

**Technical Thought Leadership
for Research and Engineering**

Remarks as prepared for delivery by
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Director, Defense Research and Engineering
Department of Defense

to the

American Institute of Aeronautics and Astronautics
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Thank you Dave and Good morning everyone!

I am delighted to be here among this talented and diverse community of professionals whose goal it is collectively to advance innovation, technical excellence and global leadership in aviation and the science of flight. With your conference theme; *New Directions in Strategic and Tactical Missile Systems*, YOU are the thought leaders, innovators and decision makers who will chart our nation's future course for aviation and space. And as the DDR&E or Chief Technology Officer of the Department of Defense, I welcome the opportunity to talk with you today.

This is especially the case because our ability to operate in the atmosphere and in space in pursuit of a wide range of missions is extremely important to the Department in general, and more specifically within Defense Research and Engineering. This should come as no surprise to many of you: As the size of our military has decreased and the need for us to gain access anywhere on the globe in short order has increased, our desire to develop and transition technologies in aeronautics and astronautics has intensified.

I would like to begin with two impressive S&T concepts that also are examples of innovation and complex system engineering central to the objectives of DDR&E rapid support to the warfighter through the deployment of innovative capabilities and streamlining the underlying processes.

Only ten days ago, on January 10, the United States Air Force demonstrated the first ever tracking and low power laser engagement of a boost phase target in the pacific missile range from the 747 Airborne Laser [\[Show Video\]](#). Later this month, a boost phase intercept is planned at full power, greater than 1 MW, which will be quite an achievement.

And later this spring, on or about April 20, the Air Force will launch a hypersonic aircraft into space from Vandenberg AFB that will re-enter the Earth's atmosphere, travel across the Pacific Ocean at speeds that may reach Mach 22, and hit a target in the Kwajalein Atoll – 5,000 miles and 23 minutes away! [\[Show Chart HTV-2, Kwajalein Atoll\]](#) The aircraft, an unmanned hypersonic glider known as HTV-2, funded by DARPA, will be the fastest farthest flying aircraft ever built, and if successful it will – obviously – realize DoD's long-held vision of a prompt and precise global reach capability for our armed forces.

The ABL and HTV-2 are both examples of projects with important research objectives that practically demonstrate the Department's investments in fundamental science and technology. These are just 2 of a myriad of programs supported by DDR&E that produce new system concepts to address key national security challenges

More than at any time since the industrial revolution, we face an uncertain future. Our nation's security is affected by the complex interactions of globalization, the pace of technology development, the availability of advanced commercial technologies by our adversaries, and the enduring challenge of asymmetric warfare.

Our military must be prepared to rapidly respond to threats to our national security anywhere around the globe. It has taken on new roles in stabilization and building partnerships. And our military has been asked to support humanitarian relief missions, most recently in Haiti.

Across this full operating spectrum, we need to supply our service men and women with the very best capabilities our nation can provide.

Drawing upon the intellectual expertise and resources of those of you here at this conference, and by employing the successful models of the commercial marketplace, we **must find** innovative solutions like HTV-2 that not only preserve our nation's technological advantages over our adversaries, *but that also* can be transformed – transitioned – into capabilities quickly.

And by quickly, I mean months, not years.

We **must find** better approaches to understanding engineering and technical risk that support knowledge-based decisions. We need agility in the industrial base to adapt and develop new products on commercial innovation cycles and cost points. And we need a new generation of systems that broadly interoperate and are adaptable to dynamic operating environments.

And we **must find** ways to achieve what Secretary Gates so succinctly has described as:

“a portfolio of military capabilities with maximum versatility across the widest possible spectrum of conflict.”

And, as Secretary Gates has also said, we’ll achieve that goal only if DoD changes the way it thinks, the way it plans and the way it executes.

The Secretary has laid out three concepts to drive our reform initiative:

1. **Reaffirm.** *That is,* reaffirm our support to our warfighters and their families, provide the best equipment, and provide support to the wounded.
2. **Rebalance.** *As in,* rebalance and equip our forces for the wars we face today and the scenarios we are likely to face tomorrow.

--and --

3. **Reform.** *By which we mean,* overhaul the DoD’s approach to procurement, acquisition, requirements and contracting; avoid exotic solutions, and eliminate waste and “requirements creep.”

In my position as Director of Defense Research & Engineering, I have been charged by President Obama and Secretary Gates with the development and oversight of DoD’s technology strategy.

As my response to the Secretary’s call to *reaffirm, rebalance* and *reform*, I have established four imperatives to focus DDR&E in support of the immediate and future needs of the warfighter. [[Show Imperatives Slide](#)]

I refer to them as “imperatives” because they are NOT lofty goals or broad mission statements. Rather, they represent where we will put our resources, our time and effort, day after day.

They are:

- *First,* Accelerate delivery of technical capabilities to win the current fight

When I talk to the combat commanders, they all say pretty much the same thing:

“Get me an 80% solution NOW rather than a 100% solution two years from now and help me innovate in the field.”

We must rapidly transition our technical capabilities from R&D into useful tools for the warfighter. We must accomplish this in a matter of weeks and months – not years.

My team and I spend a great deal of time working with the research community and also the end user – the warfighter – to make this happen. Cases in point are ongoing efforts to achieve dramatic improvements in jet and rocket propulsion technologies and in energy efficient turbine engines.

For example, we MUST accelerate our efforts to improve our overall strategic and tactical missile propulsion capabilities. The Air Force, Navy and Army are developing concepts that will result in critical capabilities such as improvements in maneuverability, materials and advanced specific propellants.

Our second imperative is:

- Prepare for an uncertain future

In addition to making things happen now, we also must invest in concepts, technologies, and basic research that will serve as foundational capabilities for our national security five, ten, 15 years, and beyond

I'm talking about stepping up our efforts across a number of core capabilities and the enabling technologies. We're in the process of an internal review to determine an investment strategy that will prepare for the future. We're particularly interested in capabilities that are 'enablers' to benefit our forces across a number of missions. These technologies would extend our capabilities and decrease our reaction time by providing:

- new design tools
- lower software development costs with increased reliability and flexibility
- the ability to quickly turn the terabytes of data our forces collect into knowledge and decision, and
- cooperative autonomous systems with trusted hardware and software concepts.

Focusing on 'enablers' will ensure that we are prepared for an uncertain future.

The third imperative is:

- Reduce the cost, acquisition time and risk of our major defense acquisition programs.

Many of the Pentagon's weapon systems have run far over original cost estimates and procurement times. Over 70% of a program's cost and capability are determined before the program has reached Milestone A. That means the program costs are set well ahead of awarding the first technology development or system development contract. How can this be?

Much of this is driven by front end architectural trades and risk assessment.

We are working to correct that. But the bow wave of projects is large and the tool set to correct the problem is thin.

So, last May, Congress passed and the President signed into law The Weapons System Acquisition Reform Act -- an important new requirement for assessing accountability for the cost and efficiency in the way our weapons systems are built. We are fully engaged across the Department along these lines and are already seeing some early successes.

And, my fourth imperative is:

- Develop world class science, technology, engineering, and mathematics capabilities for the DoD and the Nation.

In some ways, this imperative could be considered the most important– at least in the long term, – because it is so *foundational* to our ability to fulfill the other three. We must do all we can to encourage our youth to become scientists and engineers in proud service to the DoD and our armed forces.

I'm going to spend just a minute sharing with you some details about how we intend to meet these imperatives internally within my office – and then I'd like to talk a little more about our progress to date and encourage you and your colleagues and peers to become actively engaged in working with us.

When I came back into the Department as DDR&E, last July, I created four new offices within DDR&E, centered on our imperatives and structured as follows: [\[show simple org chart\]](#)

1. The **Research Directorate** is largely centered on developing good science and advancing promising technologies.
2. Our **Rapid Fielding Directorate** is focused on getting promising technologies directly to the end users.
3. The **Systems Engineering Directorate** is working to ensure that the early 'architecture' of any given program is sound and accurate from the outset, to help avoid cost problems later. This Directorate also works with the Program Office to provide technology and manufacturing risk assessments very early in the process.
4. The **Developmental Test and Evaluation Directorate** is responsible for providing risk assessments and validating the early system demonstrations.

Within this structure, we are pushing hard on three areas that will have a direct impact on our operations in Afghanistan. These are base protection, helicopter survivability and counter-IED.

Of particular interest to some of you today is the Helicopter Survivability Task Force. We stood this up in late July to quickly identify concepts to protect our rotary wing forces in theatre. In fact the timeline is targeted to have an initial impact in Spring of this year.

We have been working across the S&T community and with Army Aviation to find ways to better protect our H-60 Black Hawk, Kaiwa Warrior and CH-47 Chinook helicopters, which are widely deployed in Afghanistan.

We've also developed a concept for ways to deploy the autonomous helicopter, the A160 Airship – for resupply and ISR missions! It would be terrific if we were able to take airmen out of harm's way during these high demand missions.

Our work to improve helicopter survivability is ongoing, with various milestones set for March, September and again in March of next year.

So far today, I've covered a fair amount of territory! I'd like to conclude today by leaving you with just three simple words that I have not actually used thus far, but which sum up, I believe, everything I have talked about.

Those three words are: **Innovation... Speed...and ...Agility.**

These are not the typical vectors of the Department, but they define a future approach and operating space critical to our mission.

We must not give up our commitment to sound technological advancements, we must move very quickly to meet the changing strategies and tactics of our adversaries, and we must be nimble and flexible in our approach, so as to meet evolving realities.

And that, ladies and gentlemen, is where you come in.

For if we are to succeed, we must rely on the support of an integrated R&E Community of thought leaders to offer up technology-based options for National Defense.

We will need the application of technical excellence, strategic insight and execution speed by innovators and motivators.

And where I am more likely to find that insight, expertise, and motivation if not right here in this room?

Your organization has been at the center of the aerospace community for over 75 years.

You are leaders in the companies, organizations, and agencies that comprise a multi-billion dollar civilian and military flight enterprise.

We need your help.

I believe we see great things when a talented team is given a challenging problem, sufficient resources and an environment in which to grow technically and contribute. By capitalizing on the combined strengths of our thought leaders and pragmatists in industry, the government and academia....our research triple....we can apply focus and expertise to provide innovative solutions and the strategies to field them at speed previously reserved for the commercial marketplace.

We are trying to create the environment, and provide the necessary resources, and we are doing so in a very strategic fashion:

... One that starts with the goals of our President to improve America's technology infrastructure and create 21st Century jobs –

... and that continues through to the desire of our Nation's political leadership to maintain our national security while protecting our economic competitiveness by instituting accountabilities and efficiencies ...

...to the vision of Secretary Gates for a Defense strategy that meets real-world realities...

...and to the requirements of our combat and battlefield commanders for the tools, networks and systems that will help them the increasingly asymmetrical strategies and tactics of our adversaries and preserve the lives of our young men and women in uniform.

I would like to close by reiterating the words that we use to maintain momentum and keep focus across DDR&E. This is not just a catch phrase, but a real mandate of this Organization to work with our S&T community and the Defense industrial base to protect our National security and the men and women who proudly wear the uniform of our Nation.

Three simple words. ***Innovation.*** ***Speed.*** ***Agility.***

Thank you!