National Institute FOR Deterrence Studies
THINK DETERRENCE

National Institute for Deterrence Studies & Peter Huessy Seminar

Strategic Stockpile Stewardship: A Retrospective and Forward Look at U.S. Nuclear Weapons Policy with Dr. Don Cook

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Abstract

The National Institute for Deterrence Studies (NIDS) hosted a seminar titled *"Strategic Stockpile Stewardship: A Retrospective and Forward Look at U.S. Nuclear Deterrence Policy"* featuring Dr. Don Cook, former Deputy Administrator for Defense Programs at the National Nuclear Security Administration (NNSA). The discussion provided historical context on U.S. nuclear weapons stewardship since the cessation of underground testing in 1992, highlighting the evolution from science-based stockpile stewardship to comprehensive modernization programs. Dr. Cook detailed key milestones, including life extension programs (LEPs) for the W76, B61, and W88 warheads, the development of the "3+2" modernization strategy, and the role of advanced science and computational capabilities in ensuring reliability without explosive testing. He emphasized the critical importance of accuracy over yield, the dismantlement of legacy megaton-class weapons, and the challenges of pit production to sustain the deterrent. Looking forward, Cook outlined ongoing efforts such as the W87-1, W93, and SLCM-N programs, stressing bipartisan support and scientific innovation as essential to maintaining a credible and safe nuclear deterrent. The seminar concluded with a robust Q&A addressing modernization priorities, treaty implications, and future policy considerations.

Executive Summary

The National Institute for Deterrence Studies (NIDS) hosted a seminar titled *"Strategic Stockpile Stewardship: A Retrospective and Forward Look at U.S. Nuclear Deterrence Policy"* featuring Dr. Don Cook, former Deputy Administrator for Defense Programs at the National Nuclear Security Administration (NNSA). The session provided a comprehensive review of U.S. nuclear weapons stewardship since the end of underground testing in 1992 and examined future modernization priorities.

Dr. Cook outlined the transition from explosive testing to science-based stockpile stewardship, emphasizing investments in advanced computing, high-energy density experiments, and hydro-testing capabilities that underpin confidence in the stockpile without nuclear yield tests. He traced key modernization milestones, including life extension programs (LEPs) for the W76, B61, and W88 warheads, and the development of the “3+2” strategy to consolidate and modernize warhead families for all legs of the nuclear triad.

A central theme was the importance of **accuracy over yield** in modern deterrence, enabling lower-yield, more precise weapons that reduce collateral damage while strengthening credibility. Dr. Cook also addressed dismantlement of legacy megaton-class weapons, the technical and policy challenges of pit production, and the need for bipartisan support to sustain modernization efforts. Looking ahead, he highlighted ongoing programs such as the W87-1 for the Sentinel ICBM, W93 for SLBMs, the Air-Launched Cruise Missile modernization, and the SLCM-N initiative.

The seminar concluded with a robust Q&A on topics including treaty implications, cost management, underground testing, and risk perceptions. Dr. Cook underscored that science-driven stewardship has delivered exceptional returns, enabling modernization at scale while maintaining safety, security, and reliability. He reaffirmed that sustaining the deterrent requires continued investment in people, infrastructure, and advanced technologies.

Unabridged Transcript

(Note: The following transcript was automatically generated and will invariably have some occasional word errors or inaccuracies.)

00;00;08;17 - 00;00;18;25
Kimberly Cherington
Good morning. I'm Kimberly Cherington, the Director of Operations here at the National Institute for Deterrence Studies, or NIDS. And it's my pleasure to welcome you to

00;00;18;25 - 00;00;31;18
Kimberly Cherington
today's seminar. *Strategic Stockpile Stewardship, a Retrospective and Forward look at U.S. Nuclear Deterrence Policy*, featuring Dr. Don cook. Please join

00;00;31;18 - 00;00;44;21
Kimberly Cherington
next Friday for an in-depth discussion by Bob Peters on Heritage Foundation's latest defense study outlining conservative priorities for the fiscal year 2027.

00;00;44;23 - 00;00;53;11
Kimberly Cherington
Mr. Peters will unpack the report's implications for nuclear deterrence, missile defense and a broader strategic posture for the United States.

Events@Thinkdeterrence.com

00;00;53;11 - 00;01;10;11
Kimberly Cherington
If you'd like to explore more of our work, including upcoming events, publications and podcasts, please visit us at Think deterrence.com. We're constantly adding new speakers and content, so be sure to check back often and follow us on social media to stay informed.

00;01;10;13 - 00;01;36;05
Kimberly Cherington
If you and your colleagues would like to attend future invitations and you're Not on our email list, please email us at NIDS@Thinkdeterrence.com to get on the invite list. Throughout today's presentation, we encourage you to submit your questions in the chat function or the Q&A button at the top of your screen. We'll address them during the Q&A portion of the seminar.

00;01;36;07 - 00;01;52;17
Kimberly Cherington
Now, I'm delighted to introduce our host for today's discussion, the esteemed Mr. Peter Huessy, President and Senior Director of Strategic Deterrence Studies at Geo Strategic Analysis and a senior fellow here at NIDS. Peter, over to you.

00;01;52;19 - 00;02;18;00
Peter Huessy
Thank you very much, Kimberly. I want to welcome our friend, Dr. Cook. Don was nominated back in December 2009, by the president to be the MSR deputy administrator for defense programs. You may know that we, of course, have had each of the individuals in that position come and talk to us, including Stacy Houser, who is now head of 20th Air Force.

00;02;18;03 - 00;02;42;01
Peter Huessy
We are going to have the deputy administrator. But given the shutdown, we are not able to schedule that quite yet. But we will. Dr. Cook was confirmed in June of 2010 by the Senate, and he led the administration's efforts in stockpile stewardship and management, including detailing and executing the Stockpile Life Extension program for nuclear weapons, including within each of the three legs of the U.S. triad.

00;02;42;04 - 00;03;10;01
Peter Huessy
And as he told me just earlier, we have seven life extension programs that are on schedule, under cost or at cost. And it is an extraordinary turnaround for NNSA over the, I would say, over the last more than a decade. It's really quite extraordinary. And prior to entering the government, Dr. Cook was the managing director and chief executive officer at the Atomic Weapons Establishment in the United Kingdom from 2006 to 2009.

00;03;10;04 - 00;03;33;08
Peter Huessy
Prior to that, from 1977, he worked at the Sandia National Lab, contributing to and leading their efforts in Pulsed Power and Micro-technologies. He's a member of the American Physical Society and the American Nuclear Society. He's a fellow with the AAAS and Institute of Physics in the United Kingdom. And he retired from NNSA in July of 2015. Don, I want to thank you for coming in and joining us today.

00;03;33;11 - 00;03;57;23
Peter Huessy
We're going to get a retrospective on where NNSA has been, where are they going and the critical nature of what they do, because they are the business end of nuclear delivery systems. And we often talk about nuclear issues almost entirely, on the platforms at arms control. But this is as critical as anything else. And, Don, I want to thank you for coming and joining us today.

00;03;57;23 - 00;04;00;17
Peter Huessy
It's over to you, sir.

00;04;00;19 - 00;04;31;00
Don Cook
All right. Kimberly and Peter, I want to thank you for the opportunity. So, I know many people online are colleagues I've met, either most or many of you. And I will start out by saying I'm going to try to talk about facts rather than opinions. I'll put opinions in a few places. But, starting out early, I'm going to say, I also encourage you to come up with questions.

00;04;31;02 - 00;04;55;25
Don Cook
And hard questions. They are much better than the easier questions. Put them on the chat. Peter will go through them, and I will let you know right now, that my view is there are no such things as dumb questions. This does not pertain to answers. But I have to do the answers, and you have to do the questions.

00;04;55;27 - 00;05;24;14
Don Cook
And so, with that, I'm ready to go ahead. I thought first I'd start out telling you about the status of what I'm going to be talking about, which is the weapons, the bombs, the cruise missiles, the warheads for the ICBMs on land and at sea and not so much the delivery systems, because that's really the job of the armed services.

00;05;24;17 - 00;05;42;29
Don Cook
And Stratcom, it's not the job of the NNSA. And I say it as they may have some views. And of course, we have to work very closely. When I say we, I'm still associating with NNSA, in the history and the present and they have to work very closely with the services and understand their issues.

00;05;43;01 - 00;06;15;25
Don Cook
But the focus of this presentation is on warheads. And so let me remind you that it was, in 1992 that the last underground nuclear yield producing explosive test, and every word in this phrase is there for good reason, was conducted in Nevada. The specific test was in, as I recall, September of 1992, the designer was Gary Wall from Los Alamos.

00;06;15;25 - 00;06;44;18
Don Cook

And that was it. That was also the election year for the presidency. And President Clinton came in, and the Secretary of Energy was Hazel O'Leary at the time. And my loose interpretation at that time is both of them were not fans of nuclear weapons. Nobody needs to be a fan of nuclear weapons.

00;06;44;20 - 00;07;12;28
Don Cook
But they had more than a passing view that perhaps we should scale way back or maybe even get out of the business. I'm stating that as a fact. Having heard some things. Let me also give you the historical context. There were some good reasons for saying maybe less attention is needed now, because the Reagan updates that occurred during the 80s were largely in place.

00;07;13;00 - 00;07;52;06
Don Cook
George H.W. Bush, as you recall, followed Ronald Reagan. And so there had been, continued, excuse me, a philosophy to keep the modernization at that time going. Now, here's where I really began the forward period in 1992. The weapons in the stockpile had an average age of six years. There was then a statement made, one that I don't agree with, and this factual.

00;07;52;09 - 00;08;15;22
Don Cook
There was declaration of a peace dividend and, in the long haul of history, that peace dividend turned out to be a mortgage. And a mortgage turned out to be something that we had to pay. And so, I'll get to that in a few minutes. But first, I want to give very significant credit to one of my predecessors.

00;08;15;25 - 00;08;50;00
Don Cook
Vic Reis. He was back about four deputy administrators or assistant secretaries for defense programs before me. And he came up with the idea that there should be a program that replaces the weaponization efforts, and that was called stockpile stewardship. I'm sorry. Science based stockpile stewardship.

00;08;50;02 - 00;09;22;15
Don Cook
And, of course, when you start the new program as Vic did and you create an acronym like SBSS, then it has some critics. I'm saying this again with a smile on my face because I, I remember one of the critics said SBSS was nothing but stockpile stewardship with a whole lot of B.S. in between.

00;09;22;15 - 00;09;49;17
Don Cook
Now I'm going to counter that view as I go on. But what Vic said at the time, to those of us who were in the program, and I was at Sandia and Tom D'Agostino, who would later on be my boss and the first administrator I worked for in 2010 was at DOE. Vic said, I can save either the labs or plants, but I can't save both.

00;09;49;19 - 00;10;13;09

Don Cook
And so, Vic said I thought it through and I'm going to save the labs. And then he said, others are going to have to deal with saving the plants in the future. And what I'll say is, boy, was he right. That fell upon me in the office. It fell upon Charlie Verdon, who went into the office after a gap of a few years.

00;10;13;11 - 00;10;43;03
Don Cook
Most recently, it's fallen on Marv Adams. Now, Dave Hoagland is in the role. And so, the people in the NNSA are the program sponsors. They have to make the case to get the money for labs and plants and all of the things that go into designing, developing, qualifying, maturing, certifying and producing nuclear weapons and then put putting them in the hands of the armed services.

00;10;43;05 - 00;11;20;18
Don Cook
There were big investments that were made at the time. I'll remind you of a few of them. Big investments in computation. All through the weapons labs, the investment in the National Ignition Facility at Livermore. That was a very heavy lift. Advanced hydro testing and getting both arms in place and working right at Los Alamos in the DARHT facility. And at Sandia was MESA ... , all things micro ... microelectronics, micro optics, micro photonics, micro electromechanical systems, compound semiconductors and so on.

00;11;20;20 - 00;11;50;16
Don Cook
Now let's jump forward to 2007. So, it's 15 years later, and by now you could picture that the weapons that were put in place for at the time, you know, 22 before for at most a 30-year service life. They were now eight plus 7 or 15 years old. And so, yeah, it was important to begin thinking about aging.

00;11;50;23 - 00;12;34;08
Don Cook
The Navy had done that. The NAVY and NNSA began the life extension of the W 76 warhead. It was to be a hi-fi, life extension program, and it was. It was specifically to reproduce the W 76 exactly as it had been built the first time around, except for basically the brain, the arming, fusing and firing system that fits in the pointy end of an aeroshell.

00;12;34;10 - 00;13;02;15
Don Cook
That piece was done by Sandia in partnership with the Navy. And so that was the major new thing that was done in 76 dash one. The Congress allowed that to be done, but not anything else at the time. And, production plants, as I mentioned, were already were in disarray, disrepair.

00;13;02;16 - 00;13;26;20
Don Cook
So now let's jump forward to 2009 and early to mid-2010. This era I know, quite well because that's when I showed up on the scene at Forrestal. It's also when Obama wanted the New Start treaty to be ratified. And if you think into your memory, you recognize there was quite a debate

about that.

00;13;26;22 - 00;14;09;21
Don Cook
There was significant concern among Senate Republicans led by Senator Jon Kyl from Arizona. Negotiations among Biden's team at the white House, the NNSA, the Department of Defense, and the Senate were ongoing, and $10 billion had been agreed to be put in the program. That was not enough for the concerns that the Republicans in the Senate had at the time, because they viewed that if the New Start treaty went in place, that that would be the end of real funding for the weapon program.

00;14;09;21 - 00;14;33;08
Don Cook
And despite all the promises, the deterrent would be on a path to failure ultimately. Trying to get agreement on the New Start treaty, which, as you know, takes two thirds of the Senate to agree. The House does not get to weigh in. They, of course, wanted to at that time, but …

00;14;33;08 - 00;15;00;02
Don Cook
That's not the prerogative of the House. Only the Senate. So, another 10 billion was put in and that looked adequate. The vote was taken, cutting out a lot of steps here, and it passed. But even then, Senator Jon Kyl voted against it. So, there was concern, and I would say it was legitimate about what was going to happen under the new Start treaty.

00;15;00;05 - 00;15;31;23
Don Cook
It entered force February 5th, 2011, as you know. It was ten-year treaty. With just three weeks to spare in 2021, it was extended for another five years under the Biden administration. And it will go belly up on February 5th, 2026. So, we just have a few more months left, unless there's an agreement by both Russia and the US.

00;15;31;25 - 00;16;01;27
Don Cook
The only two parties under this treaty to extend, at least the way we operate, for our deterrence, if not through a formal extension of the treaty. There were central limits in this. The warhead modernization program began and it was driven by the central limits once again. And I presume many of you recall this was strictly not more than 700, deployed launchers.

00;16;02;00 - 00;16;29;07
Don Cook
That was one limit. Second there was not more than 800 altogether deployed and non-deployed launchers. And the third element which affected us in NNSA much more than the others was the limit of not more than 1550 bombs and warheads. But there was the bomber counting rule, and bombers at the time at least, were considered principally for signaling rather than war fighting.

00;16;29;08 - 00;17;04;19
Don Cook
I'm giving a kind of a loose interpretation, but those words were used in the development of the

nuclear posture Review at the time. And so, the bomber counting rule allowed the U.S. and Russia to count each bomber as one warhead, even though it might have, who knows, 20 warheads or so on board. So, when you added everything together, that might have been 1550 plus the bomber counting rule, about 1800 warheads.

00;17;04;21 - 00;17;35;09
Don Cook
However, a weakness of the treaty was it did not include a large number of tactical nukes that the Russians have. And so, thinking about treaties in the future, unless something is done with tactical nukes as well as strategic nukes, probably it's not likely to be easily supported. Now, with the treaty in place and work to be done, the first step was to finish the W76-1.

00;17;35;12 - 00;18;06;25
Don Cook
And so, I put a great deal of effort and budget and, authority, to labs and plants to finish that up while trying to start on the B61. Congress had agreed that a non-nuclear component refurbishment or upgrade to the B61 bombs was allowed, but they did not agree with a whole bomb body upgrade and everything else associated with that ... a

00;18;06;28 - 00;18;36;18
Don Cook
Life extension program for the B61. It was my task to make the case for that. I was very new in the office, but I hade a good colleague in the Senate, and that was Madelyn Creedon. Madely, you may or may not remember really wrote the NNSA Act. Senators didn't write so much, but they approved the NNSA law that created NNSA as a semi autonomous body of the Department of Energy.

00;18;36;25 - 00;19;05;08
Don Cook
She was also the first deputy administrator for defense programs and served in that role for six months before going back to the Senate. So, we started on making the case for a B61 life extension program. I called Madelyn regularly. She probably remembers that. And ultimately, Madelyn was able to secure approval within the Senate for NNSA to go forward with the B61, LEP. On a related

00;19;05;08 - 00;19;31;24
Don Cook
Note, but just an aside for a minute, my first visit to HEWD. I knew the committees pretty well ... two authorizing committees and two approps committees that deal with the budget, and among the approps committees, the one that often gets really out of the forest, into the trees. Again, smiling into the grass, into the soil, into the nematodes in the soil is HEWD.

00;19;31;25 - 00;20;04;25
Don Cook
The House Energy and Water Development Committee. I first met Tanya Burquaam and Rob Blair there soon after coming back from England, going into NNSA. And I remember the discussion and I asked them to support the B61 LEP, and I wrote down the words. It kind of went like this. Well, it's a nice request for the B61 update, Dr. Cook, but, no, not until you show us the whole program.

00;20;04;28 - 00;20;41;10
Don Cook
And that took me back a bit. I didn't say no. I had dealt with enough congressional staff to know that members may come and go, but staffers remain forever. You should always make friends with congressional staffers. Not enemies. And I try and do that throughout my career. And so, I said, you know, I understand the request, and, okay, I will come back at a time unspecified with a plan for what we'll do with a modernization of the whole deterrent effort as far as the warheads go for delivery vehicles. You know who you have to contact now.

00;20;41;12 - 00;21;18;26
Don Cook
And so, I went back to Forest Hall and immediately began working with the team there, letting them know about the discussion. A few people were with me. Might have been Steve Goodrum at the time, went with me to HEWD. Steve is no longer with us. And I miss him, but we also began working with the Nuclear Weapon Council and I was involved at the level one level below the Nuclear Weapons Council ... the NWC Standing and Safety Committee.

00;21;18;29 - 00;21;46;17
Don Cook
That's the body where you do most of the work and have most of the arguments, most of the debates, and make most of the decisions that are then carried up a level to NWC where they're either shot down or they're approved. At the time, Frank Kendall was the undersecretary of defense for acquisition, technology and logistics, and he was also the NWC chair.

00;21;46;19 - 00;22;17;27
Don Cook
Jim Miller, another good colleague, was undersecretary of defense for policy. Vice Chair of the Joint Chiefs of Staff, another voting member of the five at the time. I think that we started out with Hoss Cartwright And then went to Sandy Winnefeld. Commander, U.S. Strategic Command was Bob Kehler, and the NNSA administrator was Tom D'Agostino.

00;22;17;29 - 00;22;54;20
Don Cook
Now the background of the work that we had to do was that we recognized that the labs had not done work like real LEPs, other than the 76, for a long time, or real weapons systems. I knew they were rusty. I knew the labs well enough, and so did my colleagues at NNSA. And so, one of the very first things, when the House asked us for a grand plan, I went back and I contacted the weapon heads at the three labs Livermore, Los Alamos, and Sandia.

00;22;54;22 - 00;23;20;03
Don Cook
And I said, you will have an opportunity to come to Forrestal. I'll give you about 3 or 4 weeks. And I want you to let me know the following ... What if you had the chance you would want to do to update ballistic missiles, the guts of ballistic missiles for ICBMs, for SLBM's, for bombs and cruise missiles. And the labs went to work.

00;23;20;03 - 00;23;48;26
Don Cook

At first, they didn't believe me. I got a few calls, a couple of emails that said, we're not sure we're authorized to do this work. And I said, you're authorized. They said it would be really helpful to have like, a memo or a letter. I said, I'll give you a letter. And the reasons they said they couldn't do it or they were skeptical were the plywood, the plywood prohibition against low yield weapon development. I recalled that and had ilved through it.

00;23;48;28 - 00;24;22;22
Don Cook
And so, I said, let's make it even more concrete. I'll give you 120 days after you come to Washington in a few weeks, I'll give you… I'll give you four months to actually show in solid models what you want to do and bring solid models, full scale to the Forrestal. Because as good as view graphs are, I just don't trust view graphs in proving that two components can't occupy the same space.

00;24;22;22 - 00;24;58;12
Don Cook
But solid models do that. And so they did. The rest in that regard is history ... some amazing work was done by teams that had more experienced mentors and some, less experienced, mid-career and early career people. And won't go into too much detail on what they said or did because a whole bunch of it is classified. But that began to form up the plans for the modernization of the entire warhead element of the deterrent.

00;24;58;14 - 00;25;27;08
Don Cook

Gleneral Larry Welch was a great help. He was a friend and a colleague and a former head of STRATCOM. He had at the time a 2+1 plan. I and a few from DP in Forrestal went to meet with him. We also went out to STRATCOM and eventually came up with a plan that was called a three plus two strategy with details, and we would ultimately brief all the congressional committees.

00;25;27;08 - 00;26;01;23
Don Cook
We did what the three plus two was, three warheads for ballistic systems that would be common and interoperable among land based and sea-based fleets. And there would be two elements in air carried weapons, one modern bomb and one modern cruise missile. Later on we began to execute the plan and got many questions. I think I confused a lot of people who said, why are you focusing on the B61 and and a cruise missile that doesn't really matter?

00;26;01;25 - 00;26;24;03
Don Cook
I said, it's all the three plus two, but we're just doing it in reverse order. The two plus three. The first is the B61, and the second is the W80. For the three missile warheads, the first of those became the W87-1 ... the replacement of the W-78. The second one will be the W93, the replacement of the W-88. And there will be future elements.

00;26;24;03 - 00;27;00;09
Don Cook
Interesting DoD point, maybe for your amusement? In the Nuclear Weapon Council Standing Safety Committee. I always went to that meeting with a one star general officer. I had the opportunity and really, the luxury to work with four. First one was Garrett Harencak. Second was Sandy Finneran, third was Jim Dawkins, and the fourth was Steven L Davis - SL.

00;27;00;12 - 00;27;27;18
Don Cook
Sack, Sandy and Jim are all retired now. But still very involved in nuclear weapon things in the complex. What the DoD and the services said at the SSC was that they wanted weapons, not science. And, it took some patient explanation of possibilities, you know, saying that we could have science alone, or we can have science and weapons, but not weapons only.

00;27;27;21 - 00;27;57;09
Don Cook
That's a null set. Although the deterrent appears to be weapons and delivery vehicles, the real core of the deterrent is the people. It's the capabilities f... first and foremost the designers, engineers, manufacturers, the labs and production plants, the warheads themselves and the delivery vehicles are the instantiation of all that work. But the real core is the people.

00;27;57;12 - 00;28;33;10
Don Cook
So, now onto the B-61 plan. We had to appeal to both Democrats and Republicans in the four committees and Congress writ large. I'll just call these Ds and Rs from now on. I'm neither. I go right down the middle. Given the program that I've worked on for so many decades in my career. The point for the Ds was they wanted to dismantle first and reduce before modernizing and the short factual answer was, we couldn't do that, because for the B-61, we're going to do heavy reuse to keep the cost down.

00;28;33;10 - 00;29;01;09
Don Cook
We needed the bomb bodies, we needed the pits. We needed other things. We needed to scavenge the weapons and make new systems. But with many old parts, and we were going to get rid of the parachutes. Some of you may not know that we had parachutes in the deterrent up until about 2021, maybe even early 2022 when the 61 MOD 12 program was finally complete.

00;29;01;12 - 00;29;29;17
Don Cook
We said we needed to improve the accuracy, reduce the yield, cut numbers. And the only way we could consolidate systems was with a modern tail kit. There was a significant amount of opposition to that at the beginning, and we got through that by saying we couldn't cut the number of bombs in half or consolidate the families or approach a reasonable cost, of 8 to 10 billion.

00;29;29;19 - 00;29;58;10
Don Cook
It was nominally eight, and we had some contingency for the basics. Ultimately we got approval. And there were common radars, new components, making a better deterrent with greater accuracy and, and you know, my kudos still go to the people at NNSA, in the federal ranks, at the labs and the plants along the way.

00;29;58;13 - 00;30;29;08
Don Cook
It was important that the vice president and president, approved a request to begin publishing in

the open the number of dismantlements. There were concerns on the R side that we might want to call some of those back. But you know, retirements are nice, but dismantlements and disassemblies are permanent. And the Ds said they would support the program if we began publishing dismantlements.

00;30;29;10 - 00;30;54;16
Don Cook
The things that are classified are the numbers of weapons and the yields. I'm moving right along with things. I'll talk fast, but you can get to some questions if you wanted to on what I just said about that, the other changes we made, I want to call one out. I was particularly interested and concerned about getting the B53 system dismantled.

00;30;54;18 - 00;31;27;17
Don Cook
Again, some of you may know, many of you may not know what the total amount of explosive ordnance used by the Allies in the Second World War was, from 1939 to 1945. If you don't know, it was 3.4 million tons of high explosive used in all the bombs and missiles and everything done in WWII by the Allies. The B-53 is now dismantled.

00;31;27;17 - 00;32;16;23
Don Cook
And once it's dismantled and disassembled, then the yield is unclassified. The last unit disassembly happened October 25th, 2020. I'm sorry, 2011. Its yield was nine megatons, but I'll let that sink in. So, a single bomb had roughly three times the explosive ordnance of everything used by all of the allies in all of World War two, from 1939 to 1945. I presume you knew before, but now maybe you're getting a new appreciation that decisions in the nuclear deterrence program have massive consequences, either for good or bad, depending on the quality of the decisions.

00;32;16;25 - 00;32;47;27
Don Cook
And we didn't just have a few B-53s, we didn't have a few tens. We had hundreds. They are now all dismantled. Other changes that were associated with the New Start treaty and warheads, associated with delivery systems were that the Minuteman III missile was deMIRVed. MIRV means multiple independently targetable reentry vehicle. And so those went from, from a few to a single warhead.

00;32;47;27 - 00;33;20;09
Don Cook
I'd say that reduced either the W78s or the W87s, but now to only one warhead per missile. And also TLAM-N was taken out and retired ... that is the Tomahawk land attack munition nuclear that was taken off boats. And we agreed that the W76 fleet as we modernized would be reduced by a factor of two as well.

00;33;20;11 - 00;33;48;09
Don Cook
The short and simple answer was we didn't need more and we didn't have the parts in the inventory to do complete builds without costing an incredible amount of money. We wanted to keep the costs down. And in the end, I believe that the cost of the 76-1 fleet of warheads was in the range of $4 to $5 billion once it was complete.

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00;33;48;09 - 00;34;13;19
Don Cook
So really quite modest. We had difficulty in getting the B 61 approval. And it really had to do with two things. The modern tail kit gave us accuracy, and we had agreed we were going to go to a smaller yield. And the concern on the D side was, you know, Cook your you're making this weapon much more usable.

00;34;13;21 - 00;34;44;15
Don Cook
And for a while, I didn't agree with that at first. I tried to explain how. Well, no, it's not actually the case. And later I decided that it was more effective, right? Yep. Probably. So, we're going to make it more usable. The immediate jump by people who opposed the B61 mod 12 went a further step. And there were a few senators, certainly constituencies outside the Senate as well.

00;34;44;17 - 00;35;14;09
Don Cook
And they said, look, look, look, if you agree that the weapon is more usable, then then its probability of use is higher. And I said, well, there are a couple of steps in that logic, and I don't agree with the second part. As politely as I can say it, I think that our adversaries will know that a weapon that has a lower yield, in fact, in this case, an adjustable yield, and a very large improvement in accuracy, no longer sent down by parachute...

00;35;14;09 - 00;35;40;05
Don Cook
That that weapon, because it is more usable will in their mind deter them better and it will become a better deterrent. Having said that, now, I'd like to go further, to get out of the megaton class.

00;35;40;05 - 00;36;03;16
Don Cook
It's just not a very effective way to deal with nuclear weapons. Russia is still there. China is still there. I won't go further than that. But I, I now believe that when we retire the B83, we will be out of the megaton class. I think I just have about another 5 to 10 minutes here, and then we'll open up for questions.

00;36;03;16 - 00;36;31;13
Don Cook
So, the first issue I want to bring up is yield versus accuracy. And this is an opinion, I will say, however it's based in fact: accuracy always trumps yield. If you have a nuclear explosion in the atmosphere, all the X-rays, the debris and eventually the neutrons get absorbed, that's what creates the blast. And that blast strength falls off as one over R cubed.

00;36;31;13 - 00;37;00;19
Don Cook
And so, if you if you are not very accurate and you try to compensate with a larger yield, let's say you go from one accuracy you hoped for to an accuracy which is only one tenth of that, so you wind up at ten times the distance from the target compared to where you wanted to be, you need a thousand times the yield to compensate for that,

and for radiation exposure, radiative load, it's one over R squared..

00;37;00;19 - 00;37;22;23
Don Cook
So, you need 100 times the yield to compensate. Accuracy always beats yield. It is never, ever the other way around. Unless there's a target that you cannot destroy with a lower yield. even if you hit it directly. And there are some, that's why we have Earth penetrators. And for a while, that's why there was the B53. There is now the B61-11.

00;37;22;26 - 00;37;52;10
Don Cook
The second point I want to make is a core principle of deterrence. And that is that weapons that are much larger than needed and highly inaccurate might be viewed by adversaries as ones that a president might be self-limited in employing and not use these weapons in the worst of times. That means they don't make as good an effect of deterrence on the adversary.

00;37;52;12 - 00;38;30;24
Don Cook
And it's especially true if the response to an adversary strike by a US weapon would be seen as tremendously disproportionate. And so having having said those things, let me move on. So, the B61-12 proceeded and so did the W88 Alt 370 plus CHE refresh that gave the weapon a new brain. Again, there was a new AF&F in the W88 at the pointy end of the Mark 5 RV, and the CHE was replaced because there were some concerns about its age.

00;38;30;25 - 00;39;00;25
Don Cook
Again, I won't go into detail and that has all now been done now or I wouldn't be talking about it this way. So, both the B61-12 and the W88 Alt 370 are completed now. And that brings us to the present moment. Since the 76-1 one was done, you've heard about the 76-2 that went in the direction of producing a lower yield, still classified, and the number of weapons is still classified.

00;39;00;25 - 00;39;32;01
Don Cook
That gave the Navy a lower yield capability as well as the base level of the 76-1 in their fleet at sea. When you look at the whole aggregate of all the warheads for all the delivery systems, I would say NNSA is about halfway through the body of work that many of us foresaw in 2010, when New Start was agreed and the warhead modernization program began going.

00;39;32;03 - 00;40;02;10
Don Cook
So let me just now look to a little bit of the future, and then the rest will be for questions going forward. The W80 mod 4 for the air-launched cruise missile is underway. The W87-1 warhead for the Sentinel ICBM missile system is underway. And that will, as I said, replace the W78 and the W93 warhead for the SLBM, submarines that will replace the W88 are both underway.

00;40;02;13 - 00;40;29;07
Don Cook

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I will say after some pressure from Congress to go forward with the SLCM-N, it is agreed. And that will go ahead. I won't give many details on these items because they're still underway. And even after they're fully in place, the numbers and the yields are still classified.

00;40;29;07 - 00;41;02;08
Don Cook
So now I would like to emphasize two last points, the first on science. You know, I said you can have science alone, or science and weapons, but not weapons alone. That's a null set. And science based stockpile stewardship, which was a wish and a dream at the beginning, has proven to be just an amazing success. So, high performance computing and computational models, hydro testing capabilities, high energy density experiments, all of those are now in place.

00;41;02;11 - 00;41;35;21
Don Cook
The computation synthesizes the experimental results, really into a body of knowledge on how these weapons behave. And, last year, a federal advisory committee for NNSA documented that the proven leverage of the science investments now used for the modernization efforts and for confident use of resources in modernizing the production plants, well that leverage exceeds a ratio of 10 to 1.

00;41;35;21 - 00;42;07;18
Don Cook
And that's just in the first half of the program. Today at Los Alamos, DARHT is in heavy and regular use. At Livermore, NIF achieved ignition first in 2022, and it regularly and repeatedly achieves ignition now. The yield from a fusion capsule is up to about 8 million joules. And the laser energy is just 2 million joules. And, you know, that's quite something At Sandia the MESA complex is in place.

00;42;07;18 - 00;42;40;04
Don Cook
It's the nation's only trusted foundry for strategically radiation hardened, micro technologies. And, since 1992, high powered computation, led at first by NNSA and DOE, has increased in speed by more than 10 million, which is just massive. The last point I want to make is about pits. I'll try to do it quickly.

00;42;40;06 - 00;43;07;17
Don Cook
There's always a debate, you know. Is 30 enough? Short answers ... No. Is 80 enough ... And the answer I would say is yes. Is more than 80 needed maybe in the future? I would say maybe, but probably not right now. Not yet. Let me stay away from politics. No D&R politics, but just running the numbers for a moment to help with some understanding here of the need for new pits. Let's say we have today about 4000 weapons, you know, active weapons and weapons in in reserve.

00;43;07;17 - 00;43;29;28
Don Cook
I think the declassification of dismantlements each year may still be in place, I don't know for sure. But 4000 as a number is pretty decent. So, you can have you can do 50 weapons a year. That'll take you 80 years. But now I'm giving you the second fact, unclassified, which is that our pits today have an average age of about 40 years right now.

00;43;30;00 - 00;43;53;22
Don Cook
And so, 50 per year doesn't cut it because the labs, at the current point, have confidence in pits up to 100 years. but at only 50 new pits per year, the age of some pits will exceed 120 years. It depends on the specific type of pit, but they don't have confidence beyond that. If we did 80 per year, it's 50 years to get there and the age of some pits would be 90 years. But there's a different way to think about it.

00;43;53;24 - 00;44;16;07
Don Cook
We all know how man-hours or person-hours are counted. You can have one person working 40 hours/week or two persons working 20 hours/week. You still have 40 person-hours if you work that in a week. Being retired has this advantage. I don't do that anymore. But I still think a lot of about our pits. The Rocky Flats plant where we used to make pits was closed in 1988.

00;44;16;07 - 00;44;45;20
Don Cook
So let me talk about a new coin of the realm, which is pit years. The number of aged years right now we have in the stockpiles is, let's say 4000 weapons and 40 years, so we have 160,000, aged pit years in the inventory. Now, let's say we do 50 per year. And so we remove 50 times 40, or 2000 aged pit years.

00;44;45;22 - 00;45;23;16
Don Cook
What happened in the meantime? The remaining 3950 aged one year. And so, we didn't even fix the problem to half of the measure. So, let's go to 100 per year then. We remove 4000 pit years. And the pits that we have, the remaining pits of 3900 now have aged another year. So, we've just barely broken even at 100 pits per year, but the average age of pits remains at 40 yrs..

00;45;23;18 - 00;45;53;18
Don Cook
I don't need to tell you more detail. I just wanted to say, that level of 80, which was the congressional requirement set, it was advised by NNSA and by STRATCOM, that that is a real target. And so, you know, 30 at Los Alamos, 50 at Savannah River is the plan right now. And, and I just can't see based on the numbers and trying to go through simple considerations how less than 80 new pits per year can work.

00;45;53;18 - 00;46;19;28
Don Cook
Simple. Just running the numbers. I cannot see a way to maintain the deterrent. If we went with 50 per year, that is only commensurate with cutting the stockpile in half. And right now I can't see that. So, with that, I'm done. I think we're ready for questions. I hope there are some hard ones.

00;46;19;28 - 00;46;49;01
Peter Huessy
Don, Thank you very much for your remarks. They were really extraordinary. You ended right where the number of questions that I had written in here and I'll give you both is you pretty much answered why we need, 30 and 50 pits combined of 80 per year.

00;46;49;03 - 00;47;10;10
Peter Huessy
Congressman Garamendi proposed in the HASC this year an amendment to build only 30 pits per year and no more until 2050. His comment basically was we can't get to where we want to go, which is 30 and 50. So since you can't get there, you have to be realistic and go to a much lower number, which is only 30 per year, and delay it until 2050, however, you want to comment on that. I don't want to beat up on that Congressman.

00;47;10;10 - 00;47;21;26
Peter Huessy
That was the only amendment in committee dealing with pits. And I thought it was interesting. He then withdrew his amendment. So, they never had a roll call vote.

00;47;21;28 - 00;47;43;01
Don Cook
So, I have respect for John Garamendi, you know, I testified 20 to 25 times in the House and Senate. And I remember a question from John. I'll just add a little bit here when he was concerned about what we're doing to the B61-12, I said, let me make you feel a little bit easier.

00;47;43;04 - 00;48;14;04
Don Cook
We're going to consolidate the families of the B61-3, -4, -7, and -10. We're going to cut the number of B61 nuclear weapons by a factor of two. We're going to go with a lower yield option, still adjustable. And I can't say what the yield is. And we're going to retire the B83. As a consequence, we will remove 80% of the explosive power in the bomb arm of the air leg.

00;48;14;06 - 00;48;42;19
Don Cook
And if you don't allow us to proceed, we can't do that. And that stuck. And so in this case, what I'd say to Representative Garamendi is first that cutting back to 50 per year is commensurate only with a stockpile that is one-half the current size. And 50 years from now, the average age would be nearing 90 years. We'd have no time to recover.

00;48;42;21 - 00;49;11;03
Don Cook
But here's what I'd also say. Los Alamos has done the first diamond stamped pit for the W87-1. To get from 0 to 1 is an enormous hill to climb. To get from 1 to 2 is modestly difficult. But once there, it is easier to take it from 2 to 10 and 30 is just not so tough.

00;49;11;03 - 00;49;23;11
Don Cook
You've got almost everything in place. All the equipment needed for 30/yr is almost there now. The climb at Savannah River will be larger for SRPPF, but that's how I'd answer. I just hope they're going to know that bipartisan support will be maintained in the meantime.

00;49;23;11 - 00;49;23;26
Peter Huessy
Understood.
00;49;24;02 - 00;49;46;09

Don Cook
Oh, I'm. I'm sorry, can I quickly mention others ... I didn't say so many of my colleagues made the program work. I want to do that. Many people in NNSA who really were important leaders in the modernization program. Phil Calbos was my deputy. Steve Goodrum, who was head of Stockpile, is not with us anymore. Chris Deeney, head of science. Mike Thompson ,head of all the LEPs. I mentioned the generals I worked with earlier. Steve Henry at DoD, he kept me sane in working with the DOD.

00;49;46;09 - 00;50;04;06
Don Cook
His boss was Andy Weber. And he's a friend. But, boy, we had a number of arguments. Madelyn Creedon, Anne Harrington both first not in the NNSA and then in the NNSA, were really good colleagues. Okay, back to you, Peter.

00;50;04;08 - 00;50;15;05
Peter Huessy
It's a fine, wonderful, question came up on, and it's in the news. Do we need to resume underground nuclear testing?

00;50;15;07 - 00;50;40;08
Don Cook
Alright, I'll address that one directly. There are many opinions on this, and they vary all over the place. And for the people who have the knowledge of the guts of what we're trying to do in terms of not only designing, manufacturing, and qualifying weapons, and then entering new nuclear weapons into the US stockpile, we are nearing the point of having all that we need, but support must be maintained. My own answer regarding whether we need to return to underground nuclear explosive yield producing testing is no. And I'll give just a point or two about that.

00;50;40;08 - 00;51;07;09
Don Cook
An example. In this case, I'll use the a thing I didn't mention ... the enhanced capability for subcritical experiments that is now going into place at Nevada. Already we have a radiographic capability there. The size of test objects is classified, unfortunately. I hope someday it's not. But they're less than full size of a pit. So, you make something out of real plutonium for a hydrotest driven by high explosives underground.

00;51;07;12 - 00;51;33;13
Don Cook
You also do surrogates out of uranium, tantalum, whatever you want to do. And you actually put explosives around it, and you implode the object and you radiograph it. So that's done in Nevada today, and it'll be done again in the future. What's going into place. You know, the reason I mentioned the computational capability and DARHT is that's hydro testing.

00;51;33;13 - 00;52;05;11
Don Cook
There's a Contained Firing Facility at Livermore. What happened in the Gemini series of sub criticals? I challenged the labs in December of 2010 to have within two years, two experiments with surrogates and with plutonium in Nevada driven by high explosives and they achieved it in
00;52;05;13 - 00;52;34;17
Don Cook

December 2012. They used a diagnostic inside the pit. It was called PDV ... Photonic Doppler Velocimetry. I won't go into the details of what that means. It looks at all the plutonium inside the pit as it is imploding toward the center. They got in one experiment more than a thousand times the data obtained in any other subcritical experiment. They got more data than all the subcritical sets of data before. And in the future that will be done at the different scales in Nevada.

00;52;34;19 - 00;53;01;05
Don Cook
You know, we wouldn't get that by testing a real weapon in Nevada. The details of what we need to know now are the very fine details of where the plutonium really is, what it's density is, how everything worked, what the symmetry is. And I'll just say we won't get that out in full scale tests in Nevada unless you took years to do that.

00;53;01;10 - 00;53;09;13
Don Cook
What we will get out from ECSE in Nevada is a lot of precision results on explosively driven plutonium behavior 1000ft underground that can validate our computational models and are therefore much more valuable than a go/no go result like a UGT. Okay, back to you, Peter.

00;53;09;15 - 00;53;34;22
Peter Huessy
There's a question from Dylan Spalding. This little lengthy. Don, let me read it to you. Jill Hruby has acknowledged that both the W87-1 and the W93 will reuse pits due to delays in production. This will result in a mixed pit population for a given warhead. Can you comment on the desirability or problems that arise from this?

00;53;34;22 - 00;53;44;17
Peter Huessy
And also, if we can reuse some pits for these designs, why not all? So we relieve the pressure on the production complex?

00;53;44;20 - 00;54;13;07
Don Cook
Sure. It's a really good question. I'll try to answer it fast to allow more questions. With regard to the W87, the plan was always to use some re-use pits and then to make some new pits. So we're not going away from the plan. The W93 is different. In the case of the W88, it was during the production run that Rocky Flats was abruptly closed by the FBI.

00;54;13;09 - 00;54;38;11
Don Cook
Some people may remember that. And so, the Navy and DOE wanted to have more pits, but we didn't get them then and we never got them. There was a run at Los Alamos that wound up making a few. I won't go into numbers there. And so there just aren't.

00;54;38;11 - 00;55;07;05
Don Cook
There aren't enough for the W93. There will be new pits. And that's the intent.

00;55;07;07 - 00;55;44;10
Don Cook
You know, it's the same work, just varies by a little bit. The important new thing is that we have sufficient confidence and capability almost in place at Nevada and certainly in place at Los Alamos and Livermore. And when I count the compression work on plutonium done in explosive chambers at the Z machine at Sandia, we are getting down to the details of details and we will surely be able to qualify systems that are different.

00;55;44;13 - 00;56;14;10
Peter Huessy
Okay. This is a question from, Steve Schwartz. And I remember I first talked to Steve about the cost of nuclear weapons. Must have been 20 years ago when he was doing an assessment. And what he lays out is interesting. He says, adjusted for inflation between 1948 and 91 or the end of the Cold War, and NNSA was spending about $8 billion a year, and now there were we're not spending 19.8 billion in fiscal 25.

00;56;14;10 - 00;56;36;27
Peter Huessy
And the budget request is for more than that is about $25 billion. He asks the question of given the track record for completing large, capital intensive projects and keeping them on schedule, on budget, how much does this concern you? Whether or not we can sustain the growth in the budgets?

00;56;36;29 - 00;57;04;14
Don Cook
So what I would say again, it's a good question. What I'd say is, you know, some of the largest, most complex projects are the LEPs. People don't usually think of them that way. You have capital project, like the Uranium Processing Facility or SRPPF. Those are capital projects. They involve a lot of infrastructure. The most complex ones are the weapons systems.

00;57;04;17 - 00;57;26;25
Don Cook
The track record that NNSA has established now is good. Now, the thing I mentioned to Peter earlier, and Peter mentioned here, is that we have seven life extension programs going on in NNSA. And I can say and that are tracking according to plan. In fact, this the first time I could even say all are tracking according to Hope.

00;57;26;27 - 00;57;37;28
Don Cook
That is how well the program is being executed. You all or many of you get to hear from Dave Hoagland. I think it's December 12th, is it Peter? I hope I'm not wrong.

00;57;37;28 - 00;57;39;15
Peter Huessy
If we get the shut down taken care of.

00;57;39;18 - 00;58;05;07
Don Cook

Yeah, yeah. So I mean, Dave will address that. Now when it comes to nuclear projects that involve the nuclear industry that went away, starting with Three Mile Island and then with, you know, the explosion of the RBMK in Russia in 1986. That industry has not ever really come back, is coming back now.

00;58;05;07 - 00;58;35;03
Don Cook
But the principal problem in so many of the construction projects, nuclear construction projects in NNSA was in finding welders and following in QC1 or NQA-1 processes. That's the hard part. I you know UPF is largely done now is transitioning to operation… SRPPF is the one coming up.

00;58;35;03 - 00;59;03;17
Don Cook
That's the big one. Most of the installation of equipment at PF4 is done. The high explosive capabilities are all pretty much rebuilt at Pentax. Not all, but the high explosive processing facility is the big deal and that's done. And so, most of those are now under the belt, but people hold the impression of early problems too long in their mind.

00;59;03;17 - 00;59;43;25
Don Cook
What I'd say in a polite way is to look at present data and, you know, you are to form your own judgment about it. My judgment is that the deterrent in importance is the ultimate guarantee, the insurance policy, of American civilization, the economy, our life in the US. The expansion from the 8 billion in present terms to of order of 20 billion, is reflective of the amount of work that is being done.

00;59;43;28 - 00;59;49;10
Don Cook
If you look at the work that has already been done, it is a massive amount. Back to you, Peter.

00;59;49;12 - 01;00;15;07
Peter Huessy
I'm going to turn it over to our president. Jim Petrosky. Jim has a question. And since we're at 11:00, but we can go a couple of minutes over. We are our attendees are hanging on. So, Jim, over to you, sir. And again, Don, thank you for an extraordinary, session. It's, as Kimberly will have a video of this and the transcript, and it'll take her take her a couple days.

01;00;15;13 - 01;00;28;14
Peter Huessy
But really, thank you for, really wonderful presentation, because we really you spoke in wonderful English and not bureaucrats. So, it was very helpful. And I thank you again over to Jim.

01;00;28;16 - 01;00;50;28
Don Cook
Peter, you're quite welcome. And I want to thank you for the opportunity.

James Petrosky
Hi, Don. Yeah. And, again, I echo Peter in saying this was really fascinating what you talked about. Yeah. I want to catch you on one of your comments you made about megaton class weapons because, you mentioned that there were, you know, one option is, you know, large megaton weapons with low accuracy.

01;00;51;04 - 01;00;58;02
James Petrosky
But there's another option that is megaton penetrators with great accuracy. I mean, we don't have to remove the accuracy. We get that large. And can you comment.

01;00;58;28 - 01;01;21;11
James Petrosky
Because I know you do risk assessment, so comment on the effect, the societal risk perception, that concept where society is less willing to accept risks that result in large number of fatalities in a single event. Regarding the fear factor, which is what provides deterrence, on an adversary or even on deterrence, can you can you comment on that reduction from megaton class to kiloton class?

01;01;21;15 - 01;01;41;14
Don Cook
Well, sure. I'm going to start from the place that nuclear weapons have only been used in anger twice. I'm going to use some of my British language because it takes me too long to transcribe it back to American English. So, they've only been used in anger twice. And it was us, the U.S., who did it each time.

01;01;41;17 - 01;02;16;07
Don Cook
Since then, we've had a real deterrent. The most important thing to me is maintaining the view of that deterrent. This is especially important in the mind of our adversaries. Much more important to me than in the mind of our Congress. What is important to me is that we have exercised and need to continue exercising everything we can so that we maintain bipartisan support of the deterrent in Congress.

01;02;16;10 - 01;02;44;02
Don Cook
You know, an answer that I didn't give to Peter, Jim, is that if we resumed underground testing, underground nuclear explosive yield producing testing, the Ds would drop away. That's the sure way to kill any further progress in the U.S. Deterrent. I advise against it, not because of the politics I'm commenting here, but because from the scientific point of view, it it's not needed.

01;02;44;02 - 01;03;07;23
Don Cook
Number one, it actually takes away value because the cost of each test would be in the range of 1 or $2 billion. Even if it's a very simple test, it would cost that much. And the amount of information we get out would just be minuscule compared to what we're getting out of the stewardship tools today. Now, I'll comment a little bit about B61-11.

01;03;07;26 - 01;03;41;14

Don Cook
The unclassified fact, or I wouldn't say it here, is that if one can couple a weapon into the ground by a few body lengths of the weapon, the physics of soil explosion is that one launches a shock that goes down and that goes sideways. The problem is, one also launches a shock that goes up. It vents at the ground, creates lots of debris, a terrible amount of mess.

01;03;41;16 - 01;04;13;14
Don Cook
So, Earth penetrators do that. Anybody who says they don't or they're clean is just is not paying attention to the facts. But the real problem is when the shock goes up and reaches the surface, that causes a rarefaction wave to go down. And the rarefaction wave will ultimately connect up with a compression wave and basically cancel it out. But if the bomb body is a few body lengths into the ground, that rarefaction wave never catches up.

01;04;13;17 - 01;04;54;06
Don Cook
And if you look at certain yields, that multiplication, the yield multiplication factor is in rough numbers ten. It may be a dozen. There's a precise number depending on configuration, so I just don't think that many people know that. And you won't have a low yield there. That might be a larger yield. But doing that with megaton class, is just it's harder ... it's harder to get something in the ground that's big and tends to be fairly fat because of the secondary.

01;04;54;09 - 01;05;20;12
Don Cook
So, you know, evaluations have gone on. They are going on now. In my own opinion the B61 mod 11 needs to be either life extended or replaced. You know, more than 90% of the targets of concern have been deeply buried underground for the last three now going on four decades.

01;05;20;15 - 01;05;47;03
Don Cook
And as far as accuracy, yeah, there'd be nothing, terribly difficult about applying a modern tailkit to an Earth penetrator. And then you've got the accuracy, and accuracy once again, in my mind, along with reduced yield means less collateral damage, less unintended damage. You still destroy the target, and certainly there would be lower loss of life. Back to you.

01;05;47;06 - 01;06;02;29
James Petrosky
Okay, well, thank you for that answer. This will be, I always like, when we have a little bit of disagreement on some things. And that's great because that's what we need to do, as part of the think tank. And so, I want to turn this over to Kimberly to close us out and talk about what's coming in.

01;06;03;00 - 01;06;12;27
James Petrosky
Thank you so much for the audience that stuck with us a little bit, past our hour, but I think this was great information. And again, check us out on YouTube. Kimberly, you.

01;06;12;29 - 01;06;40;25

Kimberly Cherington
Thank you so much, Dr. Cook, for joining us and bringing your expertise, to our audience. If you are new to NIDS, we're 501 C3 nonprofit organization dedicated to advancing peace and promoting stability through a strong national security and nuclear deterrent. We do this by offering a wide variety, range of deterrence education from live events like this,

01;06;40;27 - 01;07;16;15
Kimberly Cherington
Virtual events to podcast publications, workshops and courses through our Events Academy. Looking ahead, please mark your calendars for next week. Next Friday, same time, Bob Peters. And on December 5th, Peter Huessy will join Adam Luther as they present "*Hollywood Versus Reality nuclear Deterrence in the Age of Dynamite and Oppenheimer*", which would be very interesting conversation. And then, of course, on December 19th, we have Dave Hoagland, as we talked about in

01;07;16;15 - 01;07;23;16
Kimberly Cherington
today's presentation, we have a full line up of events, and we're adding speakers every week.

01;07;23;18 - 01;07;46;21
Kimberly Cherington
They're always on Friday morning. So be sure that you and your colleagues are on our invitation list by emailing us at NIDS@thinkdeterrence.com. Thank you for being part of our growing community, and be sure to follow us on LinkedIn and share, our content with your network to help us spread the word. We hope you have a peaceful day.

01;07;46;23 - 01;07;48;04
Kimberly Cherington
Thank you all and thank you.

01;07;48;04 - 01;07;57;28
Peter Huessy
And thank you, Don cook, for a wonderful presentation. I will be in touch with you about a couple of things I'd like to talk to you offline. Thank you, Kimberly, and thank you to our president, Mr. Petrosky. Thank you for that. And we will see you, all of you, next Friday. Take care.