific areas of required legacy

improvements. Furthermore, to support transformation these improvements must be accomplished within the command and control concept and framework of the Standing Joint Force Headquarters command and control concept and infrastructure to ensure near term improvements align with future warfighting initiatives.

MANEUVER AREAS

18. Senator THURMOND. General Kernan, your proposed joint training exercise, Millennium Challenge 2002, which is a major milestone toward transformation, calls for using a broad array of land and ocean training areas. What constraints in terms of population and environmental encroachment are you facing in planning this exercise?

General KERNAN. Encroachment constraints limiting our Joint exercise are those that impact our host military installations on a daily basis. For example, various encroachment factors on the 17 miles of beach front at Camp Pendleton restrict the number of simultaneous landings to only three Landing Craft Air Cushion (LCAC) transports, which is half the number required. As a result, we must land the remaining force administratively and later combine them at a nearby boat basin. This limits our scope of operations and minimizes the realism necessary for effective tactical training.

Another major constraint impacts the southern corridor at Fort Irwin. This area is designated as critical habitat for the Desert Tortoise and cannot be used for maneuver training. Maneuver training is restricted to the central corridor, which is not large enough to provide realistic training and reduces the amount of training that can be conducted at Fort Irwin. Fort Irwin will also be constrained by air quality restrictions and by the reduced number of radio frequencies. Air quality restrictions prohibit training with graphite smoke and the particulate matter standards restrict the amount of smoke that we can generate via other methods. These restrictions have a direct impact on training realism. The loss of radio frequencies, due to the proximity of Los Angeles and other larger cities in Mexico, also impacts the ability of the forces to freely communicate with one another.

Restrictions on the use of the Navy's important Anti-Submarine Warfare (ASW) sensor prevented us from being able to demonstrate the contribution of this system toward improving ASW proficiency in littoral waters, a key to providing Joint Force access to denied areas and for assisting in Navy transformation efforts.

QUESTIONS SUBMITTED BY SENATOR JOHN MCCAIN

CORNERSTONE OF TRANSFORMATION

19. Senator MCCAIN. Secretary Wolfowitz, I realize that transformation means different things to different people and is not only measured in modernization of weapon systems. Given President Bush's promise to transform our military, what in your opinion, is the cornerstone of transformation in the President's 2003 defense budget? What specific program stands out in your mind as one that best exemplifies transformation?

Secretary WOLFOWITZ. Transformation and modernization are not either or choices. We must do both. One cannot neglect either modernization or transformation. The lion's share of Department budgets will still be spent on operations and modernization in coming years and not transformation. The fraction to be spent on transformation will be very small in comparison but equally significant. That said we have to rebalance the investments being made in critical areas. Investments in information must increase. Our networking capability must go up, our sensor capabilities must increase. Additional funding could be used to accelerate unmanned aerial vehicle and unmanned combat air vehicle programs as well as unmanned undersea sensor efforts. The Department is in the midst of a massive transformation into the information age so there must be a wholesale rebalancing of investments. What will become highly prized are those capabilities that improve positioning, sensing and networking. Systems or capabilities that are big, slow and ponderous will hold less and less value for the future military.

RESEARCH AND DEVELOPMENT

20. Senator MCCAIN. Admiral Cebrowski, would you agree that military transformation requires some level of experimentation in both strategic thinking and weapons development?

Admiral CEBROWSKI. Experimentation is essential for defense transformation. The emerging security environment presents many uncertainties and strategic issues. Each issue involves alternative concepts for addressing that issue and each concept calls for particular capabilities. A variety of combinations of operational arrangements and weapons also may be used to provide the requisite capabilities. Only through experimentation will we learn and gain enough experience to understand what approaches comprise the best way to allow U.S. Armed Forces to extend and broaden their competitive advantage and 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. One aspect of force transformation is to embed a culture of experimentation throughout the defense establishment. 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 co-evolving 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.

21. Senator MCCAIN. Admiral Cebrowski, do you feel that the level of research and development (R&D) funding in the 2003 defense budget is adequate to propel our military into the 21st century?

Admiral CEBROWSKI. The fiscal year 2003 defense budget request of $369 billion, balances the immediate threats to our national security with the long-term process of military transformation. The fiscal year 2003 defense budget request contains a significant increase of $12 billion in R&D funding over fiscal year 2001. It includes a substantial investment of $9.9 billion for S&T programs. If approved, the requested R&D funding will provide the needed funds intended to begin yielding the desired transformational effects necessary to propel our military into the 21st century. Examples of such transformational effects are major leaps in military capabilities that are likely to occur in the discovery and development of new technologies funded in S&T programs.

22. Senator MCCAIN. Admiral Cebrowski, with respect to the Navy's amphibious warfare capability, it seems to me that the proposed LHD–9 is not a very transformational program especially considering that it is the exact same hull of the current LHA class that is based on a 1950s design. It seems to me that if the LHA(R) class ship is built to have a lifespan of 50 years with no further R&D invested, then LHD–9 will be a 100-year-old design when it is decommissioned in the 2050 timeframe. The Navy would not develop an aircraft carrier (CVN), destroyer (DD), or submarine (SSN) without a robust R&D effort, so where is the R&D funding for a major amphibious ship like LHA(R)? Is the amphibious Navy being relegated to non-transformational status?

Admiral CEBROWSKI. The major transformational impact in expeditionary warfare will be a function of the modular capabilities, which will change the nature of the battle space for the expeditionary forces. Transformational capabilities in sensing and networking relevant operational information will allow agile effects based operations leveraging joint mission capabilities originating both within and outside the littoral region. Manned and unmanned sensors and countermeasures will produce an asymmetric information advantage for U.S. and coalition forces. It can be anticipated that the systems and maneuver elements that deploy from the amphibious ship will be changed repeatedly during the planned 40-year service life of the LHA(R). Exciting developments in hull forms, power and propulsion systems are being explored which appear to have unique applicability to littoral operations. The most beneficial application of all of these transformational concept/technologies will be as a complement to the LHA class of amphibious ships, which can be thought of as one of the containers expeditionary warfare comes in. An equally valid alternative view is that high speed vessel technology could be further exploited as a means to broaden the capabilities base and as a means of delivering ground force combat power. After this approach, as older ships left the inventory, a different capability could be substituted or added yielding a broader mix of capabilities. This is a fruitful area for further study.

JOINT OPERATIONS

23. Senator MCCAIN. General Kernan, our military's performance in Afghanistan during Operation Enduring Freedom has been remarkable. The ability of our Army, Navy, Air Force, and Marine Corps to work seamlessly together has been key to that performance. Obviously, joint operations are going to be critical to success in the future. Can you give me some specific examples of programs in the President's budget that are directly related to help our Armed Forces work together?

General KERNAN. Operation Enduring Freedom demonstrated many joint military capabilities and successful cases of transformational efforts that typify our Armed Forces working together. Specific examples of programs in the fiscal year 2003 President's Budget include:

1. The Joint Direct Attack Munitions (JDAM) has been used extensively in Afghanistan. This joint munition is deliverable by multiple models of Navy and Air Force aircraft. The Joint Direct Attack Munitions does not replace any existing weapon system; rather, we take a low cost weapon and couple it with a high tech kit to make a weapon with high accuracy, all-weather, autonomous, conventional bombing capability

2. Unmanned Aerial Vehicles (UAV) made a significant operational impact and promise even greater advantages in the future. As you are aware we have had stellar success with UAVs in finding hostiles in Afghanistan and creating increased situational awareness for commanders and troops in the field without placing additional personnel at risk in the air or on the ground.

3. Deployable Joint Command and Control—a program for new land- and sea-based joint command and control centers that can be easily relocated as tactical situations require—is under development by the Navy. Deployable Joint Command and Control is aligned with Joint Forces Command's development of the Standing Joint Force Headquarters, the Chairman of the Joint Chief's priority transformation initiative. Taken together, these two initiatives exploit new operational and organizational concepts and technology to reduce the ad-hoc nature of current joint operations and planning times. These capabilities will significantly enhance integration, interoperability and operational execution.

4. Joint Multi-TADIL School (JMTS) located at Ft. McPherson, GA provided critical joint tactical data link (TADIL) training to the Joint Interface Control Officers (JICO). JICC–D personnel redesigned the existing Operations Southern Watch data link architecture and added the new architecture for Operation Enduring Freedom.

5. Joint Communications Support Element (JCSE) based at MacDill AFB provided rapidly deployable, robust operational communications suites to the CINCs, and the joint task force commanders. The JCSE team configured and modified their high-speed multiplexers in order to feed Intelligence Surveillance and Reconnaissance (ISR) data to the major HQs in theater.

6. Joint Warfighting Analysis Center located in Dahlgren, VA has been a vital asset in current Enduring Freedom operations. Joint Warfighting Analysis Center capabilities are intrinsically linked to the way we plan and fight across all spectrums of conflict with nodal analysis of effects-based precision targeting options for our combatant commanders.

QUESTIONS SUBMITTED BY SENATOR BOB SMITH

TRAINING AND EDUCATION

24. Senator SMITH. Secretary Wolfowitz, as I understand it, the transformation process is a multi-pronged approach to change the way we fight. You need to change the organizational structure, change the way it thinks about national defense and warfighting and change the institutional or cultural mindset. To date, we have seen changes in DOD organizations—changing BMDO to MDA; changes in DOD guidance documents—the Defense Review, Defense Planning Guidance, and the Nuclear Posture Review; and changes in some technologies and weapons. These all seem to be steering the DOD complex in the direction of "transformation."

It seems to me that people need more and more time to get operationally proficient in a more complex world, a more complex operational arena, and a more lethal world. Once you have done this, I believe you will have made significant progress in changing the mindset of the institution. What is being done to change the training and education and subsequent employment and rotation of the people within the DOD to keep up with the increasingly rapid pace of combat operations?

Secretary WOLFOWITZ. Training and education transformation will enable the overarching DOD transformation. The Department's vision for training transformation is significantly different from those used to conduct training today. 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 Combatant Commanders 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 Combatant Commanders 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.

As the Department increases emphasis on the training requirements of combatant commanders, the services' training commands, in meeting their Title 10 obligations, must find ways to maintain a balance between training for near-term operations and those in the future. In addition to supporting service core competencies, transformed training must be coherent and applicable across the full spectrum of joint, interagency, intergovernmental, and multinational operations.

REVIEW STRUCTURES

25. Senator SMITH. Secretary Wolfowitz, it seems to me a critical component of a transformation of the Department's weapons programs is a rethinking of the review structures and processes that are used to forge and define the programs. Recently the Department has announced a new development paradigm, spiral or evolutionary acquisition, and a revised review structure for the missile defense program, a move that I fully support, and a new structure that I believe better characterizes the proper method of development. Yet, the new paradigm and structures have come under considerable criticism, both from within the Department itself and from some in Congress. It seems there are those who are comfortable with the onerous review structures of years past that do not want to see real change. What is being done to ensure the "transformation message" is driven down into the Department through the bureaucracy to the program manager in the field?

Secretary WOLFOWITZ. DOD is committed to transforming our capabilities to suit the unique demands of the 21st century threat and we recognize we must also transform our processes and policies to support these changes. Of course, if our policies are not communicated to the work force, they will be of little value. Evolutionary acquisition, the key to speeding the acquisition of transformational capabilities to our warfighter, is a good example of how this policy was communicated to the community. First, we defined evolutionary acquisition in our acquisition policy document as the preferred approach. Second, the Department's leadership is committed to supporting evolutionary acquisition and that is apparent in various speeches, conferences, and fora to the workforce. Third, we also communicate via electronic and paper publications. Finally, we use training to reinforce our message. The use of evolutionary acquisition policies have been thoroughly integrated into every aspect of the Defense Acquisition University curriculum and we are developing distance learning training to ensure the information is available on the desktop of every member of our community.

26. Senator SMITH. Secretary Wolfowitz, is the entire development/review structure being redefined to allow all Department programs to utilize the approach being used on missile defense?

Secretary WOLFOWITZ. No. The special nature of missile defense calls for a nonstandard approach to acquisition. The Secretary of Defense has approved a streamlined executive oversight and reporting process in order to substantially reduce decision times for missile defense.

27. Senator SMITH. Admiral Cebrowski, as I'm sure you will agree, the trick here is not only to accomplish a "one-time-good-deal" transformation of the Department but to establish a paradigm of continuous review and change for the better. Part S&T and technology efforts within the Department with an eye toward taking the promising ideas and concepts and maturing them using the evolutionary development process to quickly get them into the hands of the warfighter.

I have heard countless times from my constituents that such a review process either doesn't exist or is badly broken with respect to the Small Business Innovative Research (SBIR) efforts. Innovative concepts that are awarded SBIR contracts are taken only so far along the development path, and at some point the service or component that would ultimately utilize the concept should take over the final stages of development and fielding into the operational forces. Apparently, there is no structured review process to ensure the operational arms of the services have insight into the SBIR efforts, provide resources in the Future Years Defense Plan, and revise concepts of operation to integrate the efforts into doctrine. Are you aware of this deficiency? If so, what is being done to ensure the Department gets the most "bang for its S&T buck" and uses promising innovative concepts?

Admiral CEBROWSKI. The Office of Force Transformation is working on a new process to enable the co-evolution of concepts and technologies and consequently catalyze relevant innovation. Technology search throughout the national and defense laboratories, academia and the commercial sector will be coordinated with conceptual thought for the transformed DOD. Where concepts and technologies are a potential match, we will embark on a process of development of transformation articles, "prototype-like capabilities" to be iteratively investigated in operational or limited objective experimentation. This will enable us to explore the ramifications of the new concept/technology and provide a metric for assessing fitness for the future Through this initiative we will provide a customer for an S&T community whose most advanced products have often been forced to queue-up behind ongoing acquisition programs until our technological head-start is gone. We can also pressurize the pipes in the operational experimentation process, which needs surrogate future capabilities to enable evaluation of new concepts. With these tools we can build our own future.

The Office of Force Transformation is exploring strengthening relationships with angel investors and venture capitalists to help bridge the SBIR–FYDP funding gap and to get warfighters early access to technologies being developed in start-ups. Essential to closing this funding gap will be getting new technologies into the hands of operators through the transformation articles. The key leverage imparted is that they will help people see the range of possibilities for performing operations in truly new ways that abstract discourses on innovative ideas cannot.

There are currently several programs also trying to bridge the SBIR–FYDP gap. The Air Force's Warfighter Rapid Acquisition Process and the Army's Rapid Acquisition Process bridge the gap to allow for a smoother development process for the most promising of technologies. The Navy SBIR program concludes with a forum bringing together the small businesses and public and private investors and customers. Also, the fiscal year 2002 Defense Appropriations Bill directed the creation of a non-profit Army venture capital corporation.

SPACE SYSTEMS

28. Senator SMITH. Secretary Wolfowitz, it is clear that the Department is becoming more and more dependent on space systems in the prosecution of its wars. Indeed, the U.S. economy is also increasingly dependent on space systems. I applaud the Department for adopting many of the recommendations of the Space Commission, which includes dual-hatting the Under Secretary of the Air Force, Peter Teets, as both the Under Secretary and the Director of the National Reconnaissance Office, and also making him the Milestone Decision Authority for Space. I have met Mr. Teets and believe he is the right person for the job at an incredibly important time. Given the vast increase of space system requirements, as well as the cost and complexities of space systems, all now under the Air Force, why does the Department still allocate funding to the services in a roughly equivalent percentage?

Secretary WOLFOWITZ. Fiscal guidance provided to the DOD Components is provided in such a way as to meet the direction provided in the Defense Planning Guidance. Final decisions on the final allocation of resources to the DOD Components is made by the Secretary of Defense following Defense Resource Board deliberations. Necessary changes to the DOD Component budgets to meet the DPG are provided as a result of DRB deliberations.

29. Senator SMITH. Secretary Wolfowitz, I have data from 1995 forward that shows the three services get roughly 25–30 percent of the DOD budget. Shouldn't the Air Force be provided higher funding amounts to take into consideration its shouldering much of the burden of space programs?

Secretary WOLFOWITZ. I am confident that the Air Force is getting sufficient funding to handle its responsibilities for space programs. Thousands of factors determine

the funding shares of each service in any given year. Changes in the Air Force's space program funding—this year or in future years—would not necessarily produce a corresponding change in its budget share.

QUESTIONS SUBMITTED BY SENATOR RICK SANTORUM

ENCOURAGING CHANGE

30. Senator SANTORUM. Secretary Wolfowitz, Admiral Cebrowski, and Dr. Krepinevich, it has been argued that for military transformation to take place, there needs to be an organizational climate that encourages vigorous debate regarding the ways in which war may change and the impact of those changes on the military organization in question. That is, you need a climate that encourages change, wants the organization's future to be different from its past, and that welcomes change. Historically, this has been rare in the both the military and the business world. How best can we stimulate or prod the services into updating their core competencies?

Secretary WOLFOWITZ. Under the oversight of the Senior Executive Council (SEC) and the Business Initiative Council (BIC), we have directed the services and Department agencies to review their core and non-core competencies. To aid in this analysis we are using a decision tree methodology that helps us determine our core competencies and explore the possibility of outsourcing non-core competencies and explore the possibility of outsourcing non-core competencies. We have emphasized several important themes throughout this analysis:

(1) Transfer military personnel performing business functions to warfighter jobs.

(2) When outsourcing decisions are made, consider A–76 and alternatives to A–76.

We are working with the Office of Management and Budget to identify Pioneer Projects as prototype processes for A–76 alternatives.

Admiral CEBROWSKI. Researchers have written that because institutional culture is usually the last thing to change, it is the first effort that must be undertaken in any organizational transformation. That effort begins and ends with leadership. Effective transformation leadership encourages innovation and intelligent risk taking. Leadership must own the vision for transformation. Additionally, we must incentivize those activities of discovery—operational concept development, experimentation, and operational prototyping, to name a few—that will allow us to create the future from the unknown.

Dr. KREPINEVICH. There are a number of ways to promote a climate that encourages and welcomes change. Permit me to elaborate on two.

A Critical Mass of Senior Leaders: Military transformation requires a critical mass of support from senior military and civilian leaders who are, themselves, advocates of change. I have yet to find a single case of military transformation that was effected without this kind of critical mass. Moreover, by its nature, dramatic change in large military organizations almost inevitably involve, a long-term process that spans a decade or more. However, the U.S. military's institutional practices typically find senior leaders rotated out of their assignments every 3 or 4 years. While this rotation cycle may work well for leaders whose responsibilities are near term oriented (for example, the regional CINC who is responsible for the immediate warfighting mission in his area of operation), the transformation mission is one that can be accomplished only over a relatively long period of time.

It is not surprising, then, that military organizations that have successfully transformed have almost always had a few key senior leaders serve an extended tour of duty, often double or even triple the length of a typical flag (i.e., general or admiral) officer tour in today's U.S. military. During the German army's transformation to blitzkrieg, for example, the head of its shadow general staff, General Hans von Seeckt, served 7 years in that position. The American Navy's exploitation of naval aviation was shepherded by Vice Admiral William Moffett, who remained head of the Navy's Bureau of Aeronautics for 12 consecutive years. On the other hand, the tour of duty for the CINC JFCOM remains the same as those for CINCs who are primarily responsible for meeting immediate warfighting requirements. The absence of extended tours of service for transformation-minded senior U.S. military leaders serving in key positions (e.g., CINC JFCOM) should give pause to those who are concerned about joint transformation field exercises in particular and the prospects for transformation in general.

Joint Field Exercises: One reason why military transformations typically require a decade or so to bring about is that they must overcome the resistance of large organizations to major change.

This is especially true with respect to the U.S. military, which must contend with the additional burden of its remarkable success, and which today is undisputedly the world's premier fighting force. Thus, aside from convincing the U.S. military that transformation is necessary, its members, especially the officer corps, must also be convinced that transformation is possible, and that the military is proceeding down the right transformation path. Properly structured field exercises, involving actual forces in an environment that is as close to actual operations as possible, are arguably unsurpassed in their ability to generate support, and even enthusiasm, for transformation within the officer corps. History shows that such maneuvers are important in convincing the officer corps-in a way that no war game or simulation ever could have-that they were onto something special, that a dramatically new and more effective way of conducting military operations was indeed possible. In short, past exercises have helped to sustain momentum for transformation and to institutionalize it within the military services.

EXPERIMENTATION

31. Senator SANTORUM. Secretary Wolfowitz, Admiral Cebrowski, and Dr. Krepinevich, what role does experimentation play in this process? That is, to what extent do the services need to experiment, discover, learn, test, and demonstrate new concepts, technologies, and applications?

Secretary WOLFOWITZ and Admiral CEBROWSKI. Experimentation is essential. Results provide critical feedback to refine and ascertain feasibility of concepts, processes, organizations, and technology. This process provides for a frequent and continuous cycle of events where spiral learning can occur and be rapidly incorporated into joint force capabilities and operations. Concept-based experimentation in wargames and field exercises yields new ways to accomplish critical operations, missions and tasks. Transformation occurs most rapidly and effectively when military personnel and system developers work side-by-side on emerging concepts and operational challenges. A process of rapid spiral transformation employs experimentation to reach beyond current capabilities and learn what actions must be taken to reach the next step in achieving desired joint mission capabilities.

Dr. KREPINEVICH. Field exercises, and the experiments they make possible, play a critical role in enabling military innovation and transformation, which can be defined as innovation on a grand scale or on a scale sufficient to bring about a change in warfare regimes (i.e., a military revolution). Properly undertaken, field exercises are a source of great competitive advantage. Their benefits include:

- Reducing uncertainty concerning how best to meet emerging threats;
- Determining the proper mix of emerging and legacy systems in the future force;
- Enabling militaries to develop and evaluate a wide range of military capabilities and forms of operation, which can be fully and rapidly developed if and when a threat emerges;
- Crenerating successes that inspire enthusiasm for, and sustain the momentum of, military transformation and innovation;
- Complicating the planning of would-be enemies;
- Identifying intra-regime shifts—major shifts in the military competition that, while they do not require large-scale transformation, do require the military to effect significant innovation;
- Helping to avoid premature, large-scale production of emerging systems that may appear promising but that actually offer little in terms of military capability; and
- Identifying and solving the practical problems inherent in developing new operations, force structures and systems that cannot be determined through wargames and simulations.

SPIRAL DEVELOPMENT

32. Senator SANTORUM. Secretary Wolfowitz, the Bush administration touts the concept of "spiral development" as a way to accelerate capabilities and get technologies and platforms in the hands of the warfighters faster. The idea, in concept, is to field a platform or device, allow the users to become proficient in the use of the system, and then add capabilities as they mature. How does this concept differ from traditional "block modification" processes where technological advances are added to an existing platform as part of technology "refresher" or insertion?

Secretary WOLFOWITZ. While evolutionary acquisition/spiral development is similar to the traditional "block modification" process you described in your question, it

differs in several ways and provides significant advantages. In the past, "block modifications" were applied to fully capable systems which met all stated requirements. With spiral development, each spiral will incrementally provide greater capability approaching the satisfaction of all stated requirements. Evolutionary acquisition and spiral development are focused on providing the warfighter with an initial capability which may be less than the full requirement as a trade-off for earlier delivery. This offers greater reduction in our cycle time, not only speeding the delivery of advanced capability to our warfighters, but also allows fielding demonstrated technologies for both hardware and software in more manageable pieces.

INTERIM FORCE

33. Senator SANTORUM. Dr. Krepinevich, under the leadership of Army Chief of Staff General Eric Shinseki, the Army has initiated a bold transformation strategy to better align the service to counter 21st century threats. A central element of this initiative is to make the service lighter and more easily deployed to a particular conflict. The Army has elected to undertake a phased approach to this transformation initiative by pursuing an "interim force" and by investing in technologies to support an "objective force." In your opinion, does it make sense to invest in this interim force, thereby diverting critical resources away from the fielding of the objective force?

Dr. KREPINEVICH. The Army plans to field the first of six (or perhaps seven) medium-weight brigades—or Interim Brigade Combat Teams (IBCTs)—in January 2003, with the first brigade ready for combat by May 2003.

Several issues come to mind in considering the IBCTs' function as a bridge to the Army's Objective Force. One is that, the first four brigades to be reformed into the IBCT configuration are light formations. In short, if it succeeds in executing its conversions to IBCTs as planned, by the end of this decade the Army will be a heavier force than it is today.

In depicting these new formations the Army states that "The IBCTs two core qualities are high mobility . . . and its ability to achieve decisive action through dismounted Infantry assault." While the first quality would seem to conform to the Army's concept for the Objective Force, the second seems quite at odds with the Army Training and Doctrine Command's (TRADOCs) concept of a force that exploits its ability to "see first, understand first, act first, and finish decisively." Why would an IBCT close with the enemy through infantry assault, save as a last resort? There are also concerns over the IBCTs' lack of organic air-defense support. If these formations are to deploy early in an anti-access/area-denial environment, it would seem essential that they be provided with air and missile defense assets.

TRADOCs operational concept for the Objective Force states that "Objective Forces must have the organic capability to conduct vertical envelopment and tactical air assault . . ." This capability seems consistent with the concept's emphasis on a non-linear battlefield and highly mobile forces capable of executing rapid maneuver to achieve positional advantage. The Army today relies on the AH–64 Apache attack helicopter, UH–60 Blackhawk helicopter, OH–58D Kiowa Warrior Scout helicopter, and CH–47 Chinook heavy-lift helicopter. The RAH–66 Comanche helicopter is supposed to be fielded in 2008. However, there are no organic air assault assets in the IBCTs, although one of their principal purposes is to serve as a bridge to the Objective Force. Given the IBCT deployment timelines and relative paucity of high-speed air and sea-lift assets, if these formations do not have organic aviation assets, it is difficult to see how they will be provided with such assets early in a campaign.

Finally, in periods of transformation, military organizations run the risk of buying large quantities of a promising system too early, and the Army is no exception. The risk of committing to a "false start" is demonstrated in the U.S. Navy's affection for its first carrier designed from the keel up, the Ranger, which was commissioned in 1934. Although some Navy leaders had pressed for construction of five *Ranger*-class carriers, wargame analysis and fleet problems soon indicated that, at roughly 14,000 tons, the Ranger was far too small to meet many of the demands of future fleet operations. As it turned out, the Essex-class carriers that formed the backbone of the Navy's fast carrier task forces in World War II each displaced nearly twice as much tonnage as the Ranger. The Army is running the risk that, should the Future Combat System (FCS) develop as hoped for, its Stryker IAVs—over 2,000 systems—could represent a very expensive "false start."

SHORT RUN RISK

34. Senator SANTORUM. Dr. Krepinevich, obtaining the resources to finance the Army's transformation has been difficult for the service. This resource shortfall has forced the Army to terminate a wide variety of weapons systems and recapitalization efforts. How much risk do you believe the Army can incur in the short run to achieve its transformational goals?

Dr. KREPINEVICH. Senior defense decision-makers always confront the challenge of developing a strategy to minimize the overall—near-term and long-term—risks to our security. Those resources devoted to minimizing the immediate risk to our security risk cannot fund initiatives that promise to reduce the dangers we are likely to confront over the longer term, and vice versa. Since no one can predict the future, in the end, his or her judgment as to the appropriate balance between near and long-term risk is ultimately subjective.

Given the description of the current and emerging threat environment set down in the Department of Defense QDR, it is my judgment that the Army can accept some additional near-term risk over and above what is currently called for in the defense program. Put another way, some near term risk can be accepted to ensure the service can transform to achieve the six critical operational goals set forth in the QDR, thereby substantially reducing long-term risk.

35. Senator SANTORUM. Dr. Krepinevich, are you aware of similar efforts by the Navy/Marine Corps or Air Force to pursue a phased approach to transformation?

Dr. KREPINEVICH. Transformation is, by its nature, a "phased" process in that it typically occurs over a number of years, often a decade or more. I am not, however, aware of efforts by the Navy/Marine Corps or the Air Force that would be comparable to the Army's plans to field an Interim Force.

INVESTMENT IN SCIENCE AND TECHNOLOGY

36. Senator SANTORUM. Secretary Wolfowitz, recognizing that the Army's objective force will be significantly different that the current force, are you convinced the Army is making the investments in S&T programs that will allow our warfighters to realize "leap-ahead" capabilities? That is, what type of investment are we making into enabling technologies such as engine and propulsion technologies—to include hybrid, batteries, power cells, etc.?

Secretary WOLFOWITZ. I am convinced that the Army is committed to pursuing many critical enabling technologies that will provide our future warfighters with awesome capabilities. In particular, the Army has been investing and will continue to invest in electric and hybrid electric vehicle technology and the requisite component technology development. The goal of the Future Combat Systems (FCS) program is to provide a system of systems that is deployable, lethal, survivable and sustainable within this decade. Electric and hybrid electric vehicles will play a significant role in future military systems. In fiscal year 2002 the Army will spend more than $18 million on development of the FCS engine, lithium ion high energy batteries, high power silicon and silicon carbide switches, electronic controllers/motors, and fuel cells/reformers. In fiscal year 2003 the planned investment will be more than $40 million in this area.

UAV SENSORS

37. Senator SANTORUM. Secretary Wolfowitz and Admiral Cebrowski, Senate Report 106–292, to accompany S. 2549, the National Defense Authorization Act for Fiscal Year 2001, set a goal that within 10 years one-third of U.S. military operational deep strike aircraft will be unmanned and within 15 years one-third of all U.S. military ground combat vehicles will also be unmanned. Recently, Air Force Secretary Jim Roche and Air Force Chief of Staff General John Jumper stated that they want more companies to compete in the UAV sensor market to achieve significant price reductions. They asserted that sensor costs are soaring due to growing demand and a shortage of competition. Sensors, according to Secretary Roche, are starting to dominate the cost of the vehicle. What steps can the Department of Defense take to encourage the development of new UAV sensors?

Secretary WOLFOWITZ. UAVs have proven their military worth in recent operations, especially in their capability to loiter for extended periods over the battlefield. A major focus now is to improve the reconnaissance performance of these systems to enhance operational requirements and extend capabilities. This improves UAV system flexibility, but also increases cost for these upgraded sensor systems.

Many sensor systems require state-of-the-art components in critical areas, and often these components have no corresponding equivalent in the commercial market. Cost control is a significant challenge for our highest performing sensor systems, such as those used on the U–2 and Global Hawk, due to limited competition and procurement quantities. Historically, sensor quantities have been insufficient to maintain a robust, competitive market for these systems and components. As an example, the Air Force is procuring only six new multi-spectral EO/IR U–2 sensors (SYERS 2). The multi-spectral focal plane array in this system has no commercial equivalent, and including spares, the total focal plane buy is only nine units. As part of our UAV Roadmap update activity, we are reviewing the current sensor technology development efforts for our UAV and UAV support activities, looking for areas where these critical components might be used by multiple sensor systems, both manned and unmanned. The Predator UAV sensor ball upgrade used this strategy, sharing development and production with a Navy helicopter upgrade. The Department will continue to encourage the incorporation of commercial technologies and standards, allowing increased competition, and reduced time to fielding. Encouraging competition will also open other potential operational capabilities for UAVs, and further extend their use to the warfighter.

Admiral CEBROWSKI. An important difference in the concept of operations which will pertain to emergent unmanned systems will be the emphasis on more proximate sensors and effectors integrated into the scheme of maneuver of the operational forces. The distributed capability envisioned will break the paradigm of Low Density High Demand (LDHD) ISR/EW assets and supplement them with an array of the "the small, the cheap, and the many." Distributed elements employed as part of an expeditionary grid will incorporate inexpensive modular sensors/effectors which will exploit the asymmetric advantage of their unmanned nature to penetrate and position themselves close to potential adversaries in areas and times of operational interest. The sensor and effector packages will be simplified and exhibit great reductions in size and required power. The effects possible from their advantaged locations will be dramatically different from what can be achieved from standoff ranges.

In addition, using the Small Business Innovation Research (SBIR) program, DOD is working to develop affordable, advanced sensor technology that can be applied to both commercial and military space and manned/unmanned airborne systems. These technologies, which range from devices to complete systems, must also have other commercial applications, such as imaging, surveying, telecommunications and medical. Research and development for providing intelligence, surveillance and reconnaissance sensing capabilities for UAVs that sustain a "continued presence" are also a priority. Sensors need not be considered as large system. A multiplicity of smaller netted sensors leveraging the power of the collective and expeditionary in nature warrant further research.

Complementary air and space sensors with differences in field-of-regard, range, textural fidelity and latency are needed to give a complete and timely picture of the battle space, enable a timely precision response and enhance the warfighter's survivability. Areas to be focused on include:

- Space-based and manned/unmanned airborne radars with advanced antenna designs and low-cost digital receivers
- Active and passive electro-optical systems with multi-spectral and hyperspectral sensors and multi-function laser radars
- Navigation aids with inertial navigation components and satellite-based global positioning
- Automatic target recognition and sensor data fusion

OFFICE OF FORCE TRANSFORMATION

38. Senator SANTORUM. Secretary Wolfowitz and Admiral Cebrowski, does the Office of Force Transformation have the ability to apply funds to a particular transformational process/technology/application it deems worthy of financial support?

Secretary WOLFOWITZ and Admiral CEBROWSKI. Yes. The OFT will use funds to seek prospects for differences in kind and for new operational concepts that could generate leaps in relative military effectiveness. By way of example, OFT will use funds to assess transformational implications in the conflict in Afghanistan. Specifically, some funds will be used for research, information gathering, and analysis to flesh out the transformational implications of the extensive and effective use of ground observation and target designation. The operational mode demonstrated in Afghanistan highlights the possibility of extraordinary precision and timeliness of air responses. Further analysis may provide evidence that we are approaching a

"tipping" point where the effective use of ground observation and target designation posit significant differences in kind and point to a much-expanded form of the operational concept demonstrated in Afghanistan. A specific example of how the office has provided funds is to transformational initiative is with PACOM. Resources were provided to catalyze a Combatant Commands experimentation effort. This is in keeping with our efforts to create a broader, more robust, experimentation base. A decentralized approach vice centralized.

PRIVATE RESEARCH AND DEVELOPMENT

39. Senator SANTORUM. Admiral Cebrowski, while the Federal Government has the most funding to contribute to the development of new military capabilities, clearly the private sector can contribute resources (manpower and funding) to help speed this process along. What efforts can the Department of Defense initiate to encourage more independent R&D by private industry?

Admiral CEBROWSKI. Research and development efforts leading to discoveries in government and private laboratories are likely to be a leading source of future technological development. The Department is exploring two initiatives to encourage more independent R&D by private industry. The first one deals with the issue of intellectual property. Many private companies do not believe that adequate safeguards to protect intellectual property exist as part of doing business with the Federal Government. Private industry needs to be assured that their technological discoveries and intellectual property will be adequately protected. Hence, the Department must work on creative ways to protect intellectual property and creating a greater incentive for industry to not only do business with the Federal Government, but also increase the likelihood of their investing their own resources in conjunction with government sponsored and funded research programs. Therefore, the Department is working on ways and means to enhance the protection of intellectual property via government contracting and education of the acquisition workforce.

Second, the Department is addressing the challenges and barriers associated with inserting leading-edge technologies into defense systems later in the acquisition cycle. As structured today, cost, schedule, and performance, as established goals at contract award, are put at risk if the program office is asked to integrate new developments not previously planned for—after the design baseline is established. If we can devise structural and program incentives to more easily permit technological insertion, even during the production phases, it would potentially offer some advantages. Not only would it result in earlier fielding of more advances systems and capabilities, but it would possibly create an earlier market demand for new developments coming out of private industry R&D laboratories.

40. Senator SANTORUM. Secretary Wolfowitz, recently, Admiral Vernon Clark, Chief of Naval Operations, stated that the Navy needed a more effective partnership with industry. Admiral Clark stated that, "I am concerned about the industrial base and I am concerned about investment strategies that look like sine-cosine curves. I just don't know how anybody can make that work." Do you share Admiral Clark's concerns? Are his concerns just limited to the Navy or are the other services and the Office of the Secretary of Defense just as vulnerable to this situation?

Mr. WOLFOWITZ. The Department does share Admiral Clark's concern over fluctuations in all Defense budget categories. DOD and all the services have long recognized that budget variations from year to year cause extensive disruptions in the planning, execution, and cost of our programs, both in the Department and services, and particularly at our contractors. Annual budget fluctuations are one of the most significant causes of the cost growth at our contractors, who are ultimately the ones who have to implement the costly processes associated with layoffs, rehiring, and retraining employees to accommodate such variations. With this comes inefficiencies in development and manufacturing processes, difficulties sustaining or developing sources for components or services, component price changes, and both short- and long-term variations in overhead costs. Often hidden, but very significant impacts of budget fluctuations are the adverse affects on our contractors' ability to retain key employees, and to attract key suppliers at the sub-tier level, many of whom seek a higher level of stability than that offered by defense budgets.

History is clear that the most affordable way to maintain a healthy industrial base to develop and produce our systems at the lowest possible total program cost is to maintain a stable pace. The Department and the services work extensively to assess, reduce and control the effects of such fluctuations, both in our budget preparations and, to the extent we can, in subsequent appropriations.

BASIC RESEARCH

41. Senator SANTORUM. Secretary Wolfowitz, with the exception of the fiscal years 2001 and 2002 funding spike, funding for Department of Defense basic research has been consistently underfunded. Congress shares some of this blame as it has taken funds from these crucial accounts and used them to pay for the near-term modernization or procurement needs of today's military.

I am concerned with the level of basic research funding in the United States. Without increased investment in Department of Defense basic research, the number of graduate student opportunities to pursue Department of Defense research cannot increase. A decline in the pool of scientists, engineers, mathematicians, and skilled technicians will prevent the Department of Defense from achieving success in the pursuit of "leap-ahead" technologies. Could you address the importance of DOD basic research (and S&T programs) in realizing "leap-ahead" advances in military capabilities? In addition, please address how funding levels for DOD basic research impact not only military capabilities, but also the pool of skilled scientists and engineers who will drive innovation and change.

Secretary WOLFOWITZ. DOD-sponsored basic research is a wellspring of new knowledge and understanding that underpins the development of future military capabilities. Prior basic research enabled the generation of today's revolutionary military capabilities, including the Global Positioning System, stealth, night vision, and precision strike. We expect equally important new capabilities to emerge over the long term from today's investments in basic research in areas such as those relevant to nanotechnology, smart materials and structures, information technology, human-centered systems, compact power, and biomimetics. Our support for basic research today will help to give future leaders the technological edge they need to deter potential adversaries and, if necessary, conduct military operations, much as we reap benefits from prior defense research in the current Operation Enduring Freedom.

Basic research has an additional long-term benefit to the DOD because universities are the predominant performers of basic research in this country and university research is inextricably linked with the training of scientists and engineers in fields important to national defense. DOD-supported basic research thereby helps to ensure the future availability of talent needed for defense research and development.

42. Senator SANTORUM. Secretary Wolfowitz, do you believe that the levels of S&T funding requested by the administration for fiscal year 2003 are adequate to propel transformation throughout the services?

Secretary WOLFOWITZ. Yes, I believe our fiscal year 2003 request for S&T funding is adequate to support our transformation initiative. We increased the DOD S&T funding request from the previously planned $7.8 billion for DOD S&T to $8.8 billion in the amended fiscal year 2002 President's budget request. Our fiscal year 2003 S&T budget request is for $9.7 billion: plus an additional $213 million in Defense Emergency Response Funds for combating terrorism technology. This addition of $213 million increases the total fiscal year 2003 budget request for DOD S&T to $9.9 billion. However, because of the significant increase in the Department's total funding in fiscal year 2003 and the need to add dollars to fully fund acquisition programs and health care etc. the percentage of the budget request devoted to S&T is less than 3 percent.

[Whereupon, at 12:31 p.m., the committee adjourned.]