National Institute for Deterrence Studies & Peter Huessy Seminar

The Hypersonic Imperative: Restoring U.S. Advantage in a Contested Battlespace with Michael White

April 10, 2026, 10:00-11:00 AM (Eastern)

Webinar Transcript

How to cite:

National Institute for Deterrence Studies. *Huessy Seminar: Hypersonic Weapons and the Imperative for U.S. Deterrence*. Featuring Michael White. Video recording, April 10, 2026. https://youtu.be/Cch7AbRn1aQ.

Abstract:

In this Huessy Seminar recorded on April 10, 2026, the National Institute for Deterrence Studies hosted Michael White, Managing Member of White Arrow LLC and former Principal Director for Hypersonics at the U.S. Department of Defense, for a comprehensive examination of hypersonic weapons and their implications for modern deterrence and warfighting. Mr. White outlines what defines hypersonic flight and explains how speed, maneuverability, and atmospheric operation fundamentally compress the time scale of battle, complicating adversary defense and enabling transformational military effects.

The seminar explores the role of hypersonic systems within highly contested environments, emphasizing survivability, lethality, and unpredictability as key advantages over traditional ballistic and cruise missile systems. Mr. White situates hypersonic strike capabilities within a broader framework of comprehensive layered defeat, integrating kinetic and non-kinetic offensive and defensive measures to counter advanced peer competitors. Drawing from the Atlantic Council's *Hypersonic Capabilities Task Force* report, he discusses challenges related to affordability, production scale, testing, allied cooperation, and workforce development, as well as the need to transition from research and development to fielded warfighting capability.

Moderated by Peter Huessy, the discussion includes an extensive question-and-answer session addressing materials science constraints, budgetary considerations, escalation dynamics, and the strategic balance between offense and defense. The seminar underscores the growing

imperative for the United States and its allies to accelerate hypersonic capability development to maintain deterrence credibility and battlefield dominance.

Executive Summary

On April 10, 2026, the National Institute for Deterrence Studies (NIDS) hosted a Huessy Seminar featuring **Michael White**, Managing Member of White Arrow LLC and former Principal Director for Hypersonics at the U.S. Department of Defense. The seminar examined the growing strategic importance of hypersonic weapons and their implications for deterrence, warfighting, and U.S. national security in an era of great-power competition.

Mr. White explained that hypersonic systems—defined by sustained flight at speeds exceeding Mach 5 within the atmosphere—fundamentally **compress the time scale of battle**, creating decisive advantages in speed, survivability, and lethality. Unlike traditional ballistic missiles, maneuverable hypersonic weapons follow unpredictable flight paths, significantly complicating adversary detection and interception while enabling rapid, long-range strike against time-critical and heavily defended targets. These characteristics make hypersonics a transformational capability for operating in highly contested environments.

The discussion framed hypersonic weapons within a broader concept of **comprehensive layered defeat**, integrating kinetic and non-kinetic offensive and defensive capabilities to counter advanced peer adversaries. Drawing from the Atlantic Council's *Hypersonic Capabilities Task Force* report, Mr. White highlighted key challenges facing U.S. hypersonic development, including affordability, production scale, testing infrastructure, workforce sustainment, and the need for allied cooperation. He emphasized the importance of transitioning from exquisite, first-generation systems to more affordable, scalable capabilities fielded in meaningful numbers.

Moderated by Peter Huessy, the seminar included a wide-ranging Q&A addressing materials science limitations, budgetary and congressional considerations, escalation dynamics, and the balance between offense and defense in deterrence strategy. The seminar concluded that accelerating hypersonic capability development—while integrating it into coherent operational architectures—is essential for maintaining U.S. and allied deterrence credibility and battlefield dominance as adversaries continue to field and expand their own hypersonic systems.

Unabridged Transcript

(Note: A.I. assisted, there will invariably be some word errors in the following transcript.)

00:00:11:07 - 00:00:28:09

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Kimberly Cherington
Good morning. And thank you to everyone for joining us live today. I'm Kimberly Cherington, and on behalf of the National Institute for Deterrence Studies, we appreciate you taking time to be part of this important discussion today. We hope you'll join us again next week. At the same time when we welcome major,

00:00:28:11 - 00:00:35:09
Kimberly Cherington
General Stacy Jo Huser, Commander of the 20th Air Force, who will speak on today's ICBM mission.

00:00:35:11 - 00:01:11:13
Kimberly Cherington
To register for this and all of our upcoming events, we invite you to visit our website at Thinkdeterrence.com or our weekly events email that comes to your inbox. Now it is my pleasure to welcome our special guest for today, Mr. Michael White. Mr. white is the managing member of White Arrow LLC and former Principal Director of Hypersonics at the Department of Defense, where he was responsible for leading the nation's vision and strategy for developing offensive and defensive warfighting capability enabled by hypersonic systems.

00:01:11:14 - 00:01:44:13
Kimberly Cherington
Previously, Mike was the head of Air and Missile Defense Sector at the Johns Hopkins University Applied Physics Laboratory. Mike recently was the lead author of Atlantic Council's Hypersonic Capabilities Task Force, which published his final report, The Imperative for Hypersonic Strike Weapons and Counter Hypersonic Hypersonic Defenses, in October of 2025. Throughout today's presentation, we encourage you to submit your questions using the chat or the Q&A button at the top of your screen.

00:01:44:14 - 00:02:05:00
Kimberly Cherington
We'll address them during the dedicated Q&A portion of today's seminar. Now please, I am pleased to introduce our host and moderator for today's discussion, Mr. Peter Hussey, the president of Geo Strategic Analysis and a senior fellow here at NIDS. Peter, the floor is yours.

00:02:05:02 - 00:02:36:05
Peter Huessy
Thank you so much, Kimberly. And I want to welcome Mike White, our guest speaker today and also our president, Jim Petrosky, who's here. And, our vice president as well. Curtis, thank you for joining us. I also want to acknowledge a number of people who signed on from TechSource, from Moog, from Northrop Grumman, from Systems Planning and Analysis, Booz Allen Hamilton, Lockheed Martin and want to thank you all for joining us today.

00:02:36:06 - 00:03:04:10
Peter Huessy
This subject is one which we haven't addressed previously this year. But given the fact that Mike is the author of a major study, we thought, why not write someone who's done the work, and the reading and the analysis that will bring us up to speed, because it's becoming more and more of a serious issue to our war planners and our military and civilian national security

leaders.

00:03:04:10 - 00:03:11:14
Peter Huessy
So, Mike, thank you for joining us today. We appreciate it. And it's over to you, sir.

00:03:11:15 - 00:03:44:10
Mike White
Thank you. Peter. Kimberly, very much appreciate the invitation. And I want to give say my thanks to nerds for inviting me to talk today. And also thank, thank the Atlantic Council for the resources and the effort and energy that we all put in to, the recently released a report on Hypersonics and hypersonic imperative, including, you know, the chairman, the two chair persons with the Atlantic Council study, Secretary McCarthy and Secretary James.

00:03:44:12 - 00:04:10:11
Mike White
And it was a it was a very, energetic and, encompassing effort by it, by a large group of people. So, thank thanks to the Atlantic Council. I wanted to just start off the discussion of hypersonics with a scoping of what we mean by hypersonic. So, what I mean by hypersonics in this context and that, you know, a lot of people think that hypersonics is a thing.

00:04:10:11 - 00:04:35:10
Mike White
You know, I'm going to go build a hypersonic. But really, a hypersonic is a descriptor. Really. What hypersonic means is it's just a description of the relative velocity that you are traveling through, through air. And that and it's relative to the speed of sound. So if you're below the speed of sound at subsonic, if you're flying at the speed of sound, and sonic supersonic is above the speed of sound, and then hypersonic is significantly above the speed of sound.

00:04:35:10 - 00:05:02:13
Mike White
And really the description of hypersonic really is driven by the physics of the flow and the fact that when you fly very fast through the air or, the shockwaves and the friction tend to heat the air to very high temperatures and air starts to not act like normal air. So, there are certain energy states that get excited, certain chemical things that happen through decomposition of the air, from the molecules in the atoms.

00:05:02:15 - 00:05:31:10
Mike White
And that really characterizes the way the air behaves when something flies through it at very, very high speeds. And it really frames the physics challenges and the design challenges for, for, vehicles that fly through the air, at very, very high speeds. The typical rule of thumb for where that phenomenology starts to happen is around Mach 5, but it becomes more dramatic the higher speeds you go.

00:05:31:11 - 00:06:02:00
Mike White
And, and especially once you get up near Mach ten and above, things become very interesting from a physics perspective. But we're not here to talk about physics today. What we're here to

talk about are the characteristics of hypersonic flight that enable transformational warfighting capability. And, when we characterized systems in general, you know, my simplistic mind thinks, you know, my flying slow like a typical airplane kind of flight or a typical cruise missile kind of flight.

00:06:02:00 - 00:06:31:06
Mike White
Subsonic speeds, 500 miles an hour or so, or my flying fast at supersonic or hypersonic speeds. And speed is important not in and of itself with speed is important because it allows you to do some things that have warfighting value that you otherwise wouldn't get if you weren't flying very fast. And, and in particular, it also allows the strategic advantage of dramatically compressing the time scale.

00:06:31:07 - 00:06:56:09
Mike White
Of the battle. So, let's start off by just characterizing some of the attributes from a warfighting perspective that allow Hypersonics to be, important and even transformational as we develop these systems and start to feel these systems in numbers. So, first of all, I mentioned time scale of the battle of and then let's just let's just kind of create some, relativistic metric on what that really means.

00:06:56:10 - 00:07:15:04
Mike White
If I haven't as an adversary and I'm having a military exchange and we're at ranges on the order of, let's just pick round numbers 500 miles and I'm flying 500 miles an hour. If I launch a weapon at the adversary, it's going to take an hour for that missile to get to or that weapon to get to.

00:07:15:04 - 00:07:50:04
Mike White
My adversaries target. If they're launching systems that are flying at hypersonic speeds, it takes less than ten minutes. And so, what you can see is that there's a dramatic difference in the exchange ratio enabled over a finite period of time. And if you're not able to operate in that compressed time scale, or operate in a time scale relevance, relativity, in that compressed time scale, then you lose significant advantage relative to your adversary's ability to, to fight the fight.

00:07:50:05 - 00:08:13:15
Mike White
When we talk about hypersonics, we talk about generally, systems that are flying within the atmosphere and maneuvering. There are other high-speed systems, like ballistic missiles that fly a large portion of their trajectory out of the atmosphere and then reenter at very fast speeds, hypersonic speeds, when they reenter. So they technically are flying when they are in the atmosphere at hypersonic speeds.

00:08:14:01 - 00:08:40:15
Mike White
And then they do operate in that compressed time scale of battle. So ballistic missiles are important systems to be able to characterize and include in this family of weapons because they allow for compression of the time scale as well. But ballistic missiles, by their very nature and almost by, by their definition, operate essentially following the laws of gravity.

00:08:40:15 - 00:09:12:04
Mike White
And so, our ballistic missile defense systems and others ballistic missile, the, the ballistic missile defense capabilities of our adversaries, and our friends, rely on the ballistic trajectory to be able to have a relatively significant chance of success for doing the defensive operations against those systems. So, while you have the speed, there are vulnerabilities that you still have relative to the nature of your trajectory.

00:09:12:06 - 00:09:53:03
Mike White
So, the distinction I'll make here is that we're talking about systems that fly well, large majority are there of their trajectory within the atmosphere at speeds around five or greater. And the significant advantage that that atmospheric flight provides from a warfighting capability is it dramatically enhances the survivability of your high speed system so that now now you can operate in that compressed timescale of battle, and you can do so by taking advantage of aerodynamic maneuverability so that your ballistic signature trajectory is not predictable like it would be if you were a ballistic missile.

00:09:53:04 - 00:10:27:14
Mike White
And that's the mechanism that you use to compress, the timescale of battle. So that operation and that ability to have aerodynamic control, because you're flying within the atmosphere makes your trajectory extremely unpredictable. And then that makes that defensive problem very, very difficult. It makes it very, very hard to have a missile with sufficient energy when you do not have a very good feel for what the aim point, prediction or in particular intercept point is, for a defensive, or defensive engagement.

00:10:27:15 - 00:10:54:12
Mike White
So systems flying at very high speeds within the atmosphere, with unpredictable or unpredictable maneuverability, allow you to compress the time scale of battle and have a very, very high degree of survivability in a highly contested environment where you have an adversary with significant, air defenses and ballistic missile defenses, and then finally, you're flying very fast by definition.

00:10:54:12 - 00:11:31:01
Mike White
And so, you know, when you bring lethality into the equation, you're able to have significant lethal effects due to that velocity. Kinetic energy is mass times velocity squared. You're using the v squared term and you're significantly increasing lethality potential, for your, for your payload. So, all those factors, all those features of hypersonic weapons make them a significant enhancement or improvement over the way we do, the way we project power and the way we deliver effects, today.

00:11:31:01 - 00:12:15:11
Mike White
So that kind of characterizes, the warfighting benefit and the kind of the physics behind the challenge associated with flying in the atmosphere very, very, fast. I want to talk a little bit about

the strategic implications of hypersonic systems, and I want to do that first by setting the context of, you know, a large scale conflict against a major power peer competitor in an environment that's being created, particularly in the Pacific, but as well as well as in Europe, where the adversary is putting together a significant layered capability, to do in AI access area denial.

00:12:15:11 - 00:12:46:00
Mike White
So, developing systems that, are the defensive systems and the offensive power projection systems that can reach out in layers, significant distances, and deliver lethal effects or provide defensive cover, and prevent our traditional systems from entering into, into the area of interest and so we call that a trade or in AI access area denial. But I'll use the term highly contested environment.

00:12:46:00 - 00:13:19:02
Mike White
It really is having to operate and deliver military effects of military intent through an environment that is being very highly contested by an adversary. And if you're in such an environment with a determined adversary and a capable adversary, you have to think of things in a much more comprehensive way than, than any individual system. And so there's a term that we put together or that we describe in the report called integrated Comp and Comprehensive Layered Defeat.

00:13:19:03 - 00:13:46:00
Mike White
And that means that you have to look at being able to understand and adversaries' capability, understand how to defeat that capability in terms of four quadrants, that's left and right of employment of that capability and using means that are both kinetic and non-kinetic in nature. So, think of a quadrant, where you have left and right and kinetic and non-kinetic, effectors in each of those quadrants.

00:13:46:00 - 00:14:24:14
Mike White
And then how do you tie that together through an integrated, architecture and command and control structure, to be able to orchestrate the four elements of the quadrant and the capabilities that you need to deliver that work in general, develop individually for individual mission elements. How do I now integrate those capabilities into a comprehensive lay or defeat strategy to go after critical warfighting capabilities that are creating that contested environment and, challenging the US battlefield dominance in whatever theater we happen to be operating in.

00:14:24:14 - 00:14:59:05
Mike White
So, when you think about that set of systems, a big part of that has to do with kinetic strike pre-launch, to, to deny the adversary capability to deliver effects, that hold forces at risk. And so, interestingly, interestingly enough, when I first devised this notion of comprehensive layered defeat, it was from the defensive perspective. I was at the Applied Physics Lab laboratory working on an Air Force Scientific Advisory Board study, on defense for basis.

00:14:59:05 - 00:15:29:09
Mike White
And what you find is that if you're just focused on defense, it's really, really hard, if not

impossible to win the numbers game, especially if you're playing the away game and you're playing against an adversary who's playing a home game. And so what you have to be able to do is have a credible layered defense of capability, kinetic and non-kinetic, you know, think interceptors and then other means for non-connected defeat like jamming and things like that.

00:15:29:11 - 00:16:09:00
Mike White
But just as importantly, maybe perhaps more importantly, you have to be able to deny the adversaries ability to overwhelm you with numbers. So that means you have to deny the ability for the adversary to complete their kill chain, to, physically actually engage in weapon launch. And you have to attack the entirety of their, strike and defensive capability before they employ it, so that you can reduce the number of factors that you have to have to employ after launch and make the defensive problem much more tenable.

00:16:09:00 - 00:16:47:08
Mike White
So, so this notion of comprehensive, layered defeat and, and having the strike capability associated with comprehensive layered defeat, actually derive from the challenges and difficulties of fielding a credible, defensive capability against a determined adversary and dealing with the numbers and capabilities that the adversary is going to field. So, the report describes what that really means and, and puts, the hypersonic strike capabilities in the context of that, that architecture, a comprehensive layer to the architecture.

00:16:47:09 - 00:17:13:10
Mike White
And so if we think about Hypersonics and in general, what we, have endured, I will say over the past several decades, I've been doing this for almost five decades, and I was mentored by people at the Applied Physics Laboratory who would do who had done it for three, three decades prior, two and a half decades prior.

00:17:13:11 - 00:17:55:05
Mike White
And that in Hypersonics we have historically had peaks and valleys, cycles of interest and lack of interest that have kind of relegated hypersonic development to the research. And S and T, buckets of our investment strategy as a nation. And for many years we were well ahead of everybody in hypersonic research. But we continually made the decision not to, to, to make the investment necessary to get us over the hump to where we turned our hypersonic research and the and the advantages we had in Hypersonics into viable warfighting systems.

00:17:55:07 - 00:18:23:02
Mike White
And, That has actually cost us dramatically in the momentum that we have got to have moving forward. And the imperative that we have that we see right now in fielding capabilities, because our adversaries made the decision to turn hypersonic technology into capabilities, a decade or more ago. And so we're, we're playing catch up, to be quite honest.

00:18:23:02 - 00:18:44:04
Mike White
We're playing catch up from that relative to that decision to turn hypersonic technologies and

system capabilities into warfighting capabilities. And so, you know, when I got to the Pentagon, Dr. Griffin asked me to lead the nation and put together a vision and a strategy for moving us out of the S and T world and into the war-fighting world of Hypersonics.

00:18:44:04 - 00:19:07:01
Mike White
And so, we laid the groundwork and create a foundation to do that. And then I've turned it when I turned it over to doctor, Doctor Webber, who's now in charge, within the Pentagon. He's working to take that take that next step and, and implement capabilities and accelerate, even further beyond where we were. A couple of years ago.

00:19:07:01 - 00:19:34:06
Mike White
So, I'm encouraged by the direction of the department. And I think, what they're what they're doing and what they're about to do is going to be transformational and transformational in the way we can fight, moving forward. I'll just kind of give you an example to just frame the value proposition for hypersonics and when and it's a real life example, should be fresh in everybody's mind.

00:19:34:06 - 00:20:11:06
Mike White
And that's and that's Midnite Hammer as a, as a, as a mission, if you will, to go after, targets a long way away and deliver ordnance. With, with lethal effect. And, and what it took to use our conventional and traditional means to do that relative to the size of the strike package, the people, and warfighters that got put in harm's way, the time it took to deliver capabilities from the beginning of that mission to the end of the mission, it were the end of the mission is not only delivery, but safe return of the crew and and equipment from that mission.

00:20:11:07 - 00:20:50:13
Mike White
You know, it was measured in tens of hours, whereas if you were to deliver that capability through a long range hypersonic strike system, you could do it in, in tens of minutes. So, so, you know, the, the warfighting capability we're talking about has dramatic and significant effect on how we might, do critical missions from a mission itself perspective, can constrain missions, but also in the way that we would be able to deep contested environment and fight in a in a larger scale conflict and protracted conflict.

00:20:51:00 - 00:21:27:06
Mike White
Conflict, first, with the ability to degrade adversary defensive systems and create a less contested environment and then that less contested environment or lack of contested environment can allow us to bring more traditional systems in, in mass and fight the way that we normally fight. So, there are a lot of implications and benefits to a renewed or I would say a, a renewed focus, but an accelerating focus on the delivery of hypersonic capabilities where we find ourselves today.

00:21:27:06 - 00:22:05:14
Mike White
And you can read this in the open press, is that China and Russia, and even some of the other,

other less capable nations, have fielded or are in the process of fielding hypersonic weapons. We are in the process of fielding hypersonic weapons as well. And we need to make sure that we maintain that level of capability parity and accelerate our ability to have hypersonic weapons in sufficient numbers to be able to have the impact we need them to have on, on the, on the battlefield.

00:22:05:15 - 00:22:37:01
Mike White
So it is within that context that we put together this report. And what I wanted to do is talk. If you read the report, there are ten recommendations that we provide to to the leaders. Again, I, as Kimberly said, I am not speaking in any way shape or form on behalf of the government. I'm, you know, I'm a private citizen today, so, but what I'm giving you is my, my opinions based on the perspective that I've gained over, over the several decades.

00:22:37:01 - 00:23:14:08
Mike White
And working, working in this field. So one of the things that I want to talk about, and very briefly, and as we address this in the report, is some of the hurdles and, obstacles associated with delivering new weapons to the department. And that is the, the inertia that gets created and the and if a weapon is disruptive to a, to a group of people who have a stake in a certain way of doing things, and you just create antibodies, it's nothing different that disruption creates antibodies.

00:23:14:08 - 00:23:41:06
Mike White
No where, no matter where you go. And the other hurdle is that our services are platform centric. So, they are very focused on delivering ships, tanks and airplanes. And so something that's not a ship tank or airplane i.e. weapons, it tends to be a bill payer for those platform capabilities as they get matured and fielded.

00:23:41:06 - 00:24:16:08
Mike White
So, web weapons have always taken a backseat. Now, now what we see today is that that has that is starting to change. We're expanding considerable inventory in the current conflict in Iran. And there's a dramatic emphasis now on producing weapons and the idea of consolidating weapon production and having somebody or a set of people in charge of fielding certain classes of weapons in the capability suite, and the numbers that net are necessary to be able to fight a high end, protracted conflict is going to be critical.

00:24:16:08 - 00:24:51:08
Mike White
So, one of the recommendations of the report, and I think it's being implemented to some degree within the department already, is because we need to create that center of mass from a leadership perspective to focus on the delivery of not only, inventory replenishment, but next generation capabilities like, hypersonic systems. One of the other recommendations in the report is that we've spent a lot of effort and time over the last five or so years, maybe even a little bit before that, to mature a first generation of hypersonic systems.

00:24:51:08 - 00:25:25:10

Mike White
So, we have air, land and sea launch, hypersonic capabilities that are being matured, and ready for fielding. But by the services, those, those systems are very, very capable systems that are extremely robust and good systems. But they were derived from technologies and prototypes without a lot of attention to affordability and cost. So they they're the first instantiation of high end and engineering materials sciences.

00:25:25:11 - 00:25:56:14
Mike White
And, and aerospace capabilities, fielded to it to achieve exquisite capability and, and therefore they are more expensive than you would like, in their current form. And so, the recommendation is let's continue to field those systems, but let's continue to evolve those systems through upgrades, to continue to evolve capability and drive affordability into those systems as we as we move forward.

00:25:56:15 - 00:26:45:10
Mike White
So, we're fielding them, you know, first of kind systems. Now let's continue those that aggressively pursue that because we need capability to answer the warfighter. But let's also focus on taking those systems to, you know, block upgrades, which include focus on and affordability, and then to pursue a next set of next generation systems that are really driven by affordable capacity and the need to, build systems in numbers and build them affordably and, and provide a much more ubiquitous high speed strike capability in our weapon suite, for the warfighter, so we can make sure that we're truly able to fight in that time scale of relevance against an adversary who is fielding

00:26:45:13 - 00:27:14:12
Mike White
significant high speed, capabilities. So those are key elements associated with the recommendations articulated in the report. And how do we get hypersonics into the hands of the warfighter in meaningful numbers and allow those systems to change the way that we fight and be able to have be much more effective in highly contested environments where we're being kept out at long range?

00:27:14:13 - 00:27:51:04
Mike White
Part of the activity that needs to happen as well is to accelerate our learning. So, the department right now is doing a good job within the Test Resources Management Center and energizing the T&E environment. You want to fly early? Fly often? I used to say when I was in the building, I want to go from flying once a quarter to once a week, so that we can accelerate our learning and provide the opportunity for our engineers and scientists and our warfighters, for that matter, to understand and mature the way we develop and employ or hypersonic capability.

00:27:51:04 - 00:28:18:12
Mike White
So, track as well along the way, and doing that through numerous programs that they put in place to inspire and enable the industry and government team working on these systems to fly off and do so effectively to accelerate that learning. Another area of emphasis really is that we need to, to work closely with our allies.

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00:28:18:12 - 00:28:40:09
Mike White
Our allies are very interested in also moving into high-speed systems. The numbers which we're going to have to field these systems is going to be significant. And we want all of our allies who are in the fight with us to be able to have similar capabilities and to have invested in and developed and been able to field so similar capabilities.

00:28:40:10 - 00:29:10:06
Mike White
So, they can also fight in that time scale of relevance with systems, of importance. And in the future battlefield, we have to make sure that we maintain the ability for the United States to dominate the battlefield. I think we see kind of an eye watering example of the dominance that we have in our current capabilities against moderate, highly capable adversaries.

00:29:10:07 - 00:29:41:09
Mike White
The difficulty is going to become how the different difficulty comes with, that next level of capability that that the adversary that is a peer competitor who has thoughtfully evaluated our traditional systems and devised defensive, counters to those systems, what's the next? And then they've themselves employed hypersonic and high-speed strike capabilities that we have to deal with compressing the time scale of battle.

00:29:41:13 - 00:30:09:13
Mike White
How do we make sure we accelerate and deliver those capabilities so we can maintain that battlefield dominance? And I think the hypersonic systems are enablers from that perspective. It's nice and fun. And, those of us who came up in the technology and engineering world focused on hypersonics, they're they're, it's interesting to develop the widget as necessary to develop the widget.

00:30:09:13 - 00:30:47:08
Mike White
But if you can't close a kill chain, it's not it's not that significant. So we have to also make sure we invest in the kill chains necessary to close, close that pose. The capability and make deliver the capability. Moving forward. And then as we, as we look at how we expand the relevance of this capability, we need to make sure that, we're thinking not only in the conventional world, but how do we make sure that our strategic systems moving forward, moving forward, take the event, take advantage of the survivability aspects and the and the capabilities?

00:30:47:09 - 00:31:12:10
Mike White
Enabled by hypersonic flight, and delivery of hypersonic for delivery of payloads within the hypersonic realm come within the atmosphere. And then finally, the last point I'll talk about is, you know, you really have to continue to replenish the technological underpinning and the workforce knowledge that feeds into future transformational capability. So those investments are going to be important moving forward.

00:31:12:11 - 00:31:45:00

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Mike White
So that kind of as a summary of what the report says, it kind of captures the overarching strategy and, and strategic implication in some of the tactical suggestions on how to move forward to leverage the capabilities we're talking about here. And I'll just close by emphasizing the fact that that we call it a hypersonic imperative, because our adversaries are all have already moved into this domain, and they've already fielded capability, they're already able to compress the time scale of battle.

00:31:45:01 - 00:32:11:00
Mike White
And we must be able to use these systems and develop systems not only to create a similar capability on the offensive side, but be able to evolve our defensive capabilities and our layered defensive capabilities kinetically and non-kinetically to defeat and defend against adversary, hypersonic systems. So, Peter, with that, I think I'll wrap up and then turn it over to you and open the floor.

00:32:11:10 - 00:32:30:05
Peter Huessy
Thank you Mike, very much I have a question. Which kind of interesting it says what specific lessons can be learned from observing adversarial or sonic, capabilities? And are these lessons learned being incorporated into our own capabilities?

00:32:30:07 - 00:32:51:06
Mike White
Yeah, that's a that's a great question. And, you know, we oftentimes go through painstaking efforts to, to protect what we're doing, when we're ahead in areas, and we should continue to do that because there are areas where we feel we still have the lead. But it's always good to recognize what adversaries are doing and learn from that.

00:32:51:06 - 00:33:18:04
Mike White
So we, we, you know, we do pay attention to what the adversary does, and we do, try to make sure that as we evolve our strategy, especially from a comprehensive later defeat, perspective, we, we take those lessons learned and those observations and, and make sure that we are developing the most effective offensive, counters or capabilities and defensive systems as well.

00:33:18:05 - 00:33:27:06
Peter Huessy
Our president has a question, president of NIDS. And his question is, why was the U.S, getting into this game so late?

00:33:27:08 - 00:33:49:08
Mike White
Yeah, I think there's there are a number of answers to that. And, and I have, you know, my cynical side, but I but I've got I'll save that for a few beers I have with somebody on the side. But I think it has to do with that disruption and there there's, there's the notion of how much disruption you're willing to tolerate driven by what you perceive as the threat.

00:33:49:08 - 00:34:16:08

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Mike White
So, you know, our first, you know, our first or our, our most recent off set strategy really brought stealth into the game. And so, what stealth allowed us to do was go into highly contested environments against active air defense systems and deliver capability to decompress the environment in a traditional warfighting sense. But with stealth technology. And that was very effective and portrayed in the various conflicts that we've had and still is working.

00:34:16:08 - 00:34:55:06
Mike White
Great. Look at the recent, you know, the Midnight Hammer activity. But what that doesn't do, if you put the stealth in traditional systems, that doesn't account for being able to fight in the proper time scale or time scale relevance against an adversary that had this building hypersonic system. So, the imperative that really drove us for the situation that really drove us to this period was the adversary developing, significant capability that compresses that time scale of battle and challenges our defensive systems against the more traditional air defense threats and ballistic missile defense.

00:34:57:01 - 00:35:20:15
Peter Huessy
So, one of the questions that I have is the key to this whole thing is material sciences. Because of the high temperature and high stress involved, I remember the work that I did for previous administrations was on this very thing is, if you're gliding over the top of the atmosphere, it's going to be rough. It's going to be bumpy, as they say.

00:35:21:00 - 00:35:36:13
Peter Huessy
But going down to the ground and hitting the target is you're going to have enormously high temperatures. Have other adversaries solved the high temperature and high stress issues, or are they just ahead of us in dealing with that?

00:35:36:14 - 00:36:02:15
Mike White
Yeah, I don't I don't really, I won't really comment on specific technologies and relative positioning for specific technologies, but. Okay. Materials, high temperature materials capable of handling the aerodynamic stresses associated with lighting in flight in the atmosphere is a key technical challenge that has to be overcome. And then once you overcome it and we have materials that can do that.

00:36:03:00 - 00:36:27:04
Mike White
It's just that being able to build those materials efficiently, affordably and rapidly and that rate and, you know, and numbers necessary to field a full set of weapons, that's the key. And how do you optimize a weapon design. With the affordability and, and, and capacity and, drivers that allow you to feel the capability.

00:36:27:04 - 00:36:50:02
Mike White
So, so I mean, we got we know how to do this, right? I mean, we have successfully demonstrated very capable, very high-speed systems that have are able to deliver effects at

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very long ranges very accurately. We know how to do this. It's just a matter now, how do we scale it to production and get it to the point where we can field it in numbers?

00:36:50:04 - 00:37:11:12
Peter Huessy
Given that we are, as you have pointed out, trying to catch up with both China and Russia, among others, can you really accelerate the deployment of our own systems, or is this something where you have to solve certain problems? Are just certain, takes the amount of time that you can't compress?

00:37:11:13 - 00:37:39:13
Mike White
Yeah, I think there's a degree of acceleration that we can still, employ. And a lot of the recommendations, especially with respect to the next generation systems and, and more aggressively fielding the capabilities we have right now, reflect that reality that there's more we could do to accelerate, but there's a certain amount of time it's going to take to develop next generation systems and next generation capabilities.

00:37:39:14 - 00:38:03:14
Mike White
And what we should focus on is how do we compress that time and field capabilities in a manner that isn't waiting for the most exquisite capability as an end state to start delivery? You know, let's build something quickly and then let's evolve it and improve it through block upgrade strategies so we can get inventory into the hands of the warfighter.

00:38:03:15 - 00:38:36:04
Peter Huessy
Okay, you mentioned integrated layered defeat. And one of the questions we have for our audience is what are the implications for a strategy to be adopted for that integrated layered defeat? Because the question is how to integrate offense and defense capabilities into an architecture. And we say the same. We have the same issue in terms of nuclear versus conventional, is what happens when an adversary thinks that they can use battlefield nuclear weapons in a conventional conflict.

00:38:36:06 - 00:38:51:02
Peter Huessy
We've never done that before. We've never had two-armed nuclear armed powers fighting each other and using nukes, let alone. So it's a it's a one of the key questions. And it goes into extended deterrence. And,

00:38:51:03 - 00:38:59:07
Peter Huessy
Trying to dominate the escalation ladder, as you know. But what about in this area of your point of integrated layered defeat?

00:38:59:08 - 00:39:03:02
Peter Huessy
What's this? What's the strategy implications there.

00:39:03:03 - 00:39:30:10
Mike White
Yeah, I think I think it's important and I think I don't want to I don't want to say we don't do that now. Right? I mean, we if you listen to General Cane's press conference right after the current conflict that Iran started, he kind of walk through what we did and, you know, and that and the start of that conflict, how you, you know, you deny certain capabilities through certain means before you go in and, and do kinetic strikes.

00:39:30:10 - 00:39:52:07
Mike White
And, and he kind of walked through what we did there. So we kind of a kind of we do that now, you know, we roll back enemy air defenses before we go in with strike packages. I mean, there's a there's a orchestration that happens right now. I think it's not very well integrated from an architectural perspective…

00:39:52:07 - 00:40:23:08
Mike White
Per se. And so what we're talking about is making sure that we have the full toolkit populated that allows the warfighter to not only fight in all four domains in a way that makes sense, but, actually, and I think I will help this in, in a big way, actually conceive of battlefield tactics and methods of employment and sequences of employment that maximize effectiveness moving forward.

00:40:23:08 - 00:40:46:12
Mike White
So, if you if you think of, you know, an AI engine that's kind of running through that and allowing you to use the tools in your toolkit to maximum effect to where the whole is much greater than the sum of the parts. You know, that's kind of the integration step that I think is still ripe for opportunity.

00:40:46:13 - 00:41:10:09
Peter Huessy
The next question is a little technical, but it, it, it assumes that if Merv capabilities in the terminal phase of a hypersonic missile are possible, and of course, corrections so they can how does that affect the countermeasures we have in term to intercept them?

00:41:10:10 - 00:41:12:06
Mike White
Yeah, it makes it makes it much more.

00:41:12:07 - 00:41:13:01
Peter Huessy
Have to go ahead. Right.

00:41:13:04 - 00:41:41:01
Mike White
If you wait until the deployment of multiple vehicles or multiple effectors and you're doing kinetic defeat, then you have to somehow have enough interceptors to go after each of the effectors. And so, it just a multiplier that makes the numbers problem even worse. And I think, you know,

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we I've seen reports on the news about kind of cluster munitions being delivered with ballistic missiles.

00:41:41:01 - 00:42:06:13
Mike White
And, and you've seen some reports from Ukraine about, Russian employment of a ballistic missile that's got multiple, multiple effectors. And so what, you know, what you have to do, you know, that's one of the modalities that that makes exoatmospheric intercept very attractive is if you can hit the bus, but before the bus deploys, it's multiple effectors.

00:42:06:14 - 00:42:21:15
Mike White
You know, you can kind of get on the positive side of the numbers game. Again. So, that's a important capability that makes the defense a problem much harder if you allow them to get to the point of deployment.

00:42:22:00 - 00:42:45:10
Peter Huessy
One of our questions had to do with JDAMS. And as you know, that's joint directed air munitions, we could put on what otherwise would be a dumb missile, right. And directed to the target, I remember, I don't know, I'm sure you're familiar with the book *Ghost Horse Warriors*, (*Horse Soldiers*) which was the use of Jay dams in Afghanistan in the fall of 2001 and were an extraordinary…

00:42:45:12 - 00:43:21:02
Peter Huessy
You had soldiers on the ground with laptops talking to B-52s. It 50,000ft, being directed to the target by guys on horseback who were our friends from the Northern Alliance. And, it's quite a story. So in in that one of our questions is, could you retrofit existing missile systems with a hypersonic speed capability, or is that just something where you're going to have to you can't do it in terms of the physics required?

00:43:21:03 - 00:43:48:15
Mike White
Yeah. I mean, if you think about, I think in the, the general sense, certainly that's in the design space where a hypersonic delivery vehicle, if you will, will deliver a precision, munition in a, in a terminal phase, in a, in a kind of a general category of capabilities, whether you can take a specifically take a JDAM and do that or whether you would even want to do that.

00:43:49:00 - 00:44:14:12
Mike White
But employment of those kinds of multiple precision effects would be an interesting application of, and being able to deliver them quickly would be an interesting application. I mean, there's a lot of stories about, you know, Desert Storm one where we, we saw a bunch of ballistic missile launches, you know, but we didn't have any way to call in effects in time to, you know, to hit them before the tails moved.

00:44:14:12 - 00:44:35:11
Mike White

And we knew where Osama bin laden was at a certain time, having launched some cafe, but we couldn't get effects in quick enough, you know, the compression of the time scale really is, is essentially one of the key features of why we want to do what we want to do, combined with survivability, lethality.

00:44:35:12 - 00:44:40:09
Peter Huessy
Are you familiar with something called the Five Rings theory?

00:44:40:10 - 00:44:41:10
Mike White
I'm not.

00:44:41:11 - 00:45:02:13
Peter Huessy
Okay, I'll skip that question is, we have kind of an interesting question. I've heard it in the literature. Is that given the speed of represented by hypersonic capability and does that make something like Golden Dome obsolete before we build it?

00:45:02:15 - 00:45:31:02
Mike White
Yeah, I think I think to the extent we're going to develop a robust shield against incoming adversary weapons, you have to be able to defend against threats that are going very fast and able to perform unpredictable maneuvers within the atmosphere, and that that's a very hard problem. So, I mean, it's just needs to be accounted for in the threat set, and it will create significant challenges.

00:45:31:03 - 00:45:33:15
Mike White
As those threats proliferate.

00:45:34:00 - 00:45:56:03
Peter Huessy
One of the questions we had which was kind of an interesting question, and now I think it's quite interesting that you said, what's the size of a missile that can go to the speed of what we're talking about? Does it have to be a certain size given, you know, the fuel you need, and you need the ability to withstand enormous amounts of heat?

00:45:56:04 - 00:46:25:07
Mike White
Yeah. That's a good question. And I and I didn't get to this, but there really are two fundamental ways of delivering hypersonic flight capabilities. One is through what we call boost glide. And that is you take a hypersonic glide body, the unpowered hypersonic glide body, and you boost it on the front of a big rocket to very, very high speeds.

00:46:25:08 - 00:46:47:10
Mike White
And at the beginning, it kind of looks like a ballistic missile as it goes very fast and very high. And then you deploy it, it comes in the atmosphere and then maneuvers within the atmosphere.

And does its thing and those, those tend to be larger systems because rockets are in order to get that much energy out of a rocket you have the rockets are pretty big.

00:46:47:12 - 00:47:11:00
Mike White
And what makes rockets big is that you have to carry your propellant or your propellant, which is both your oxidizer and your fuel. So the rocket rockets that have to carry all the energy on board to get the speed and flight characteristics that you want, an alternative way of delivering capability and flying hypersonic speed is to air breathing propulsion.

00:47:11:00 - 00:47:43:09
Mike White
So more like a jet engine. In that case, you boost hypersonic vehicle up to relatively low speed. You know, you don't have to boost at the Mark 10 or 12 or 15 or 18 or whatever the numbers are, you can boost it to much lower speeds, and then you then you have the vehicle take over with an air breathing propulsion system, like a, dual mode ramjet or a scramjet or some, some other kind of air breathing propulsion system.

00:47:43:10 - 00:48:06:01
Mike White
And then it, it cruises at a high Mach number, to the target. And when you when those two respective systems get to the end state, they're both traveling at about the same speed, Mach 500,000ft kind of thing. But you've gotten there in two very different ways in the air. The advantage of the air breather is you don't have to carry your oxidizer.

00:48:06:01 - 00:48:29:08
Mike White
You carry, you carry your fuel, but you're burning the oxygen in the air that you capture with an inlet. And so the size of the vehicle can become much smaller. So we kind of characterize those systems as what we call hypersonic cruise missiles versus boost glide systems. And so the boost glide systems are big. It are they have a size rule that it requires.

00:48:29:08 - 00:48:56:05
Mike White
They're either launched from the ground, from a hotel or from a large, large, two from a ship, or from a or a large bomb or B-52 as an example. But the cruise missiles can be launched from much smaller ground or sea launch cells, like a MK-41 DLS on a DDG 51 class ship.

00:48:56:06 - 00:49:26:02
Mike White
Or they can be launched from fighters. You know, there's there are the size to where you can carry them on the wing of an F-15 as an example. And so that gives you the ability to have a much more compact, you know, a lot of times cost is driven by size, right? So more compact, more affordable system, you can get more to the theater because not only you can afford to build more and field more, but you can deliver more because you have a more, more proliferated launch, platform, modality.

00:49:26:04 - 00:49:40:07
Mike White

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And so, you know, you can scale to a much more tactically sized vehicle, if you're using everything propulsion. And we are pursuing both boost glide systems and hypersonic cruise missiles.

00:49:40:09 - 00:50:16:08
Peter Huessy
As someone who used to work in the United States Senate, I tend to that. One of my first jobs just out of graduate school and also during college as an intern, I look at things is how does the Senate and the House look at a budget that comes over that has hypersonic capable technologies in it? What if you were sitting in Congress, what are the things you would perhaps add to the budget that we need to do more of, or is it pretty balanced?

00:50:16:09 - 00:50:19:00
Peter Huessy
As it is, yeah.

00:50:19:00 - 00:50:49:12
Mike White
I'll just kind of use the question just to say a couple of things, Peter, that I, I don't think I've said, one is that, you know, the, the real acceleration of this capability, has had white House support and congressional, bipartisan congressional support pretty much through the whole thing. And so we've had great support in Congress, and, very strong support at the white House.

00:50:49:13 - 00:51:26:10
Mike White
And, and so the political environment or the political support for this capability, one thing we've been able to do is demonstrate why it's so important and why why it's valuable. And we've had good results in presenting a budget to Congress in particular, that has gotten support. You know, by bipartisan support. And I think one of the things that, you know, where we stand right now is that, we've gotten great support to get us to where we are in developing and being ready to to field these first generation systems.

00:51:26:12 - 00:51:49:12
Mike White
But it's going to take a significant uptick in investment to get to where we need to be and develop accelerating development of the next generation systems and field and capabilities in numbers. And so, I think looking forward to the budget. You know, we had what I call the acceleration plan, back several years ago in the 22 budget.

00:51:49:13 - 00:52:15:13
Mike White
And, and, and I think it's time for accelerate the celebration plan 2.0 to get these, you know, to get us over that next hump of fueling affordable capacity and and actually delivering meaningful capability to the warfighter based on what we've developed and matured today. So I would expect that, Congress will play a big role in allowing us to do that acceleration as we need it moving forward.

00:52:15:14 - 00:52:31:01
Peter Huessy

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I'm going to turn it over to our president as he has a question about the five rings, which now I understand what it is. It's the Jim, I'm going to just turn it over to you. You can answer Mike, your question.

00:52:31:02 - 00:52:54:03
James Petrosky
Okay. Yeah. And I'll apologize. There may be some noise in the background. My house is being destroyed as I'm here. Actually, it was destroyed by winds a few weeks ago. They're hammering, but. Yeah. So, in the in the question and answer, the five rings theory is basically a theory where you have multiple, basically five rings of, that come from a state, that you can paralyze with military force.

00:52:54:04 - 00:53:18:12
James Petrosky
Most of it's been developed from World War One, World War two, looking at the leadership population, infrastructure, I probably population twice military, I think. And, yeah, I think I've got all five of them in there. I may have missed one. But the point is that where do Hypersonics fit into this? Because we're seeing in Iran, for example, you know, strike surgical strikes with missiles.

00:53:18:15 - 00:53:27:05
James Petrosky
Where do the hypersonic vehicles sort of fit in? Is it fear for the population, for the leadership, for military forces? How is it used over here? I think.

00:53:27:06 - 00:54:01:13
Mike White
Yeah, I think it the real capability is to go after a high value target that are time critical in nature and really the military high value targets that are time critical in nature. So, and time critical is in terms of, warfighting relevance. Right. So, if you have, you know, a command, you know, group or a command structure in a building that's fixed, but you need to hit it at a particular time relative to the start of conflict.

00:54:01:14 - 00:54:25:15
Mike White
You know, if it becomes a time critical target. So, you know, anything that's time critical, anything that require that is heavily defended, that you need to get through to high end air defense systems. What you probably want to do is use hypersonic systems because they're very survivable. And, and you probably would use those at the beginning to take out the defenses and bring in more capable systems.

00:54:25:15 - 00:54:51:02
Mike White
So and then systems that are at long range. Right. So that, you know, that you can reach out and touch somebody at significant distance in a manner that allows you to affect a target that is time critical, even though you're not local. And that and, and all those systems really all those applications are focused on, military capabilities and military targets.

00:54:51:04 - 00:55:17:08

Peter Huessy
Well, thank you. Kimberly, I'm going to turn it over to you, to close out the program. Michael, I want to thank you for really a to Z review of what hypersonic technology can give us and what the issues are. I want to thank you for joining us, and we appreciate it. And we will have you back an appropriate time, I think, because this is not an issue, that this issue is going to continue to grow in importance.

00:55:17:09 - 00:55:34:13
Peter Huessy
And so, really, we had a number of comments from the audience already that this was an extraordinarily good presentation that you've made. And so, again, we want to thank you. And I'm going to turn it over to Kimberly, who's going to take us out.

00:55:34:14 - 00:55:37:13
Mike White
Okay. Thank you, Peter, for the invitation. You're welcome sir.

00:55:39:02 - 00:56:10:08
Kimberly Cherington
I also want to thank you, Mr. White, for being here with us today. And for your good work. Any questions that are in the chat that haven't been answered yet? I will forward those to you in case you would like to address them to individuals. Just to make our audience aware, next week, on April 17th, as I mentioned, Major General Stacy Jo Huessy, Commander of the 20th Air Force, will be talking about the ICBM mission on April 24th.

00:56:10:08 - 00:56:38:14
Kimberly Cherington
We have George Miller from Lawrence Livermore National Lab joining us on nuclear deterrence without full scale nuclear testing. So he'll be talking about stockpile stewardship as well. We have two live events we have coming up in Washington, DC at the Capitol Hill Club. We have Rear Admiral Weeks, on May 15th, we have Lieutenant General Lutton joining us on June 3rd.

00:56:39:00 - 00:57:13:02
Kimberly Cherington
Those invitations are on our website. So you can sign up at Thinkdeterrence.com. I also wanted to mention that the fifth annual Nuclear Triad Symposium will take place on June 18th in the University Center Ballroom at Louisiana State University in Shreveport. It's an in-person event in partnership with BRF Defense and National Institute for Deterrence Studies, or NIDS us, and you can find more about that event and register on our website as well under events.

00:57:13:03 - 00:57:36:05
Kimberly Cherington
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