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PROMPT GLOBAL STRIKE: AMERICAN AND FOREIGN DEVELOPMENTS

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BEFORE THE

SUBCOMMITTEE ON STRATEGIC FORCES

OF THE

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HOUSE OF REPRESENTATIVES

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HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
SUBCOMMITTEE ON STRATEGIC FORCES,
Washington, DC, Tuesday, December 8, 2015.

The subcommittee met, pursuant to call, at 2:18 p.m., in room 2212, Rayburn House Office Building, Hon. Mike Rogers (chairman of the subcommittee) presiding.

Mr. ROGERS. I want to call this hearing of the Armed Services Subcommittee on Strategic Forces to order. We are going to have our hearing today on "Prompt Global Strike: American and Foreign Developments."

I want to welcome our panelists and guests with us today.

And is Ms. Cooper here? Martha is here. I want to welcome the ranking member's wife, Martha Cooper, for being with us today. I had a chance to travel with her recently. She is wonderful. I don't know how she puts up with Jim, but she is wonderful.

But we are happy to have our witnesses with us today. We have got a fine bunch. And I am happy to dispense with my opening statement.

If Jim wants to do the same, so we—unless you just feel compelled or something.

Mr. COOPER. You didn't even say "Roll Tide" or anything.

Mr. ROGERS. Don't stir me up.

Because of the vote series, what is happening is there is a series of procedural votes that have been happening, will be happening all day, so we will probably be interrupted. So to ensure that we can get to the witnesses for their statements and questions, we will just dispense with the reading of our opening statements and submit them for the record.

[The prepared statement of Mr. Rogers can be found in the Appendix on page 23.]

Mr. ROGERS. With that, we have testifying before us today General C. Robert Kehler, retired former commander of Strategic Command, U.S. Strategic Command; Mr. Tom Scheber, independent consultant; and Dr. James Acton, senior associate, Carnegie Endowment.

I want to thank you for your time and energy that you put in to preparing for these hearings and for traveling up here on your own dime. I appreciate that.

And, General Kehler, if I bet you money 2 years ago that we would be able to get you to sit in this chair again, what would the odds have been? Not good?

General KEHLER. Very high.

Mr. ROGERS. Oh, really? Well, good.

General KEHLER. Of course, of course.

Mr. ROGERS. We appreciate you being here.

So, with that, I will recognize General Kehler for his opening statement.

STATEMENT OF GEN C. ROBERT KEHLER, USAF (RET.), FORMER COMMANDER, U.S. STRATEGIC COMMAND

General KEHLER. Thank you, Mr. Chairman, Ranking Member Cooper, distinguished members of the subcommittee. I am honored to join you today.

With your permission, Mr. Chairman, what I would like to do is submit my full statement for the record and then provide a brief summary now.

Mr. ROGERS. Without objection, so ordered.

General KEHLER. This is the first time I have appeared before a congressional committee since retiring from active service in December of 2013, and I am pleased to be here to offer my personal perspective today on the topic of conventional prompt global strike [CPGS].

We live in challenging times, and I continue to believe that a strong strategic deterrent composed of effective defenses, modern conventional and non-kinetic capabilities, an updated nuclear triad, and highly trained and well-led people will be needed to underwrite our national security and assure the security of our allies and partners well into the future. The potential threats to our security and the security of our allies are diverse, can arrive at our doorsteps rapidly, and can range from small arms in the hands of terrorists to nuclear weapons in the hands of hostile state leaders. The possible intersection of violent extremism and weapons of mass destruction remains a significant concern that requires constant vigilance. State and non-state actors alike can stress our intelligence capabilities and contingency plans by employing highly adaptive hybrid combinations of strategies, tactics, and capabilities, and by using the speed of information to mask their activities behind a veil of deception and ambiguity. New capabilities, like cyber weapons and unmanned vehicles, are emerging, and familiar weapons, like ballistic missiles and advanced conventional capabilities, are more available, affordable, and lethal.

I can't recall a time during my professional career when potential threats to our homeland were more varied or pronounced than they are today. The tragic events in New York on 9/11 and more recently in Paris, San Bernardino, and elsewhere remind us that we must continue to pursue and destroy violent extremists and their networks while remaining constantly on guard to prevent and respond to attacks from them.

Beyond violent extremists, state adversaries are seeking to change the strategic situation in their favor by improving their ability to threaten the U.S. and allied homelands with attack by long-range conventional, cyber, and, in some cases, nuclear weapons. When used in concert with capabilities designed to degrade our key operational advantages—things like space-based ISR [intelligence, surveillance, and reconnaissance] and communications—and negate our conventional superiority, they believe a credible

threat to escalate a conflict of a strategic level against our homeland will raise the risks and costs of our intervention and to do so to unacceptable levels, thereby enabling more assertive foreign policies and aggressive actions.

In my view, dealing with today's varied threats from actors with widely different capabilities and motivations requires the flexible application of a range of capabilities within strategies and plans that are tailored to specific adversaries and scenarios. Violent extremists and nation-states are not the same, and we cannot deal with any of them in a one-size-fits-all manner.

Deterrence strategies that are the preferred approaches to counter nation-states will likely not be effective against violent extremists, where direct action is often the only recourse. Nuclear weapons may not be the most credible deterrence tool against some targets and in some scenarios where they were once the preferred option. Therefore, it is increasingly clear to me that we must carefully match our strategies and plans to individual actors and deploy a range of conventional and nuclear capabilities that can either deter, if possible, or defeat them in multiple scenarios.

The capability to hold at risk and promptly attack a subset of high-value targets with a long-range conventional weapon is one such capability. What I said when I advocated for this capability while still on Active Duty in 2013 remains true now. Today, the only prompt global strike [PGS] capability to engage potentially time-sensitive, fleeting targets continues to be a ballistic missile system armed with nuclear weapons.

We continue to require a deployed conventional prompt strike capability to provide the President a range of flexible military options to address a small number of highest value targets, including in an anti-access and area-denial environment. In my view, such a capability would both enhance strategic deterrence and improve our ability to react quickly in a time-critical scenario by providing the President with an option to promptly deliver a nonnuclear weapon against a limited but vitally important target or subset of highest value targets at long ranges. Such targets might be presented either by violent extremists, rogue or other nation-states; could emerge in a day-to-day or conflict scenario; and would most likely be highly defended, be found in the most challenging geographic locations, or be mobile—perhaps all three.

While it is impossible to predict with 100 percent certainty what these targets might be, it is likely that they would fall into several general categories: Those that pose an immediate threat to the U.S. or allied homelands; those that involve the imminent use or movement of weapons of mass destruction; those associated with key extremist leaders; or those that represent a critical node in an important system that must be eliminated early in a campaign. Such a conventional prompt global strike system would complement, not replace, other strike capabilities by filling a gap in the capabilities of both existing and planned systems.

The analysis is simple. Traditional systems are insufficient if they cannot deliver weapons in an operationally relevant timeframe. And in many plausible scenarios, traditional conventional forces may not be close enough or in a position to do just that. While 1 hour and global range do not have to be absolute criteria

for CPGS, the need remains to provide the President with the means to strike certain targets quickly with a conventional weapon and in the face of the most challenging time and distance circumstances.

Conventional prompt global strike is intended to prevent an adversary from using time and distance as a sanctuary. Over the last several years, research and development efforts on CPGS have highlighted both the promise and challenges of fielding such a capability. As many have pointed out, beyond the technical challenges, CPGS systems also raise policy, doctrine, and operational concerns that would have to be resolved prior to deployment. Additionally, important enabling capabilities, such as ISR and battle management and command and control, must also be addressed in order to field a viable operational system.

The U.S. would also need to carefully assess the role of CPGS in strategic deterrence. While it is U.S. policy to reduce our reliance on nuclear weapons, I do not believe conventional weapons generally and CPGS specifically can serve as a large-scale replacement for nuclear weapons.

Finally, I remain concerned, Mr. Chairman, about investment priorities. I am mindful of the difficult budget environment you are facing and worry that a robust CPGS effort could delay or eliminate other necessary modernization efforts. In my view, CPGS cannot and should not take the place of the vitally important nuclear or other strategic modernization efforts this subcommittee has worked hard to help craft and support. While I believe there is a real gap in our ability to strike promptly at long range with conventional weapons and that CPGS could definitely help close that gap, I would recommend caution as you consider elevating this need against others.

Sir, I remain an advocate for CPGS as a complementary capability to enhance both deterrence and contingency response in the 21st century, but in this budget environment, I personally do so with a caveat. There are many important investment priorities that contribute to sustaining and enhancing our deterrence posture and ensuring our military people and civilian partners remain the envy of the world. A prudent CPGS investment profile seems to me to be a sensible way to preserve future decision space while respecting budget realities.

Thank you again for inviting me to appear, and I look forward to your questions.

[The prepared statement of General Kehler can be found in the Appendix on page 25.]

Mr. ROGERS. I thank you, General. I think that is a reasonable and prudent caveat, by the way.

You are having microphone problems. I am having microphone problems. We have got somebody working on that. I just wanted the people to realize that we are trying to get it fixed.

So, with that, Mr. Scheber, we recognize you for a summary of your opening statement. And we hope your microphone works.

STATEMENT OF THOMAS SCHEBER, INDEPENDENT CONSULTANT

Mr. SCHEBER. Chairman Rogers, Ranking Member Cooper, and distinguished members of the House Subcommittee on Strategic Forces, thank you for the opportunity to appear here today.

As many of the committee members are aware, over the past 15 years, the thinking about the roles served by strategic weapons and the collection of capabilities needed has undergone a significant transformation. This transformation in conceptualizing strategic force needs—plus newly available technology—has provided the catalyst for prompt global strike.

Strategic capabilities are more than destroying the adversary forces; they are, in general, capabilities that can affect the decision calculus of leaders of other countries in peacetime and can become game changers if used in wartime.

General Kehler has certainly outlined the complex security environment we face and for which CPGS would be, in many cases, an important contribution.

Longstanding national security goals remain important, and these goals include four, which I will address very briefly: One, deterring adversaries from specific actions; two, assuring U.S. allies and friends; three, discouraging further military competition; and four, should deterrence fail, limiting damage and defeating an adversary. PGS can provide unique benefits in each of these four policy goals.

Of specific interest to this hearing today is a proposal to develop long-range nonnuclear strike capabilities as a supplement to—not a replacement for—nuclear strike. The potential scenarios requiring use of such a weapon are often the primary focus of inquiries such as the discussion we will have today. However, if the late James Schlesinger were among us today and on the panel, he would insist on commenting that PGS would be used every day during peacetime and then only if needed in wartime. Let me explain briefly.

Of the four policy goals, PGS could be helpful in deterring adversaries. In some situations, advanced conventional strike, such as PGS, could pose a more credible offensive threat to adversaries than a nuclear threat. Uncertainty over just how the United States might respond to an immediate provocation without resorting to nuclear weapons would enhance overall U.S. capabilities for deterrence. PGS would also help assure allies. Allies in high-threat regions have expressed concerns about U.S. nuclear reductions and other military cutbacks, while at the same time they see their adversaries modernizing or developing nuclear and other WMD [weapon of mass destruction] capabilities. From the perspective of allies, threats to them are increasing, and allies want to know how the United States will carry out its extended deterrence commitments to them, to deter and defeat adversaries while limiting damage. Some allies may be reassured by the knowledge that the United States has a prompt nonnuclear strike capability should the need arise.

And, third, PGS can help discourage strategic force competition. Developing and deploying a global or near global precision strike capability would demonstrate to potential adversaries the technical

prowess and resolve of the United States. Some potential adversaries could be dissuaded from competing militarily because of the tangible display of U.S. technical superiority as well as the cost and challenge of military competition.

And, finally, should deterrence fail, to help and defend the United States and its allies, PGS can play a useful role. A PGS capability would provide one additional option for the President's consideration, a unique strategic capability that we do not have today. One or more PGS weapons could be employed promptly to degrade, disrupt, or destroy adversaries' capabilities, which need to be neutralized promptly and for which other options would not be timely and effective. Those who argue against developing prompt global strike would foreclose such an option from those available to a future President.

In my written statement, I have addressed these issues in greater detail. With your permission, I ask that it be made part of the record, and hope that this material is of use to the subcommittee as it considers the need for prompt global strike. Thank you, sir.

[The prepared statement of Mr. Scheber can be found in the Appendix on page 38.]

Mr. ROGERS. Without objection, that full statement will be submitted for the record.

Dr. Acton, you are recognized for 5 minutes to summarize your statement.

STATEMENT OF JAMES ACTON, SENIOR ASSOCIATE, CARNEGIE ENDOWMENT

Dr. ACTON. Mr. Chairman, Ranking Member Cooper, members of the committee, it is a genuine honor to testify before you today, and thank you for the opportunity. I hope I can be of help to the committee both today on this issue and in the future. With your permission, I would like to submit my full statement for the record.

Mr. ROGERS. Without objection, so ordered.

Dr. ACTON. While I will focus my testimony on the U.S. conventional prompt global strike program, I would be very pleased to answer questions about both Russian and particularly Chinese developments in this area too.

Let me emphasize from the start that I am genuinely undecided about whether the United States should acquire CPGS weapons. The capability would unquestionably convey potential benefits, but it would also carry potential risks. Today, in my opinion, the relative magnitudes of those benefits and risks are unclear.

The difficulty of reaching a definitive conclusion about whether to acquire CPGS weapons stems in part from technological immaturity. The underlying technology is extremely challenging, and further research and development, including flight testing, is required prior to any procurement decision. However, it also stems from what I believe are flaws in the Department of Defense's approach to CPGS development. Most importantly, the Pentagon has no official policy that sets out the specific military missions for which CPGS weapons might be acquired.

The frequently repeated statement that the program's purpose is to develop high-precision conventional weapons, capable of reaching targets anywhere on Earth within an hour, is not only an increas-

ingly inaccurate description of the technology that is actually being developed, but it does not speak to the specific military missions for which CPGS weapons might be acquired. Until the Department of Defense specifies these missions, there can be no yardstick against which to judge the likely effectiveness of different potential CPGS technologies. The tradeoffs associated with acquiring other weapons for the same purposes also cannot be properly assessed.

To compound the problem, I believe there is evidence that the Department of Defense has failed to properly consider the enabling capabilities, such as intelligence, surveillance, reconnaissance, and battle damage assessment, needed to ensure the effectiveness of CPGS weapons as well as the full range of escalation risks.

Not only do these flaws make it impossible at this time to reach a conclusion about the ultimate desirability of CPGS weapons, but they also create three real risks. They are that the United States will develop weapons that, first, are not optimized from a military perspective for the missions for which they might be employed; second, are not the most cost-effective way of prosecuting those missions; and, thirdly, unnecessarily exacerbate escalation risks with Russia and China.

Fortunately, I believe there is still time for a course correction by the Department of Defense, and in my written testimony, I suggest how the Department might proceed.

Thank you for your attention, and I yield the balance of my time.

[The prepared statement of Dr. Acton can be found in the Appendix on page 52.]

Mr. ROGERS. I thank all the witnesses for their opening statements.

We have been called for another vote. So, again, it is just one procedural vote, so we will recess for about 15 minutes to go and cast that vote and come right back. I apologize, but I am not running the trains around here.

With that, we are in recess.

[Recess.]

Mr. ROGERS. I call this hearing back to order. I don't know how this process is going to work as far as votes, but I will start the questioning while we wait on Mr. Cooper to get back.

General Kehler, in your opening statements, you talked about, while in the service, that you supported prompt global strike, and you offered a caveat. Could you walk us through the capability gap that you thought—that you believe exists that caused you to have that support?

General KEHLER. Mr. Chairman, one of the things that Strategic Command [STRATCOM] was responsible for, of course, was for planning for global strike, and so it was our job to look at various scenarios and to assess those scenarios for targeting and for the kind of capabilities we could match against those scenarios and those sorts of targets. The obvious ones that STRATCOM has been planning for years and years involved nuclear weapons and nuclear deterrence. We were very supportive of the notion that we should be looking to employ conventional weapons in times and places where we would once have used nuclear weapons as much as was feasible. We also were—so we picked up a responsibility for conventional global strike as well. That also forced us to take a hard look

at the kinds of issues that the regional combatant commanders have and that we had at STRATCOM, the kinds of targets that were defined by being time urgent and at such distances that we could not quickly get a traditional conventional weapon there. Those scenarios are typically as I outlined in my opening comments. Those scenarios exist when there is an immediate threat to the homeland, for example, or the homeland of our allies, and we are talking about WMD, those kinds of things, terrorist-related threats that can pop up quickly, be identified and need to be addressed. So we had nothing that was nonnuclear in order to go after those kinds of targets.

Once U.S. forces are in place or when U.S. forces are in place, this gap doesn't look the same at all. It is when they are not in place or when the timing—even with the in-place forces, when the timing is such that they just can't get there in an operationally necessary or relevant time. Is that 1 hour? Is that global distance? I think those are—are good benchmarks for the start of this conversation. I don't think they are absolutes. So is 2 hours sufficient? I think in some cases it is. You know, the shorter, the better, I would say. The best we can do, the better the capability.

So this was a matter of looking at a set of needs that we described as niche needs where other forces are not available, where the use of a nuclear weapon is inappropriate. And when I sat back and looked at what options I would present to the President in those kinds of scenarios, I didn't have anything in our quiver that we could immediately offer.

Mr. ROGERS. All right. Thank you. When you think about that, compare where we are to Russia and China, particularly China has tested hypersonic glide vehicles six times already this year. And I know in conversation I had earlier with Mr. Scheber, he had talked to me about China's more aggressive schedule. Do you see them confronting this gap in a more aggressive fashion than the United States did? Tell me more about it, if you can.

General KEHLER. Sir, I will just offer a quick comment and then defer to my colleagues here if that is okay.

Mr. ROGERS. Sure.

General KEHLER. I don't have—since my retirement, I don't have in-depth knowledge of what the Chinese and the Russians are both doing. I will say this: I do believe that they are both interested in pursuing a long-range prompt conventional strike means as part of their strategies. It is a strategy, in the case of the Chinese, to enhance what we call their anti-access, area-denial capabilities, their capabilities against ships and other conventional platforms where we have an advantage.

I think in both of their cases, it is also a means for them to hold targets in our homeland and those of our allies at risk, and I think they do that strategically in order to cause us to assess the risk of our intervention in a crisis or a conflict in a different way. So I know they are pursuing those kinds of capabilities. It isn't quite clear to me, and I know you are receiving a briefing a little bit later, a classified briefing, that will get into that more deeply, but I do believe they are both interested in those kinds of capabilities, and I think that they are pursuing R&D [research and develop-

ment] efforts to try to bring those capabilities to some level of decision point where they can decide on deployment.

Mr. ROGERS. Mr. Scheber, I know you and I talked about this a little bit earlier. Do you want to add something to what General Kehler just offered?

Mr. SCHEBER. Yes. Thank you, Mr. Chairman. Most of—my research has been focused on open sources, so it is all unclassified research, what is available in the press, what the Chinese wish to have revealed to us, and as well as unclassified DOD [Department of Defense] reports.

Regarding China, as General Kehler has outlined, the Chinese appear to be developing prompt nuclear and nonnuclear strike capabilities that fit with their anti-access and area-denial strategies out to the second island chain. Just specifically regarding conventionally armed ballistic missiles, they have over 1,200 short-range missiles that are ballistic, the DFs 11 and 15 that are deployed opposite Taiwan; they have medium-range missiles, such as the DF–21 family, which includes an anti-ship version; they have a DF–16, which can target Okinawa, which we have our forces deployed there; and they are in the process, at least according to open-source reports, of developing a longer range, classified as an intermediate-range missile, the DF–26, which Chinese reports refer to as the "Guam killer." The name is pretty self-explanatory.

So if we look at what we know of the Chinese strategy to dominate the western Pacific and deny the United States access to that area, these capabilities look like they are pretty well designed to help them with that strategy, and as far as we know, at least at the unclassified level, those missiles have the capability to be either nuclear or conventionally armed.

Mr. ROGERS. Great. My final question before I turn it over to the ranking member is for General Kehler. You and I have talked about this before, but I wanted to visit the subject. The disarmament advocates believe that we should get rid of one leg of the triad. They say we don't need the ICBMs [intercontinental ballistic missiles] anymore, so we shouldn't pursue the Ground-Based Strategic Deterrent program, or that we don't need air-launched cruise missiles, so we shouldn't pursue the long-range standoff weapon. In fact, these people say that these systems are dangerous and destabilizing.

What are your thoughts about the suggestions that we hear from these advocates?

General KEHLER. Mr. Chairman, I remain a supporter of the triad, and I remain a supporter because I think the triad does some very important things for us. Number one, it gives to any President a range of options. It is very difficult, I think, post-Cold War to envision the scenarios we are going to find ourselves in, in the future. We typically get that wrong, as a matter of fact.

And so I think that one thing the triad does for us is it gives us a range of options to present to any President to deal with a crisis or a conflict. The second thing it does is it provides insurmountable problems for an adversary, either attack problems to try to eliminate our forces or defense problems. And it forces them to invest in all kinds of ways that, when you start to eliminate legs of the

triad, I think they don't have to invest any longer. By the way, I think it diminishes our deterrent value as well.

The third thing it does, the triad does, is it provides the United States with a hedge—a hedge against technical failure or a hedge against geopolitical change. Again, it is an uncertain world, and if we had, for example, let's say we decided to do away with the ICBM leg of the triad—I am a fan of the ballistic missile submarine force. Ballistic missile submarine force—and by the way, when New START [Strategic Arms Reduction Treaty] is finally brought into full force, most of our deployed weapons will be aboard submarines. That works this issue about survivability of the land-based ICBM force and whether or not we are in a use-or-lose kind of scenario. We have taken steps to avoid that.

But having said that, without the ICBMs, we are one potential technical failure, in either a ballistic missile system or a warhead, away from having no ballistic missiles. And while we would still have nuclear capable aircraft, those are not on alert on a day-to-day basis. We would be putting a future President in a position of having to make that decision as well. I think for hedge purposes, it makes sense to retain all three legs.

Finally, I think it has been cost-effective.

So, yes, we need to be mindful, I believe, of the concerns about stability and ambiguity and those kind of things, but I believe that the concerns that have been raised about ICBMs, that they are on a hair trigger, that—because of use or lose, I believe you have to remember that there is one finger on the trigger, and that finger belongs to the President and only the President.

The second thing I think you have to remember is the use-or-lose issue is not the same issue today as it was during the Cold War. There are additional nuclear adversaries beyond—potential adversaries beyond the Russians. Only the Russians can threaten the ICBM force in total. So I think the use-or-lose problem looks different today, and I think that the world situation puts a different light on that as well.

Finally, the idea about unauthorized or—you know, accidental launch, I think for ICBMs there are layers of safeguards, and while, yes, it is important for us to continue to focus on that and make sure that we constantly get better in that regard, I believe that we work that problem pretty well.

Cruise missiles. You know, cruise missiles have proven their value. At least from my perspective and certainly my last job's perspective, they prove their value both in deterrence value, that you can arm a bomber, whether that bomber is penetrating, in the case of LRSB [long-range strike bomber] in the future, or whether it is standoff, what you are doing is you are increasing the effectiveness of the bomber. And to me, there is tremendous value in being able to do that. When you look at the land masses that are potentially involved here, even a penetrating platform benefits from having a longer range missile, that it doesn't have to get close to the target area if it doesn't want to, or it can hold multiple targets at risk at varying ranges while it is penetrating. I think there is tremendous value there for deterrence, and there is no question the value—the combat value we have gotten out of using hundreds of conventional cruise missiles.

So I don't understand some of the argument here about why we shouldn't go ahead with a replacement for the ALCM [air-launched cruise missile]. To me, it makes all the sense in the world. It makes even more sense if that replacement for ALCM eventually becomes dual-capable, and then I think we have done exactly what we have done with the air-launch cruise missile. I do not believe that we are changing either the stability or the ambiguity issues here. These are issues—you know, when we use B–52s today—I am taking too much time—but when we use B–52s today, we use B–2s today, and we have only ever operationally used them, thank heaven, in conventional modes. And we have been able to work the ambiguity issue when a cruise missile lifts off a surface ship, or when it drops out of a B–52 bomb bay, or if it comes out of an SSGN [guided missile submarine], no one believes that we have just launched a nuclear weapon.

Now, we need to be careful with that. I agree that that is an issue that we have to be mindful of and continue to work to reduce that risk and continue to reduce the risk as much as we possibly can, but I do not believe that we are changing the game here with LRSO [long-range standoff weapon]. I think what we are doing is continuing our—both our deterrence and our conventional warfighting capability.

Mr. ROGERS. Great. I thank the gentleman.

The Chair now recognizes the ranking member for any questions he may have.

Mr. COOPER. Thank you, Mr. Chairman.

I am most interested in that netherworld between nuclear and conventional, and we probably can't call it conventional anymore since hypersonic weapons are stretching the limits of conventionality, so maybe we should say "nuclear, nonnuclear."

I think everyone agrees that due to the speed and precision of these conventional warheads, they can have a devastating impact on the target. I think we can also all agree that many poorer nations are encouraged to turn nuclear because that is a more affordable way to get devastating capabilities because they have less hope of achieving a hypersonic capability.

So I was interested in Mr. Acton's book "Silver Bullet" when he talked about how even our bunker buster bomb, the massive ordnance penetrator, can go a certain depth, but these things can go probably twice as deep, due to the speed and precision. So it seems to me to be an interesting inflection point for the world. Several leading nations are pursuing these weapons, but we don't know quite how to classify them. And the chairman has pointed out that we have been kind of slow developing them, given the lead time, and I hope we can get to the bottom of that in the Pentagon, but to me, it is a fascinating category because they are not nuclear, but yet they have super capabilities, and they tempt other nations to do some extreme reactions.

Mr. Acton also noted that Putin comments five times in recent years. He seems to pay particular attention to these. The potential for these weapons is remarkable. So I am hopeful that we can develop the capability and do so in a sensible way that does not exacerbate the difficulties in the world that we have already.

I would welcome comments from any of the witnesses on this. Am I off base in classifying the weapons these ways, as not really conventional but certainly not nuclear?

Dr. ACTON. Thank you, Mr. Cooper.

And these are certainly weapons that have significantly greater potential to destroy certain kinds of targets than existing conventional weapons. Unclassified figures put the depth that the massive ordnance penetrator can go to at about 20 meters of reinforced concrete. My calculations suggest that hypersonic weapons might be able to go to 40 meters. With nuclear weapons, you are talking about weapons that can potentially destroy targets hundreds of meters in hard rock. So there [is] still, as you absolutely rightly point out, quite a big difference there between even these penetrating weapons and nuclear weapons.

I think one of the important questions that this raises, and this is a question that is impossible to answer at the unclassified level, that is, how many additional targets are there that are out of the reach of existing conventional weapons but would be in the reach of hypersonic weapons. I just don't know the answer to that question, but that is, I think, the type of thing that needs to be considered at the classified level, and as you say, sir, thinking about how to do this sensibly.

I would just raise a couple of points about some of the escalation risks involved with these weapons. So much of the debate so far has been swallowed up by the so-called problem of warhead ambiguity, which when the administration of President George W. Bush had a plan to take nuclear warheads off some Trident missiles and replace them with conventional warheads, Congress was concerned that an observing state, most likely Russia, would see the launch of one of those weapons and misinterpret a conventional for a nuclear weapon.

I think we have placed far too much emphasis on the warhead ambiguity problem. There are other escalation risks with conventional prompt global strike weapons that I think haven't had adequate attention. So to give you one, the Department of Defense is interested in these boost-glide weapons precisely because they don't fly in ballistic trajectories, and so DOD argues that an observing state could tell this was nonnuclear because it was in a different trajectory, and I think that is exactly right. However, these weapons are also highly maneuverable, and if one fires them, say, in the direction of Iran, Russia might not know whether that weapon was heading for Russia or Iran, or if one fired them at North Korea, then Russia or China, for that matter, might not know whether the target was Russia or China. This is what is termed destination ambiguity.

So there are real tradeoffs here in terms of risk reduction in that technologies that exacerbate one risk can reduce another. These escalation risks are risks to be considered. I don't necessarily argue that they are by any means the only factor that needs to be considered, but from everything I have seen, DOD is very largely focused on the warhead ambiguity problem and hasn't given adequate attention to those other kinds of risks.

Mr. COOPER. How would you classify a weapon that had in its glide phase only 48 percent?

Dr. ACTON. Well——

Mr. COOPER. That seems to be a pretty arbitrary distinction between 50 percent glide phase.

Dr. ACTON. I would make two points there. I mean, the distinction comes from arms control definitions where the—if a weapon is ballistic over the majority of its trajectory, then it is deemed to be a ballistic missile. And that, I think, is unquestionably the correct interpretation of the existing arms control treaties we have. The extent to which that mitigates ambiguity problems, though, I think is more of an open question, but what I would say is another issue with DOD's argument is that if you are Russia, you would see the launch of a boost-glide weapon if you had a satellite in the right place looking. You wouldn't, then, see a weapon flying in a nonballistic trajectory. What you would actually see is nothing at all after the launch because boost-glide weapons fly at too low an altitude to be detected by early warning radar.

So DOD's argument is that Russia could see that the weapon was flying in a nonballistic trajectory; whereas, in fact, I think Russia would see nothing at all after the launch.

Mr. COOPER. Thank you, Mr. Chairman.

In view of the shortness of time, I yield to other members.

Mr. LAMBORN [presiding]. Okay. Thank you. I will ask a question or two and then turn it over to my colleague from California, depending on when we have to go vote here.

General Kehler, there is a letter that I saw that one of the Senators is circulating urging the administration to stop any thought about developing a nuclear-tipped air-launched cruise missile. And I know that that is not the subject of our conversation here today, but it is related, but I realize it is on the other side of the bright line between conventional PGS, and this is on the other side. This is nuclear air cruise missile. But it is important, because that letter's circulating, and yet when I see what the President certified when he addressed the Senate on the New START treaty back in the year 2011, among other things, he certified under point 3 that he intended to modernize or replace the triad of strategic nuclear delivery systems, which is a heavy bomber, an ICBM, et cetera, et cetera, add an air-launched cruise missile. So the President in the past is on record saying that a nuclear-tipped air-launched cruise missile is part of our strategic deterrence.

In light of that, would you agree or disagree with a letter urging the administration to drop any development of a nuclear-tipped air-launched cruise missile, long-range standoff, let's say.

General KEHLER. Sir, I continue to support the need to have a nuclear-capable, air-launched cruise missile that would be a replacement for today's ALCM. As I mentioned to the chairman, I think we have—there is great deterrent value. It not only provides the ability to stand off with a bomber, depending on the scenario here, but it also allows the bomber to penetrate and still extend the range and effectiveness of the bomber, the penetrating bomber. So I think it still provides us with deterrent value. And, as I also mentioned, I think we have seen in combat the value of a dual-capable cruise missile, a cruise missile that can also be used in a conventional sense.

The letter—I have seen the letter that you are mentioning. There are a number of issues that are raised. Some of these are ambiguity issues. I know that there have been some op-eds and other things written that I have read here over the last several months about raising the ambiguity concern. And, again, while I believe that you always have to be mindful of those concerns, I think those are workable, and we have worked those with the cruise missiles that we have today and the bombers as well, that I don't think those are insurmountable issues.

I do think that the value we get out of an air-launched cruise missile and a gravity weapon also is greater than the risks that are raised here because specifically I believe that those risks are all—either have been worked or are workable.

Mr. LAMBORN. And in response to that, one of you, maybe it was you, General Kehler, had said that every time we launch a Tomahawk cruise missile from the Persian or Arabian Sea or something like that, the Russians or Chinese don't have any confusion about what is going on, you know, that that is strictly a conventional armed cruise missile. Why do we have that situation today?

General KEHLER. Well, number one, I think it is scenario dependent. I mean, they don't believe that we are shooting at them, one. So I take Dr. Acton's point here that if a conflict involves Russia or China, I think you would have to be mindful of those concerns. I think you work those in advance. I think you work those with the way you deploy these weapons. I think you work them with the way you test them. I think you work them in a lot of ways because I believe that you would have this issue in multiple ways. You will have this issue with the B–2, by the way. If we are involved in a fight with either Russia or China, I think today we would use the B–2 in that kind of a conflict, but the B–2 is dual-capable. I think those issues have been around for a long time about a stealthy platform and whether or not it would be carrying nuclear weapons, whether they would know it, et cetera, but I think that our operational behavior with B–2s has done something to help alleviate those concerns, and I think you would have to work those concerns here as well.

Mr. LAMBORN. Okay. I am going to turn the gavel back over to the chairman. But, lastly, General Kehler, so you would disagree with the letter I read earlier?

General KEHLER. I do disagree.

Mr. LAMBORN. Okay. Thank you. And I yield to the chairman.

Mr. ROGERS [presiding]. Great.

The Chair now recognizes the gentleman from California, Mr. Garamendi, for any questions he may have.

Mr. GARAMENDI. Thank you, Mr. Chairman. I noticed the bell rang, and I decided that I didn't want to prove that Pavlov was quite right about ringing bells and dogs salivating. So I think that this is probably far more important than voting on another motion to adjourn, so let me go ahead and have at this.

General, your point about ambiguity and the cruise missile thus far and the B–2 bomber thus far not creating a problem, in that Russia or China previously understood that it wasn't coming at them, but we have not been involved in a conflict with either of those two countries.

Now, in a conflict, and you were getting to this with your—at the end of your last comments, in a conflict with those countries, when their doctrine is one—at least Russia's doctrine—is one of escalate to de-escalate, I think we have a completely different situation, in which the ambiguity level significantly increases. So if we are launching a cruise missile, as was just discussed a moment ago, from the Persian Gulf to, I don't know, some place in Iraq, or Russia is launching a cruise missile from the Caspian Sea into Syria, we understood what was going on. We were not engaged in a war with Russia. So I think we have got a very, very different situation, and I think it is Mr. Perry's letter, former Secretary Perry's letter that is being discussed here, and the question of ambiguity really arises to its highest state of uncertainty in a conflict with a nuclear country such as Russia or China.

So I will just make that comment to come back at what you were saying. I think ambiguity can be a very, very serious problem under those circumstances, and hopefully, we never find ourselves under those circumstances, but that is why we have the triad, is it not? It is not to deal with Iraq or Syria.

Dr. Acton, in what way might the CPGS undermine strategic stability, and what should we do to mitigate this risk?

Dr. ACTON. Well, thank you for the question, sir. As I suggested already, I think that——

Mr. ROGERS. Dr. Acton, is your microphone working?

Dr. ACTON. Ah. I am sorry. Sorry, Mr. Chairman.

As I suggested already, there is a series of different escalatory risks that I am concerned about. There has been a lot of focus on warhead ambiguity, which is not my major concern unless, as you rightly point out, we are in a conflict with Russia or China. There is destination ambiguity, uncertainty about where a CPGS weapon will land. One has——

Mr. GARAMENDI. Excuse me. And that is because it can be redirected in flight?

Dr. ACTON. Because it is inherently maneuverable. Because with a ballistic missile, from the moment the motor burns out, you can predict where it is going to land. With a CPGS weapon, because it is maneuverable and can be redirected in flight, you don't know where it is going to land.

You have crisis instability. So the—Russia, I think, incorrectly believes that the United States wants conventional weapons in order to attack Russia's nuclear weapons, but I believe that belief is genuine. And on Russia's part, the belief that the United States might preemptively attack its nuclear forces could lead Russia to use nuclear forces first.

I have two suggestions about how to proceed. The first one is I very strongly agree with General Kehler that this is a problem that needs to be worked. The Department of Defense is only focused on warhead ambiguity to date, and I think that the first thing it should do is focus on the full range of instabilities. It should red team those instabilities, create models of how those instabilities could arise, and factor those instabilities into planning decisions.

Secondly, if the U.S. does decide to go forward with conventional prompt global strike, I think cooperative confidence-building measures, things such as launch notifications, mutual inspections, are

likely to be much more effective than the unilateral measures that DOD has placed a focus on to date.

Mr. GARAMENDI. General Kehler and Mr. Scheber.

Mr. Scheber, you seem to want to have at it, so why don't you go first.

Mr. SCHEBER. Thank you. The issue of strategic stability is certainly a serious issue. I think I am the only one old enough in this room to remember the debate in the 1980s that went on at the time when all of our cruise missiles were nuclear armed and the consideration was in developing a conventionally armed missile for just that reason. Today, if we saw cruise missiles launched in most situations, as you pointed out, people would have assumed that they are conventional in nature because those are how the weapons have been used. We have demonstrated them, informed people, and so there was a whole different context. And so I think it is instructive to see how the world views changed as the arsenal changed and other countries were made aware of it.

Regarding strategic stability and the potential for misunderstanding, it is certainly a topic that is serious. And the National Academy study report that reported out in 2008 found conclusions similar to other studies that have been conducted by the Department of Defense, that while a serious issue, there are a variety of measures, and Dr. Acton mentioned confidence-building measures, which I wholly agree with, of briefing the Russians and the Chinese as to what we are doing, having hotlines available. We have a variety of hotlines already available, so if questions arise, the phone communication can be prompt and straightforward and clear up any uncertainty. And both the National Academy study and a variety of DOD studies concluded that they believe that these series of measures would be sufficient to keep the risk of any misunderstanding very low.

Now, certainly you can never totally eliminate that risk—given that humans are involved, but there is a variety of material on which we can already draw and then build upon to resolve the nuclear ambiguity strategic stability issue.

Mr. GARAMENDI. Thank you. I am out of time. Thank you very much.

Mr. ROGERS. If you need a few more minutes, go ahead. You and I are it right now.

Mr. GARAMENDI. Very good. General——

Mr. ROGERS. Well, now the ranking member came back, but go ahead.

Mr. COOPER. Go ahead, John.

Mr. ROGERS. Go ahead, John.

General KEHLER. I agree with what has been said. I agree with your point as well that this is an issue that you have to work. And the point about Russia and China not believing that we are launching a nuclear-armed cruise missile today if we use one in combat is situationally dependent. I concede that point as well, but what I also know is that now for—I can't tell you the first time we used a conventional cruise missile in combat. Certainly in Desert Storm, we used them. So let's just say for 20 years or 20-plus years, we have used them, what that does is it changes the situation in these other more dire scenarios where I don't believe that Russia, Chi-

nese, or American leaders would knee jerk a reaction in a conflict that was at that kind of a level.

So, having said that, again, I go back to I think you have to work this issue, and you have to be mindful of it, and I think it has to shape your behavior in a given scenario as well. So I am agreeing.

And, by the way, I have tremendous respect for Dr. Perry, and when Dr. Perry says we ought to be concerned about something, I would agree with that. We ought to be concerned about it, but I do think it is workable.

Mr. GARAMENDI. Yeah. I will take just another, maybe a minute here. The principal problem that I perceive here is that we are developing weapons that are by their nature very, very difficult to observe. They are stealthy and extremely dangerous in that they can carry nuclear weapons or very dangerous conventional weapons as we are discussing here. And an adversary, given the uncertainty, the hair trigger becomes much more finely tuned, and that is a concern, particularly given the Russian doctrine at the moment, which may change in the future. We are headed down a path that is, I think, increasing the danger and creating a new paradigm for which we are, by the conversation here, not prepared for. The previous paradigm was one in which we spent 30—almost 50 years developing an understanding and a communication process.

The new weapons, however, by their nature will require a different paradigm, which we do not presently have. Could we develop it? If I recall the height of the Cold War, we were very lucky. And perhaps we were very good, but I suspect more so we were lucky, and that is my concern.

Thank you very much for the time, Mr. Chairman.

Mr. ROGERS. I thank the gentleman.

General Kehler, you and I have talked about this before, but I am real concerned about the saber-rattling from Russia, and this couple—this recent disclosure of an autonomous underwater giant nuclear weapon is deeply troubling to me. And this weapon, according to Russia, would provide a new capability that, quote, "the important components of the adversary's economy in coastal areas and inflicting unacceptable damage to the country's territory by creating areas of wide radioactive contamination that would be unsustainable for military, economic, or other activities for a long period of time," close quote.

You put this together with their public—what we know publicly about their military doctrine, it is of concern to me. What do you make of this, and what does it tell you about their mindset, Russia's mindset? Or do you have an opinion?

General KEHLER. Well, my opinion now, Mr. Chairman, is sort of shaped from being on the outside looking in, but I think—and I haven't spoken with any senior Russians lately, so I can't speak for them. It looks to me as though they have got two objectives here: One is to remind us and NATO [North Atlantic Treaty Organization], and the world really, that we have to take their concerns into account. And I think the second is, as part of a broader strategy to try to change the strategic game here, I think that they want to make sure that they can remind us that they are holding us at risk and that they can do so with conventional weapons, now long-range conventional weapons. You know that in Syria they launched

long-range cruise missiles off of surface ships and off of Tu-95s here not so long ago. So I think they are reminding us that they can hold our homeland at risk in a variety of ways and, as a result, are reminding us that us getting involved in things or acting with impunity, the risk is too high. But what troubles me about this is I think it smacks of returning to a Cold War kind of an approach here that maybe I naively had thought we were past all of that.

So while I can understand why they would do this, what concerns me is if this is real security concern on their part that they are vulnerable somehow, then I do think you begin to get stability concerns. And so I think that is what troubles me as much as anything else, is that if—someone said once, and I don't know who said this or I would give them credit for it—I didn't, but someone said this, and it stuck with me—that insecurity begets instability, and so the flip is security begets stability. And so if they are insecure, fundamentally insecure here, then I think that that is a concern to me in trying to come up with strategies for how we deal with all of that.

Mr. ROGERS. Thanks.

And, General, we have talked about hypersonic boost-glide programs. I want to call your attention to the monitors, the TV monitor that we have up there. This is an unclassified slide that we have been provided that shows French cooperation with a Russian arms manufacturer to develop hypersonic boost-glide capability.

[The slides referred to can be found in the Appendix beginning on page 69.]

Mr. ROGERS. If you were still at STRATCOM, what would you be urging the Department of Defense and the Department of State to say to our French allies about their cooperation with Russia to develop what could be a new nuclear weapon delivery system?

General KEHLER. Well, I think as with any tech transfer kind of an issue, I would hope that the United States would express its concerns to anyone out there where technology transfer is an issue. We have some pretty strict technology transfer laws and processes and procedures, and I would be hopeful that we would express our concerns as well.

I am not overly familiar with this. I see the chart. I am not overly familiar with this, and so I would hate to make a blatant statement about it, but I would just say in general terms, I would be concerned about technology transfer to any potential adversary. And whether Russia is an enemy, I think, is open for some conversation, but I would be very concerned about technology transfer to any of the potential adversaries.

Mr. ROGERS. That is all the questions I have.

The Chair now recognizes the ranking member for any questions he may have.

Mr. COOPER. I have no more questions, Mr. Chairman.

Mr. ROGERS. All right. Well, it looks like we have reached the end. And I thank the witnesses very much for their patience and for their contributions. It is very helpful to this committee.

And, with that, we stand adjourned.

[Whereupon, at 3:40 p.m., the subcommittee was adjourned.]

A P P E N D I X

DECEMBER 8, 2015

PREPARED STATEMENTS SUBMITTED FOR THE RECORD

DECEMBER 8, 2015

Statement of Hon. Mike Rogers, Chairman, Subcommittee on Strategic Forces
HEARING ON
Prompt Global Strike: American and Foreign Developments
December 8, 2015

Good afternoon. I call this hearing of the Strategic Forces Subcommittee to order and I welcome our panel of distinguished guests to our hearing "Prompt Global Strike: American and Foreign Developments".

Testifying today we have:

General C. Robert Kehler, USAF (ret)
Former Commander, U.S. Strategic Command

Mr. Tom Scheber
Independent Consultant

Dr. James Acton
Senior Associate, Carnegie Endowment

I want you to know that we appreciate the time you put into being here today.

General Kehler, if I bet you money two years ago that we'd be able to get you to sit in that chair again, what would my odds have been?

Sir, we greatly appreciate your lifetime of service to our nation, that of your family, and your continuing service.

We are here today to assess where this country stands in developing prompt global strike capability.

Since before the Administration of President George W. Bush, this country has been examining a conventional prompt strike capability.

In fact, the first non-nuclear strategic strike programs were started during the Clinton Administration.

And during the incumbent Administration, the foundational defense policies, the Quadrennial Defense Review and the Nuclear Posture Review have cited the need to have a prompt, non-nuclear strategic strike capability.

It doesn't get more bipartisan than to be supported in the Clinton, Bush and Obama Administrations.

Yet where are we? Instead of real military capability, we have a plan to test this capability again, at only an intermediate-range, in 2017.

If we're lucky, we may have a military capability in the 2030s.

To make matters worse, we're not the only ones developing this military capability.

According to Bill Gertz of the Washington Free Beacon, China has conducted six tests of a ballistic missile launched hypersonic glide vehicle.

Mr. Gertz previously reported that this system has undertaken "extreme maneuvers" and that this frequency of tests is "an indicator of the high priority placed on developing the weapon by the Chinese."

Mr. Richard D. Fisher of the International Assessment and Strategy Center reports, in a letter that I will submit for the record, that this is but one of many systems the Chinese are developing, along with companion space capabilities.

Mr. Cooper and I had the Intelligence Community come to brief us in March of this year and my eyes were opened.

We have invited them back today to brief all subcommittee Members at the conclusion of this open hearing.

I am greatly worried that the United States stands the risk of losing the next arms race to Russia and China.

In fact, I'm worried we aren't even in the race yet—we're still trying to tie our shoe laces in the starting block.

I now yield to my ranking member, Mr. Cooper of Tennessee for any opening remarks he may wish to make.

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THE HOUSE ARMED SERVICES COMMITTEE SUBCOMMITTEE ON STRATEGIC FORCES

STATEMENT OF

GENERAL C. ROBERT KEHLER

UNITED STATES AIR FORCE (RETIRED)

BEFORE THE

HOUSE ARMED SERVICES COMMITTEE SUBCOMMITTEE ON STRATEGIC FORCES

8 DECEMBER 2015

NOT FOR DISTRIBUTION UNTIL RELEASED BY

THE HOUSE ARMED SERVICES COMMITTEE SUBCOMMITTEE ON STRATEGIC FORCES

Chairman Rogers, Ranking Member Cooper, and distinguished members of the subcommittee, I am honored to join you today. This is the first time I have appeared before a Congressional committee since retiring from active service in December of 2013 and I am pleased to be here to offer my personal perspective on the topic of conventional prompt global strike (CPGS). I thank the members of this subcommittee for the support you provided to me while I served as Commander, Air Force Space Command and as Commander, United States Strategic Command, and for your continued focus on important strategic issues. We live in challenging times and I continue to believe that a strong strategic deterrent composed of effective defenses, modern conventional and non-kinetic capabilities, an updated nuclear triad, and highly trained and well-led people will be needed to underwrite our national security and assure the security of our allies and partners well into the future.

As I testified while in uniform, the national security landscape is highly complex and uncertain. Yesterday's regional battlefield is becoming today's global battle-space as adversaries acquire technologies and exploit the interconnected nature of our world to quickly transit political, geographic, and physical domain boundaries. The potential threats to our security and the security of our allies are diverse, can arrive at our doorsteps rapidly, and can range from small arms in the hands of terrorists to nuclear weapons in the hands of hostile state leaders. The possible intersection of violent extremism and weapons of mass destruction remains a significant concern that requires constant vigilance. State and non-state actors alike can stress our intelligence capabilities and contingency plans by employing highly adaptive, hybrid combinations of strategies, tactics, and capabilities and by using the speed of information to mask their activities behind a veil of deception and ambiguity. New capabilities

like cyber weapons and unmanned vehicles are emerging and familiar weapons like ballistic missiles and advanced conventional capabilities are more available, affordable, and lethal.

I can't recall a time during my professional career when potential threats to our homeland were more varied or pronounced than they are today. The tragic events in New York on 9/11 and, more recently in Paris and elsewhere remind us that we must continue to pursue and destroy violent extremists and their networks while remaining constantly on guard to prevent and respond to attacks from them. Beyond violent extremists, state adversaries are seeking to change the strategic situation in their favor by improving their ability to threaten the US and allied homelands with attack by long-range conventional, cyber and, in some cases, nuclear weapons. When used in concert with capabilities designed to degrade our key operational advantages (e.g., space-based ISR and communications) and negate our conventional superiority, they believe a credible threat to escalate a conflict to the strategic level against the homeland will raise the risks and costs of US intervention to unacceptable levels and thereby enable more assertive foreign policies and aggressive actions.

Even discounting for hyperbole, news reports since my retirement have continued to validate what I saw while on active duty. Violent extremists continue to evolve and present an active threat. Russia and China are both upgrading their significant long-range conventional strike capabilities and exercise them routinely; both are active in cyberspace; both are deploying the means to threaten our national security space assets; both are improving their defensive and anti-access capabilities; and both can quickly inflict enormous casualties and damage on the US and our allies with nuclear forces that they are modernizing. Beyond Russia and China, North Korea routinely threatens its regional neighbors, US territory, and US forward

forces with conventional and nuclear attack and is working to deploy its weapons on intercontinental-class missiles in order to threaten the US directly. Active conflict and unrest continue elsewhere.

In my view, dealing with today's varied threats from actors with widely different capabilities and motivations requires the flexible application of a range of capabilities within strategies and plans that are tailored to specific adversaries and scenarios. Violent extremists and nation-states are not the same and we cannot deal with any of them in a "one size fits all" manner. Deterrence strategies that are the preferred approaches to counter nation-states will likely not be effective against violent extremists where direct action is often the only recourse. Nuclear weapons may not be the most credible deterrence tool against some targets and in some scenarios where they were once the preferred option. Therefore, it is increasingly clear that we must carefully match our strategies and plans to individual actors and deploy a range of conventional and nuclear capabilities that can either deter (if possible) or defeat them in multiple scenarios.

The capability to hold at risk and promptly attack a subset of high value targets with a long-range conventional weapon is one such capability. What I said when I advocated for this capability while still on active duty in 2013 remains true now: "Today, the only prompt global strike capability to engage potentially time-sensitive, fleeting targets continues to be ballistic missile systems armed with nuclear weapons. We continue to require a deployed conventional prompt strike capability to provide the President a range of flexible military options to address a small number of highest value targets, including in an anti-access and area denial environment."[i]

In my view, such a capability would both enhance strategic deterrence and improve our ability to react quickly in a time-critical scenario by providing the President with an option to promptly deliver a non-nuclear weapon against a limited but vitally important target or subset of highest-value targets at long ranges. Such targets might be presented either by violent extremists or nation-states, could emerge in day-to-day or conflict scenarios, and would most likely be highly defended, be found in the most challenging geographic locations, or be mobile (perhaps all three). While it is impossible to predict with 100% certainty what these targets might be, it is likely that they would fall into several general categories: those that pose an immediate threat to the US or allied homelands; those that involve the imminent use or movement of weapons of mass destruction; those associated with key extremist leaders; or those that represent a critical node in an important system that must be eliminated early in a campaign.

A CPGS capability would complement, not replace, other strike capabilities by filling a gap in the capabilities of both existing and planned systems. Today, the US has fielded forward-based and long-range conventional weapon systems (e.g., aircraft, tactical missiles; cruise missiles) with various range, speed, penetration, and munitions effectiveness characteristics. A number of studies and reports have concluded that traditional conventional systems can achieve the desired effects in many scenarios involving critical high-value time sensitive targets of the type mentioned above.[ii] In general terms, these traditional conventional strike systems can achieve satisfactory results when they are already in place or operating near enough to the target areas that they can bring weapons to bear in operationally relevant timeframes.

However, those same studies also show that existing and planned conventional systems cannot always meet the promptness (i.e., "within one hour") or range (i.e., "global") criteria that have been established as benchmarks for striking targets that are highly important both in value and time. It's a simple analysis—traditional systems are insufficient if they cannot deliver weapons in an operationally relevant time frame; and in many plausible scenarios traditional conventional forces may not be close enough or in a position to do just that. The sophistication of today's threats makes it highly likely that the type of targets and scenarios of interest to CPGS may be intentionally located beyond the timely reach of standard conventional forces. Again, in my view, while one hour and global range do not have to be absolute criteria for CPGS, the need remains to provide the President with the means to strike certain targets quickly with a conventional weapon, and in the face of the most challenging time and distance circumstances. Conventional prompt global strike is intended to prevent an adversary from using time and distance as a sanctuary.

Over the last several years, research and development efforts on CPGS have highlighted both the promise and challenges of fielding such a capability. As many have pointed out, beyond the technical challenges, CPGS systems also raise policy, doctrine, and operational concerns that would have to be resolved prior to deployment. For example, I fully agree that ambiguity and stability issues are important considerations that must (and probably can) be addressed. Additionally, important enabling capabilities such as ISR and battle management/command and control must also be addressed in order to field a viable operational system. The US would also need to carefully assess the role of CPGS in strategic deterrence. While it is US policy to reduce our reliance on nuclear weapons, I do not believe

conventional weapons generally and CPGS specifically can serve as a large-scale replacement for nuclear weapons.

Finally, I remain concerned about investment priorities. I am mindful of the difficult budget environment you are facing and worry that a robust CPGS effort could delay or eliminate other necessary modernization efforts. In my view, CPGS cannot and should not take the place of the vitally important nuclear or other strategic modernization efforts this subcommittee has worked hard to help craft and support. While I believe there is a real gap in our ability to strike promptly at long range with conventional weapons, and that CPGS could definitely help close that gap, I would recommend caution as you consider elevating this need against others. Conventional capabilities that help narrow the gap while also addressing broader needs are in the budget. CPGS is a necessary but niche capability and it seems to me that a prudent research and development effort to pursue new approaches and resolve technical and other associated issues is an appropriate way to get on a deliberate pathway to the future.

Mr. Chairman I remain an advocate for CPGS as a complementary capability to enhance deterrence and contingency response in the 21st Century. But in this budget environment I personally do so with a caveat. There are many important investment priorities that contribute to sustaining and enhancing our deterrence posture and ensuring our people remain the envy of the world. A prudent CPGS investment profile seems to me to be a sensible way to preserve future decision space while respecting budget realities.

Thank you again for inviting me to appear and I look forward to working with you in the future.

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[i] Statement of General C. R. Kehler, Commander United States Strategic Command Before the Senate Committee on Armed Services, 12 March 2013.

[ii] See for example: National Research Council Committee on CPGS, "U. S. CPGS: Issues for 2008 and Beyond (2008)"; Defense Science Board, "Report of the Defense Science Board Task Force on Time Critical Conventional Strike from Strategic Standoff", March 2009.

Biography

General C. Robert "Bob" Kehler, USAF (ret)

General Bob Kehler served as the Commander, United States Strategic Command (USSTRATCOM), Offutt Air Force Base, Nebraska, from January 2011 until November 2013. He retired from active duty 31 December 2013.

As the Commander of United States Strategic Command, General Kehler was directly responsible to the Secretary of Defense and President for the plans and operations of all U. S. forces conducting global strategic deterrence, nuclear alert, global strike, space, cyberspace and associated operations. While in command, he crafted and implemented critical elements of policies and plans to deter strategic attacks against the U.S. and its key allies, and led a joint team of over 60,000 military and civilians in multiple global operations. He also integrated Department of Defense (DOD) activities for global missile defense, combating weapons of mass destruction, and intelligence, surveillance, and reconnaissance. His forces directly supported combat operations in Southwest Asia and North Africa.

General Kehler's military career spanned almost thirty-nine years of service that included progressively significant operational and staff assignments. He was one of a very few Air Force officers to command at the squadron, group, wing, major command, and combatant command levels, and he had a broad range of operational experience in Intercontinental Ballistic Missile (ICBM), space launch, space control, space surveillance and missile warning units. Before taking command of Strategic Command, General Kehler commanded Air Force Space Command (AFSPC) where he organized, trained, and equipped over 46,000 airmen and civilians conducting mission-ready nuclear missile, space, and cyberspace operations. In that role, he designed the Air Force's inaugural blueprint, operating concept, organizational structure, and personnel program to meet rapidly growing cyberspace challenges. General Kehler's other command tours included the 508th Missile Squadron (ICBM), 341st Operations Group (ICBM), 30th Space Wing (Space Launch), and 21st Space Wing (Missile Warning and Space Control). He also served as Deputy Commander, 351st Operations Group (ICBM), Deputy Director of Operations (AFSPC), and as Deputy Commander of USSTRATCOM.

His staff assignments included tours with the Air Staff, Strategic Air Command, Air Force Space Command, and the Joint Staff. As a young officer he served in the Secretary of the Air Force's Office of Legislative Liaison where he was the point man on Capitol Hill for matters regarding nuclear deterrence and ICBM modernization. As Director of the National Security Space Office, General Kehler integrated the activities of a number of DOD and Intelligence Community organizations on behalf of the Undersecretary of the Air Force and Director, National Reconnaissance Office.

He entered the Air Force in 1975 as a Distinguished Graduate of the Pennsylvania State University R.O.T.C. program, has master's degrees from the University of Oklahoma in Public Administration and the Naval War College in National Security and Strategic Studies, and completed executive level programs at Carnegie-Mellon University, Syracuse University, and Harvard University.

General Kehler's military awards include the Defense Distinguished and Superior Service Medals, the Distinguished Service Medal (2 awards), Legion of Merit (3 awards), and the French Legion of Honor (Officer). He wears Command Space and ICBM Operations Badges.

Upon retirement, he returned to Washington, DC, where he offers consulting services from his home office. A Senior Fellow of the National Defense University and an Associate Fellow of the American Institute of Aeronautics and Astronautics, he has spoken widely on matters of national security. He was the S.T. Lee Distinguished Lecturer at Stanford University's Freeman Spogli Institute for International Studies for academic year 2014-2015, and is a Distinguished Alumnus of the Pennsylvania State University.

General Kehler serves on several corporate and advisory boards. He enjoys playing the guitar, golf, and family.

DISCLOSURE FORM FOR WITNESSES
COMMITTEE ON ARMED SERVICES
U.S. HOUSE OF REPRESENTATIVES

INSTRUCTION TO WITNESSES: Rule 11, clause 2(g)(5), of the Rules of the U.S. House of Representatives for the 114th Congress requires nongovernmental witnesses appearing before House committees to include in their written statements a curriculum vitae and a disclosure of the amount and source of any federal contracts or grants (including subcontracts and subgrants), or contracts or payments originating with a foreign government, received during the current and two previous calendar years either by the witness or by an entity represented by the witness and related to the subject matter of the hearing. This form is intended to assist witnesses appearing before the House Committee on Armed Services in complying with the House rule. Please note that a copy of these statements, with appropriate redactions to protect the witness's personal privacy (including home address and phone number) will be made publicly available in electronic form not later than one day after the witness's appearance before the committee. Witnesses may list additional grants, contracts, or payments on additional sheets, if necessary.

Witness name: Gen C. Robert Kehler, USAF (ret)

Capacity in which appearing: (check one)

(•) Individual

( ) Representative

If appearing in a representative capacity, name of the company, association or other entity being represented: _____

Federal Contract or Grant Information: If you or the entity you represent before the Committee on Armed Services has contracts (including subcontracts) or grants (including subgrants) with the federal government, please provide the following information:

2015

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
SP4705-15-A-0005	DLA - National Defense University	$10001.00	Senior Fellow

2014

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
SP4705-14-M-0049	DLA - National Defense University	$4000.00	Senior Fellow

2013

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant

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2014

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract or payment

2013

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract or payment

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STATEMENT OF
THOMAS K. SCHEBER
BEFORE THE SUBCOMMITTEE ON STRATEGIC FORCES
OF THE HOUSE ARMED SERVICES COMMITTEE
DECEMBER 8, 2015

Introduction

Chairman Rogers, Ranking Member Cooper, and distinguished members of the House Subcommittee on Strategic Forces, thank you for the opportunity to testify on the important topic of Prompt Global Strike (PGS).

My views on PGS were formed initially during the development of the 2001 Nuclear Posture Review (NPR). During the 2001 - 2006 timeframe I served in OSD Policy. In particular, I was the Director for Strike Policy and Integration and was responsible for the implementation plan for the 2001 NPR. It was this transformational policy-related study by the Department of Defense (DoD) which provided the rationale for and led to the specific development effort which has become known as Conventional Prompt Global Strike (CPGS) or PGS. Since leaving government in late 2006, I have continued to follow PGS issues closely.

2001 Nuclear Posture Review and PGS

As many of the committee members are aware, the 2001 NPR addressed the emerging global security environment in the twenty-first century, the defense policy goals served by strategic forces, and the kinds of strategic capabilities needed to support those goals. I will be brief in summarizing those findings as they related to the topic of this hearing—PGS.

Security Environment. First, the global security environment in 2001 was characterized at the time as highly complex and uncertain, especially when compared to the decades during the Cold War. Significant threats were posed by uncertainty over the future relationship with Russia, an emerging China, regional states with weapons of mass destruction (WMD), and non-state actors, including al-Qaeda which had stated the intent to obtain WMD to be used on populated areas in the United States and its allies. The threat was dynamic and could change rapidly. The security environment of 2015 is even more complex and challenging.

Defense Policy Goals. Long-standing national security goals remained important. These goals included deterring adversaries from specific actions, assuring U.S. allies and friends, discouraging potential adversaries from military competition, and, should deterrence efforts fail, limiting damage and defeating an adversary. Given the complex security environment and pace of technological change, nuclear forces remained important to serve national goals, however, additional strategic capabilities could also contribute toward these goals. This led to an organizing concept which was referred to as the "New Triad."

New Triad. The concept of a New Triad included the integrated strategic capabilities of offenses (both nuclear and non-nuclear), defenses (active and passive), and a responsive infrastructure, all dependent on the support of a network of command, control, communications, and intelligence capabilities. Of specific interest to this hearing, was the focus on developing and deploying advanced non-nuclear strike capabilities as a supplement to, not a replacement for, nuclear strike capabilities. The combination of offensive capabilities—nuclear, conventional, and non-kinetic—could strengthen overall strategic capabilities for deterrence, assurance, dissuasion, and defense.

The concept of a New Triad was unique primarily because it provided an organizational framework for how these capabilities could be integrated to serve national goals. The PGS concept was one such capability that resulted from this transformation of thinking regarding U.S. strategic capabilities.

Initial PGS Proposal. The initial concept for a PGS capability emerged from the assessed need to fill a capability gap in U.S. strike capabilities. The number of U.S. bases across the globe had declined during the 1990s following the end of the Cold War and the breakup of the Soviet Union. With potentially severe threats emerging in many different regions and limited bases for the forward deployment of U.S. forces, the concept of being able to strike almost anywhere in the world in a relatively short amount of time was viewed as an extremely valuable option for a U.S. president. The problem at the time (and remains so today) was that the only prompt, long-range, kinetic strike capability on which a president could call was a nuclear-armed ballistic missile. As a result, the concept of a conventionally-armed, prompt, global (or near-global) capability was initiated. As documented in various government reports, in 2006 the Joint Chiefs of Staff validated the Prompt Global Strike (PGS) Initial Capabilities Document (ICD). This requirements document was reviewed again in 2013 and revalidated.

PGS and Defense Policy Goals. The potential scenarios requiring "use" of such a weapon often becomes a focus of inquiry. A PGS capability could help serve U.S. defense policy goals in a variety of ways, including the following:

- *Deterring adversaries*. Advance conventional strike capabilities, including PGS, could pose a more credible offensive threat to some adversaries in specific scenarios—specifically, scenarios in which the stakes are not sufficiently high, or too uncertain, to

warrant a nuclear strike by the United States. In addition, in some circumstances a PGS capability would further complicate planning for adversaries. Thus, a PGS capability and uncertainty over how the U.S. might respond to an immediate threat would enhance U.S. deterrence capabilities.

- *Assuring allies.* Similarly, some allies in high threat regions have expressed concerns about U.S. nuclear reductions while adversaries are modernizing their nuclear and other WMD capabilities and perceived threats to them are increasing. U.S. technical developments such as PGS could help assure allies that the United States is a reliable, capable, and technologically proficient partner and is responding effectively to the rapidly developing and uncertain security environment. Some countries may be reassured by the knowledge that the United States has a prompt, non-nuclear strike capability, should a need arise. Developing a PGS capability could help assure allies that the United States has both the resolve and capability to meet its commitments to the security of its allies. And finally, PGS would demonstrate American preeminence in military technology and would help bolster U.S. leadership of alliances and coalitions.

- *Discouraging strategic force competition.* Developing and deploying a global or near-global precision strike capability would demonstrate to potential adversaries the technical prowess of the United States and the resolve to apply cutting edge technologies to serve defense related needs. Some potential adversaries could be dissuaded from competing militarily with the United States because of the tangible display of U.S. technical superiority and the cost and challenge of competing militarily with the United States.

- *Defending the United States and its allies in cases in which deterrence fails.* Should a serious situation emerge which the president judges to be extremely serious, a PGS capability would provide one additional option—a unique strategic capability—for the president's consideration. One or more PGS weapons could be employed to degrade, disrupt, or destroy adversary capabilities which need to be neutralized promptly and for which other options would not have been timely and effective. Such an option might need to be employed to limit damage to the United States or an ally. Those who argue against developing PGS, would foreclose such an option from those available to a future president.

This thinking regarding the potential value of a PGS capability, outlined above, was developed during the 2001 timeframe. The rationale appears to be relevant today, perhaps even more so.

Initial DoD Plans for PGS

In implementing the concept for transforming U.S. strategic capabilities, cost, time, and preserving force structure were important considerations. Therefore, the potential to retain and

modernize an appropriately-sized nuclear force and to adapt nuclear forces considered excess at that time to other needed capabilities was a prime consideration. This approach involved "adaptability"—where feasible—to modify existing forces in order to develop a broader range of strategic capabilities for the emerging security environment. This approach to adapting existing forces can be illustrated by two of the initiatives for advanced conventional strike: 1) the conversion of four ballistic missile submarines to conventionally-armed, cruise missile submarines (SSGNs); and 2) the proposal to develop a near-term PGS option. U.S. Strategic Command was responsible for conducting a study of potential PGS concepts and recommended the Conventional Trident Modification (CTM) concept as the initial option to be pursued. The proposed CTM program would adapt a limited number of Trident II D5 submarine-launched ballistic missiles (SLBMs) to carry non-nuclear, near-precision payloads. As many on the Strategic Forces Subcommittee are aware, the initial DoD proposal for PGS involved a three-year development phase leading to a decision in 2008 on whether to proceed with further development and deployment of a conventional Trident variant. Reports from the Congressional Research Service (CRS) have chronicled the history of legislation regarding this and other PGS-related initiatives.

Potential Benefits and Limitations of PGS

U.S. defense officials from both political parties have envisioned PGS as a "niche" strike capability which would be procured in limited quantities—at most, tens of missiles. Such a capability could be of great value to disrupt an ongoing action in distant parts of the world. The damage inflicted by a PGS weapon may not be catastrophic against all types of enemy targets, but it could be sufficient to cripple an adversary threat or enabling capabilities until heavier and more sustained strike capabilities and defenses could be moved into place.

Several potential concerns regarding PGS have been well documented. The weapons would be costly, the damage inflicted by PGS payloads would be limited by weight and volume constraints for ballistic missile payloads, and concern exists over the potential for Russia, or in the future some other country, to mistake a PGS launch for a nuclear attack. Even with these limitations, assessments such as the 2008 study by the National Research Council, concluded that PGS could be of great value and the identified drawbacks are manageable. The potential for timely employment of such a weapon would, of course, be dependent on timely, accurate intelligence. Such intelligence could not be guaranteed, but this is a competency in which the United States excels and adversaries lag far behind.

PGS-Like Developments by Other Countries

As advanced technologies become available to an increasing number of countries, these countries will likely look for innovative ways to compete, including militarily. Open source reports from several countries—including China, Russia, Pakistan, and India—indicate keen

interest in conventional, prompt strike weapons. Below are a few examples from my research on open source reporting on such developments in other countries.

China. China's leaders appear to have found multiple applications for conventional prompt strike weapons in its military strategy in the western Pacific. According to Chinese sources, Xi Jinping, China's President, Chairman of the Central Military Commission, and General Secretary of the Chinese Communist Party, has ordered the People's Liberation Army (PLA) to build a powerful and technologically advanced missile force. These "conventional missiles for strategic use" are reportedly to intimidate Taiwan, for use in wars in the western Pacific, and to support China's anti-access/access-denial strategy against the U.S. military. According to one China analyst, the PLA's conventional prompt ballistic missile inventory includes about 1,200 short-range missiles (DF-11/CSS-7 and DF-15/CSS-6), medium-range missiles such as the DF-21/CSS-5 family which includes an anti-ship version and the DF-16/CSS-11 which can target Okinawa, and development of an intermediate-range missile, the DF-26, to be able to target U.S. capabilities as distant as Guam. In fact, one Chinese Communist Party newspaper has reportedly referred to the DF-26 as the "Guam killer." These missiles do not need to be of global reach to support China's strategy of dominating the western Pacific.

In addition, in November 2015, China reportedly conducted its sixth flight test of a hypersonic glide vehicle (HGV), designed to be launched from an ICBM missile booster. The vehicle, dubbed DF-ZF in press reports, is described as capable of maneuvering to avoid defenses and gliding to its target at speeds up to ten times the speed of sound (i.e., hypersonic). Unclassified reports speculate that the DF-ZF could carry either a nuclear warhead or perform non-nuclear strike missions.

Russia. Numerous reports on Russian strategic force developments cite the potential value of deploying conventional warheads on ballistic missiles. For example, press reports from Russia state that Russia is capable of outfitting its newer submarine-launched ballistic missiles with either low-yield nuclear warheads or conventional warheads with precision delivery. In December 2012, the Commander of Russia's Strategic Missile Forces, Colonel-General Sergei Karakayev said that Russia was also considering developing a conventional payload for its new powerful, liquid-fueled ICBM. Subsequently, Russian President Vladimir Putin spoke publically about the value of "high-precision weapons" for deterrence. In November 2014 a Russian defense industry executive announced that Russia would have an air-launched hypersonic missile by 2020.

Pakistan and India. Both Pakistan and India have reportedly deployed and are continuing to develop conventionally-armed, prompt missiles for use in a local conflict. In early 2012 Pakistan test fired a short-range ballistic missile that was characterized by a Pakistani military spokesman as having "high maneuverability, pinpoint accuracy." The Hatf-II missile, also called Abdali, is reported to have a range of 180 kilometers and is capable of carrying either a conventional or nuclear warhead. India also has conventionally-armed ballistic missiles. In

addition, India's Defense Research and Development Organization has teamed with a Russian weapons development organization to develop a hypersonic cruise missile. The missile referred to as BrahMos, is reported to have a range of about 290 kilometers.

Potential for Misinterpretation

The potential for misinterpretation—another country observing the launch or flight of one or more PGS weapons, misinterpreting this as a nuclear attack, and responding by launching its own nuclear strike—has often been cited as a reason for proceeding cautiously in developing a U.S. PGS capability. This concern is certainly worthy of serious consideration and DoD reports to Congress have addressed measures which would be undertaken to lessen the potential for any such misunderstanding. In 2007, the National Research Council (NRC) of the National Academy of Sciences was directed by the Congress to study this and other PGS issues. The NRC gave the "nuclear ambiguity" (i.e., misunderstanding) issue special scrutiny. In their 2008 final report, the NRC stated the following as one of its major conclusions regarding the Conventional Trident Modification program and the potential for misunderstanding/nuclear ambiguity:

> Nuclear ambiguity is an understandable concern regarding CTM and, to varying degrees, all other CPGS systems. Nuclear ambiguity cannot be eliminated simply by avoiding a "legacy" nuclear system, such as Trident. The risk of a CPGS attack being misinterpreted and leading to a nuclear attack on the United States could be mitigated and managed through readily available mechanisms. The benefits of possessing a limited CPGS capability, such as that provided by CTM, outweigh the risks associated with nuclear ambiguity.

Proposed efforts to mitigate this concern include cooperative measures with Russia to keep them informed about U.S. plans and the characteristics of a planned PGS system, observable differences between types of weapons/missiles, and hot-lines and emergency notification systems to be used whenever needed. Since the NRC report was published in 2008, Moscow has made significant progress in rebuilding and modernizing Russian air and missile defense and space surveillance systems that were left in disarray after the breakup of the Soviet Union. According to a June 2015 report in the Moscow Times, the modernized Russian early warning system of launch detection satellites and ground based radars is expected to be completed and operational in 2018.

According to Russian reports and press accounts, Russian leaders already have a number of modern detection and tracking systems at their disposal to help them in discerning operational characteristics of one or more PGS weapons in flight. For example, General-Lieutenant Sergey Lobov, then-Deputy Commander of the Space Troops, told journalists on February 15, 2011, that Russia's missile attack warning system was able to detect ballistic missile launches from missile bases in a number of countries, including the United States, China, and Iran. According to Lobov, when an intercontinental ballistic missile enters the ground-based early warning radar's

field of view, the radar the calculates its impact point and the time the strike will arrive. This information is sent to the Main Missile Attack Warning System Command Post in a matter of seconds, where it is processed, and the degree of threat is determined. Lobov also said that the system tracks more than 4,500 space objects on a daily basis and transmits from 40,000 to 55,000 measurements on them to the Outer Space Monitoring Center.

Summary

For the United States, the rationale for PGS remains as valid today as when first proposed. The United States has numerous strategic commitments in distant parts of the world and there is no guarantee that general purpose forces could be effectively brought to bear in time should an urgent situation arise.

For the United States, developing a PGS capability has been a goal of both the Obama and Bush administrations, and both administrations have shared similar views on the potential value of a PGS capability. Such a capability could strengthen U.S. efforts to support a number of national security goals, such as those outlined earlier. Senior officials in each administration have differed, however, over the details of the particular weapon concepts to be developed and shifting opinions in Congress have, at times, slowed or stalled progress. As a result, efforts toward realizing such a capability have languished. Currently, over a dozen years since the initial PGS concept was proposed, there is apparently no consensus on a preferred PGS concept to be developed and no planned deployment date.

I urge this subcommittee to work closely with DoD on efforts to develop a near-term PGS capability as soon as feasible.

Thomas K. Scheber
220 E. Palmer Drive
New Bern, North Carolina 28560
(252) 652-6644 (H) (703) 293-9181 (W)

SUMMARY

Extensive background in national security affairs. Specialties in strategic force policy and planning, arms control, and analysis of complex issues. History of accomplishments in management and senior staff positions in DoD and at DOE National Laboratory. Former naval aviator with test pilot and combat experience.

RELEVANT EXPERIENCE

October 2006 to Present	**National Institute for Public Policy, Fairfax, Virginia.** Vice President and Senior Scholar. Managed portfolio of studies related to deterrence of specific adversaries and conducted analyses of options for strategic force posture. Represented the National Institute in dealings with U.S. government, other business entities, and foreign governments.
May 2003 to September 2006	**Office of the Secretary of Defense (Policy),** Washington, D.C. Senior Director for Strike Policy and Integration. Responsible for implementation of DoD Nuclear Posture Review and development of New Triad of strategic capabilities. Responsible for policy development and oversight of all nuclear and strategic strike policy development.
September 2000 to April 2003	**Office of the Secretary of Defense (Policy),** Washington, D.C. Special Assistant to the Deputy Assistant Secretary for Forces Policy. Organized and integrated DoD and DOE policy and program requirements into 2001 Report to Congress on the Nuclear Posture Review. Authored DoD plan to implement the Nuclear Posture Review. Official member of U.S.—Russia Working Group on Offensive Weapon Transparency during development of the 2002 Strategic Offensive Reductions Treaty and during treaty implementation.
July 1998 to August 2000	**Los Alamos National Laboratory**, Los Alamos, New Mexico. Staff Director for the **Military Applications Group.** This group of senior Lab weapon designers, engineers and analysts performed high-level, short-fused assessments for senior laboratory leaders. Products included a comparison of strategies for nuclear forces in the twenty-first century which received wide exposure among senior government officials.

August 1994 to July 1998	**Los Alamos National Laboratory**, Los Alamos, New Mexico. **Project Leader for Weapon Studies**. Restructured the core modeling and analysis capabilities to align the project team with post-Cold War requirements. Transformed obscure analysis team into nationally-recognized asset. Directed studies of complex national security issues over broad range of topics including advanced weapon concepts, computer simulations of weapon effects, applications of advanced technologies and information operations.
July 1989 to August 1994	**Los Alamos National Laboratory**, Los Alamos, New Mexico. Planning staff for the Associate Director for Nuclear Weapons Technology. Conducted resource allocation and planning for Lab budget of approximately $500M per year. Developed testimony, position papers and briefings for external audiences. Represented the Laboratory at defense policy fora including the Navy Future Deterrence Study, Navy Strategic Technologies Study, and the Defense Policy Board review of nuclear capabilities.
February 1987 to June 1989	**Office of Secretary of Defense**, Program Analysis & Evaluation (PA&E), Washington, D.C. Responsible for model development and studies to determine the cost-effectiveness of strategic weapon programs. Developed a methodology for comparative cost analysis of future DoD strategic programs. Provided strategic force cost analyses for use by the Secretary of Defense, Senate Armed Services Committee, and U.S. START delegation. Developed an effectiveness assessment of Moscow Anti-Ballistic Missile system from Soviet perspective.
June 1985 to January 1987	**Commander-in-Chief**, U.S. Pacific Fleet. As Nuclear Planning Officer during the introduction of the Tomahawk missile on Navy ships and submarines, initiated a comprehensive review board to integrate the nuclear and conventional targeting requirements of the Tomahawk missile into strike packages for the U.S. Pacific Command. Served as the first chairman of that targeting board.
September 1981 to June 1985	**Chief of Naval Operations**, Nuclear Policy and Requirements staff. Conducted analysis and developed nuclear policy options for senior Navy leadership. - Organized and led a study team to determine the most cost-effective warhead for the Trident II missile. Briefed senior leadership on rationale for new warhead and $1.5 Billion savings over baseline design. Navy implemented the recommended new development program. - Researched and directed the first comprehensive assessment of Navy theater nuclear warfare capabilities. Navy implemented the recommended $500 Million per year program.
June 1974 to August 1981	**Department head and pilot** for Naval Aviation squadrons. Responsible for ground and flight training of pilots, including effective use of nuclear and conventional weapons and compliance with proficiency standards. Ordnance test pilot and project manager for Operational Test programs including Laser-Guided Bomb and Angle-Rate Bombing System. Total of 2500 jet flight hours and 82 combat missions as pilot in command.

PUBLICATIONS

"Transparency and Verification Issues for Nuclear Warhead Arms Control under a START III Treaty," Maaranen, Scheber, etal., Los Alamos National Laboratory report, September 1997.

"Drivers of, and Limits to, Change in a Test-constrained Nuclear Stockpile," Los Alamos National Laboratory annotated briefing, March 1999.

"Warhead Design Options for Reduced Collateral Damage," McFee and Scheber, Proceedings of the Nuclear Explosives Design Physics Conference, Los Alamos, New Mexico, October 1999.

"U.S. Policy for Nuclear Warhead Design and Production," Los Alamos National Laboratory Report LA-CP-00-280, August, 2000.

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"Multipolar Nuclear Stability," Los Alamos National Laboratory Report LA-UR-00-4025, August 2000.

"Reliable Replacement Warheads: Perspectives and Issues (Fairfax, VA: National Institute Press, August 2007).

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"Evolutionary Psychology, Cognitive Function, and Deterrence, *Comparative Strategy*, November-December 2011.

"Deterrence and Al-Qa'ida," *Comparative Strategy*, November 2012, with Keith Payne and Kurt Guthe.

Conventional Prompt Global Strike: A Fresh Perspective (Fairfax, VA: National Institute Press, 2012), Dr. Keith Payne, Study Director, et al.

Minimum Deterrence: Examining the Evidence (Fairfax, VA: National Institute Press, 2013), Dr. Keith Payne, Study Director, et al.

Nuclear Force Adaptability for Deterrence and Assurance: A Prudent Alternative to Minimum Deterrence (Fairfax, VA: National Institute Press, 2014), Dr. Keith Payne, Study Director, et al.

"Time to Deploy Conventional Prompt Global Strike," *Defense Dossier*, February 2015.

Project Atom: A Competitive Strategies Approach to Defining U.S. Nuclear Strategy and Posture for 2025-2050, Report published by the Center for Strategic and International Studies, May 2015, Clark Murdock et al.

Assessment of U.S. Readiness to Design, Develop and Produce Nuclear Warheads: Current Status and Some Remedial Steps (Fairfax, VA: National Institute Press, 2015), with John Harvey, foreword by John S. Foster.

EDUCATION

B.S., Mathematics	U.S. Naval Academy
M.S., Operations Research	U.S. Naval Postgraduate School (with Distinction)

SECURITY CLEARANCE

• Current Top Secret clearance; SCI and CNWDI access

PROFESSIONAL AFFILIATIONS

- Military Operations Research Society
- American Institute for Aeronautics and Astronautics
- U.S. Naval Institute

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Witness name: Thomas K. Scheber

Capacity in which appearing: (check one)

(•) Individual

( ) Representative

If appearing in a representative capacity, name of the company, association or other entity being represented: _____

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None			

2013

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract or payment
None			

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INTERNATIONAL PEACE

Congressional Testimony

Prompt Global Strike:
American and Foreign Developments

Testimony by **James M. Acton**
Senior Associate and Co-Director
Nuclear Policy Program
Carnegie Endowment for International Peace

Testimony before the House Armed Services
Subcommittee on Strategic Forces

December 8, 2015

Chairman Rogers, Ranking Member Cooper, Members of the Committee,

It is a genuine honor to testify before you today. Thank you for the opportunity. I hope I can be of help to this committee on this issue both today and in the future.

I am a senior associate and co-director of the Nuclear Policy Program at the Carnegie Endowment for International Peace. I hold a Ph.D. in theoretical physics and, for the last four years, have been studying the development of hypersonic conventional weapons in the United States, China, and Russia from both a technical and policy perspective. While I would like to focus my testimony on the U.S. Conventional Prompt Global Strike (CPGS) program, I would be very pleased to answer questions about Chinese and Russian developments too.

Let me emphasize from the start that I am genuinely undecided about whether the United States should acquire CPGS weapons. The capability would unquestionably convey potential benefits, but it would also carry potential risks. Today, in my opinion, the relative magnitudes of those benefits and risks are unclear.

The difficulty of reaching a definitive conclusion about whether to acquire CPGS weapons stems, in part, from technological immaturity; the underlying technology is extremely challenging and further research and development—including flight testing—is required prior to any procurement decision. However, it also stems from what I believe are flaws in the Department of Defense's approach to CPGS development.

Most importantly, the Pentagon has no official policy that sets out the specific military missions for which CPGS weapons might be acquired. Until it does so, there can be no yardstick against which to judge their likely effectiveness. The trade-offs associated with acquiring other weapons for the same purposes also cannot be properly assessed. To compound matters further, the Department of Defense appears to have failed to properly consider the enabling capabilities needed to ensure the effectiveness of CPGS weapons as well as the full range of escalation risks.

Not only do these flaws make it impossible, at this time, to reach a conclusion about the ultimate desirability of CPGS weapons, but they also create a real risk that the United States will develop weapons that

(i) are not optimized, from a military perspective, for the missions for which they might be employed;
(ii) are not the most cost-effective way of prosecuting those missions; and
(iii) exacerbate escalation risks with Russia and China unnecessarily.

A brief history of CPGS development

For more than a decade, the United States has explored various technologies for long-range, high-precision, hypersonic strike, including terminally guided ballistic missiles and hypersonic cruise missiles (the latter being funded separately from the CPGS program). Today, the CPGS program is focused on "boost-glide" weapons. Like a ballistic missile, a boost-glide weapon is launched by a large rocket. However, rather than arcing high above the atmosphere, a hypersonic glider is

launched on a flatter trajectory that either re-enters the atmosphere quickly—or does not leave it at all—before gliding unpowered to its target.

Initial efforts to develop boost-glide weapons focused on a global-range system, known as the Hypersonic Technology Vehicle-2 (HTV-2). Following two unsuccessful flight tests, in 2009 and 2010, work on this system was suspended in favor of the Advanced Hypersonic Weapon (AHW). The AHW is still in the research and development phase; no acquisition decision has yet been taken. If deployed, the AHW could be based on land or at sea (or perhaps both). According to a 2008 report by the U.S. National Academy of Sciences, the AHW could travel a maximum distance of about 5,000 miles. To my knowledge, this is the only unclassified and authoritative statement about the weapon's range and I do not know whether it is still accurate. Nonetheless, it appears that the AHW might perhaps best be described as a *non-global* Conventional Prompt Global Strike weapon.

The AHW has been tested twice. A November 2011 test, over a range of about 2,400 miles, appears to represent the first successful flight by any nation of a hypersonic glider over any distance longer than a few hundred miles. A second test, in August 2014, failed because of a booster problem. The Department of Defense's most recent budget request indicates that two more AHW tests, described as "Navy Flight Experiments," are planned in FY 2017 and FY 2019. In my opinion, any acquisition decision should be preceded by sufficient flight testing to demonstrate the system's reliability at its maximum planned range. Such testing should also demonstrate the weapon's ability to maneuver in flight and strike a target with sufficient accuracy for a non-nuclear warhead to be military effective.

The Department of Defense has not identified the specific military missions for which CPGS weapons might be acquired.

The Department of Defense has no policy identifying the specific missions for which CPGS weapons might be acquired. The program's purpose is often stated to be the development of high-precision conventional weapons capable of reaching targets anywhere on earth within an hour. Not only is this mantra an increasingly poor description of the technology actually being developed—the AHW lacks a global range, as do most of the other concepts that have been considered—but it also does not speak to the specific missions for which CPGS weapons might be employed.

Based on official documents and statements by senior officials, it appears that four missions for CPGS weapons have been or are being considered:

- **Counter-nuclear strikes**: denying a new proliferator—generally identified as North Korea or, perhaps in the future, a nuclear-armed Iran—the ability to employ its nuclear arsenal. (There is very little evidence of official U.S. interest in acquiring CPGS capabilities for counter-nuclear strikes against Russia or China.)
- **Countering anti-satellite capabilities**: destroying or disabling an adversary's anti-satellite capabilities, particularly China's.
- **Defense suppression**: countering China's and other states' anti-access/area-denial capabilities that threaten U.S. freedom of movement into and within combat zones.
- **Counterterrorism**: killing high-value terrorists and disrupting terrorist operations.

Each of these missions imposes quite different weapon requirements—a point that tends to be lost in abstract discussions of striking targets anywhere on the globe within an hour. These requirements differ according to a number of factors:

- The need (or otherwise) for **promptness**—a short time between the decision to use a weapon and its reaching the target
- The need (or otherwise) for **tactical surprise**—ensuring that an adversary has too little warning of an incoming strike to take effective countermeasures
- The required **range** of the weapon
- The type and effectiveness of **defenses** that are present
- The **target's characteristics**, including whether it is mobile or buried

To attack Chinese anti-satellite capabilities preemptively, for example, CPGS weapons would have to be able to penetrate robust defenses and could need ranges of at least a few thousand kilometers and potentially much more, depending on their basing mode. Tactical surprise would be critical to mission success. Promptness, however, would probably not be essential because the conflict would almost certainly have been preceded by a prolonged crisis lasting days if not weeks, making it essentially irrelevant whether weapons took one hour or ten hours to reach their targets. By contrast, if North Korea used nuclear weapons and the United States sought to prevent further attacks, promptness could be critical, but the distances involved would generally be shorter and the defenses much weaker than in the case of attacks on China.

The risks and benefits of different CPGS technologies and of non-prompt alternatives can only be evaluated with reference to specific missions.
All of the different potential CPGS technologies and their non-prompt alternatives have strengths and weaknesses; none is the "best" in any absolute sense. The trade-offs between them can only be evaluated in the context of specific scenarios.

To give but one concrete example, the Department of Defense has explored hypersonic weapons with ranges varying from global (in the case of HTV-2) to hundreds of miles (for some hypersonic cruise missiles). Intuitively, longer ranges may appear more desirable, and indeed, they offer a number of genuine advantages including reducing or eliminating the need to deploy forces forward in advance of a conflict. In some circumstances, however, weapons with longer ranges can become more susceptible to adversary countermeasures. There is a growing body of evidence, for example, that China is developing early-warning satellites that could detect a boost-glide weapon shortly after launch. Such satellites could provide about 30 minutes of warning of an attack originating from the continental United States—potentially enough time for Beijing to take countermeasures (it could, for example, use anti-satellite weapons before they were attacked). By contrast, weapons launched from places closer to China would provide it with less warning. To ensure funds are spent efficiently, it is well worth understanding the trade-offs associated with longer ranges—and indeed, with all the other characteristics of CPGS weapons—as early as possible in the research and development process and, certainly, in advance of any acquisition decision.

A scenario-based approach to CPGS development would also permit non-prompt alternatives to CPGS weapons to be properly considered. No non-prompt weapon system offers all of the desirable attributes of CPGS weapons; however, there is also no potential mission for CPGS

weapons that utilizes all of these attributes simultaneously. As a result, it is possible that non-prompt weapons could offer a more cost-effective way than CPGS weapons of prosecuting certain missions. Stealth is the principal competitor to speed in many circumstances. Stealthy weapons may be able to penetrate advanced defenses and evade early-warning systems. For missions requiring promptness, forward basing may be able to compensate for slower weapon speeds and can be a viable approach when strategic warning of a conflict is likely.

To be clear, I do not claim to know which potential CPGS technology is the most promising; nor do I claim to know whether non-prompt weapons offer a more cost-effective alternative to CPGS weapons in any of the scenarios for which CPGS weapons might be acquired. I am, however, concerned by the lack of any evidence that the Department of Defense is evaluating the trade-offs. Indeed, I do not see how it can reasonably do so, unless it adopts a scenario-based approach to CPGS development.

Enabling capabilities are critical to the effectiveness of CPGS weapons, but appear to have been neglected.
Without the right enabling capabilities—command and control; intelligence, surveillance, and reconnaissance; and battle damage assessment—CPGS weapons could prove unusable. So far these support systems appear to have received insufficient attention.

Current deficiencies are clearly illustrated by the difficulty of destroying mobile targets, such as road-mobile missiles. All of the potential missions for CPGS weapons could present this challenge. Locating and tracking mobile targets is very difficult, as the United States learned during the 1991 Gulf War, when it failed to achieve a single confirmed kill of an Iraqi Scud launcher in almost 1,500 sorties.

Today, the most plausible means of detecting and tracking mobile targets would be through manned and unmanned surveillance aircraft operating from within or close to the theater of operations. Using these assets to provide targeting data for CPGS weapons would, however, make little sense. If the battlespace permitted the use of aircraft for surveillance, then it would be more effective and cheaper to outfit those same aircraft with strike weapons and use them for offensive operations than to develop a CPGS capability.

Acquiring CPGS weapons to attack mobile targets would make military sense only if the United States also developed a reliable means of remotely locating and tracking these targets. Plans for such a capability—notably, a globe-spanning network of satellite-based radars—have repeatedly been canceled, and to my knowledge, no program is currently in the works. Given that this capability would probably cost an order of magnitude more than the CPGS weapons themselves, deficiencies in current enabling capabilities merit immediate attention.

Probably more worrying than specific gaps in enabling capabilities are apparent organizational deficiencies within the Department of Defense that may cause this issue to receive insufficient attention. A 2008 report by the Government Accountability Office expressed concern that major Department of Defense studies did not analyze what enabling capabilities would be required but instead simply "assumed that certain needed improvements…would be available when any future [weapon] system is fielded." Remarkably, the GAO reported that, in one of these studies—the

Prompt Global Strike Analysis of Alternatives—enabling capabilities were not considered because, among other reasons, "the study staff lacks the special access clearances required to obtain information on all [Department of Defense] efforts for improving enabling capabilities." If such deficiencies still persist—as I believe they do—they severely threaten the viability of any future CPGS weapon system.

The full range of escalation risks associated with CPGS weapons has not been considered. Debate about the international ramifications of CPGS weapons—indeed, debate about the program as a whole—has been dominated by a single issue since 2006, when President George W. Bush's administration first announced plans to replace the nuclear warheads on some Trident II D5 ballistic missiles with conventional weapons. These plans sparked concern in Congress that a state observing the launch of a CPGS weapon—Russia in particular—might incorrectly identify it as a nuclear weapon and launch a response in kind.

Although plans for the so-called Conventional Trident Modification have been dropped, warhead ambiguity still dominates the discussion about the escalation risks of CPGS weapons. Indeed, the Department of Defense focused the CPGS program on boost-glide weapons largely because it saw them as a way of mitigating warhead ambiguity. It argues that conventional boost-glide weapons can be distinguished by their non-ballistic trajectories from nuclear-armed ballistic missiles. This argument is, however, not entirely persuasive. While the launch of a boost-glide weapon would be detectable by early-warning satellites, it would generally fly at too low an altitude to be monitored by early-warning radars thereafter. As a result, a state observing—or, rather, trying to observe—a boost-glide weapon would not see an object flying in a non-ballistic trajectory; it would see the launch of a weapon that would quickly disappear from view. The extent to which warhead ambiguity would be mitigated by an unobservable characteristic is, to say the least, an open question.

The risk of warhead ambiguity should not be ignored, especially if the United States acquired CPGS weapons to conduct strikes on China or, much less likely, on Russia. However, the focus on warhead ambiguity has been unhelpful by obscuring other risks.

For example, highly maneuverable CPGS weapons with unpredictable trajectories could create a different form of ambiguity—destination ambiguity, which is uncertainty on the part of an observing state about whether it was the target of a CPGS attack. CPGS attacks against North Korea, for example, could potentially lead Russia or China to conclude that they were under attack, risking inadvertent escalation. (The risk would be even greater if the observing state also misidentified the CPGS weapon as nuclear armed.)

Ambiguity could arise about the nature of the intended target as well. For example, China's nuclear-armed missiles and conventional anti-ship ballistic missiles are reported to share a single command-and-control system. Because some components of this system are buried, hypersonic weapons may provide the only non-nuclear means to attack them. There is a real risk, however, that Beijing could interpret such strikes as an attempt to deny China control of its nuclear arsenal even if their actual goal was to protect American aircraft carriers from Chinese conventional weapons. Such target ambiguity, arising from attacks on "entangled" assets, could be highly escalatory.

Crisis instability is also a real risk; an adversary's fears that CPGS weapons could destroy its strategic weapons could lead the adversary to employ those weapons preemptively. "Strategic" does not just mean nuclear. In a conflict with the United States, for instance, Beijing would want to protect its anti-access/area-denial capabilities. It could do so by destroying or disabling the GPS satellites on which CPGS weapons would, in all probability, rely for navigation. Fearing this, the United States would have an incentive to destroy Chinese anti-satellite capabilities with CPGS weapons early in a conflict. This threat would, in turn, give China an incentive to attack the GPS constellation preemptively to disable CPGS weapons. The result could be rapid escalation that both sides might rather avoid.

Mitigating these escalation risks is complex and, as always, trade-offs are involved. Maneuverable boost-glide weapons may, for example, help reduce warhead ambiguity but at the cost of simultaneously exacerbating destination ambiguity. It would be helpful to understand these trade-offs as early as possible in the CPGS development process.

Finally, it is worth observing that escalation is something of a double-edged sword. While CPGS weapons might undermine the prospects for escalation management in a conflict, they might simultaneously enhance deterrence. Specifically, the very possibility of rapid, unpredictable escalation might have the beneficial consequence of raising the perceived costs of war and making a potential adversary less likely to transgress the interests of the United States or its allies.

Conclusion: A course correction for the CPGS program

I will not even try to offer any definitive conclusion about whether the United States ought to acquire CPGS weapons; as I said at the start of my testimony, I am genuinely undecided. However, I do believe that a course correction is required if the program is to live up to its full potential and, perhaps even more importantly, if Congress is to be able to assess the scale of that potential.

To date, the CPGS program has focused too narrowly on technology development; there has been an apparent failure to give proper attention to the role of CPGS weapons—and potential alternatives—in national strategy. To this end, I would like to conclude by offering some suggestions for how the Department of Defense might improve its *process* for developing CPGS weapons.

- The Department of Defense could produce an unclassified policy statement on the specific missions for which CPGS weapons might be acquired.

- The Department of Defense could conduct classified studies into the implications of possible adversary countermeasures over the next two or three decades for CPGS weapons, including a comparison of the effect of such countermeasures on non-prompt alternatives.

- The Department of Defense could conduct a comparative study of CPGS weapons and non-prompt alternatives in terms of their ability to hold mobile targets, and hard and deeply buried targets at risk; their relative unit cost; and their capability to successfully prosecute each of the missions for which the Department is considering acquiring CPGS weapons.

- The Department of Defense could conduct a comprehensive and dedicated examination of gaps in enabling capabilities; and develop plans, with cost estimates, to fill these gaps.

- The Department of Defense could produce an unclassified report on (i) the escalation risks of CPGS weapons, including but not limited to warhead ambiguity; and (ii) possible ways of mitigating them, including cooperative approaches.

Appendix: A summary of Russian and Chinese boost-glide development programs
There is very strong evidence that both China and Russia are engaged in research and development into boost-glide weapons.

It has been widely reported that, since January 2014, China has conducted six tests of a hypersonic boost-glide weapon prototype, reportedly called DF-DZ and dubbed WU-14 by the Department of Defense. At least one senior American official has unequivocally and publicly confirmed the U.S. assessment that the first test did involve a hypersonic glider. Chinese blogs have also published the "keep-out zones" for some of the tests (states sometimes declare such zones in advance of missile test to warn pilots of falling debris). These zones also provide strong and direct evidence of the testing of a glider (with the caveat that I have only been able to find independent confirmation of the accuracy of the zones for just one test).

There is real uncertainty about how advanced China's program to develop a hypersonic glider is and how fast it is progressing. On balance, however, the keep-out zones tend to suggest that China's program is significantly less advanced than the United States'. They imply that Chinese tests have covered ranges of less than about 1,250 miles (by contrast the AHW has successfully flown over a distance of about 2,400 miles). In addition, all but one of China's tests appear to have involved virtually straight flight paths with no cross-range maneuvering. In one test, the glider may have maneuvered towards the end of its flight—although the evidence is difficult to interpret. Moreover, it is also important to note that keep-out zones imply the plan for a test; they do not provide evidence as to whether the test was successful. Photos of the debris from the test on August 7, 2014 that appeared on Chinese social media provide reasonably persuasive evidence that this test failed. To my knowledge, there is no publicly available evidence to indicate whether the other tests were successes or failures.

The National Air and Space Intelligence Center has publicly assessed that China's glider program is associated with the country's nuclear forces. While I have no particular reason to doubt this assessment, the information I have at my disposal does not enable me to draw a conclusion about any intended payload: it may indeed be nuclear, but I would also not rule out the possibilities that it is conventional or that China intends to deploy both nuclear and conventional variants. It is also possible that no decision about payload has yet been taken (especially if Beijing has not actually decided whether to deploy boost-glide weapons).

China is likely to face significant difficulties in developing gliders with very long ranges (i.e. a few thousand kilometers or more). The development of such gliders severely exacerbates the engineering challenges associated with shorter-range systems, such as managing the heat that is generated through atmospheric friction. Given sufficient time and resources, China should be able to overcome this challenge, just as the United States seems to have done, as well as the many other obstacles it would face. However, the development of long-range gliders is unlikely to be quick or painless; it is certainly *not* a case of just putting a glider never tested at long ranges, and perhaps not designed for long-range flight, on top of a more powerful booster.

Russian interest in boost-glide weapons dates back to at least the 1980s, when Moscow became concerned that its existing nuclear-armed re-entry vehicles might not be able to penetrate the highly effective defense systems foreseen by President Ronald Reagan's Strategic Defense

Initiative program (popularly known as "Star Wars"). These efforts were revitalized in the 1990s and then again in the 2000s, apparently for similar purposes. Their current incarnation is reportedly known as Project 4202. The most detailed and credible description of this program comes from Pavel Podvig, a respected observer of Russia's strategic forces. He assesses that Russia has conducted three or four hypersonic glider tests since 2011, of which at least two were failures. The range of Russia's glider is not known (although it appears to be substantially longer than China's).

While Russia has not openly acknowledged Project 4202, a series of senior Russian officials have, since 2012, made statements that indicate an interest in developing boost-glide weapons and have strongly hinted that such efforts are already underway (although none has said so unambiguously). Russia's primary goal is almost certainly still to ensure that it can continue to deliver nuclear warheads through U.S. missile defenses. It may also seek to develop conventional boost-glide weapons. Converting a glider designed to deliver nuclear warheads into one capable of delivering conventional warheads would, however, be a major undertaking since the accuracy requirements for a conventionally armed missile are significantly more demanding.

James Acton is co-director of the Nuclear Policy Program and a senior associate at the Carnegie Endowment for International Peace. A physicist by training, Acton specializes in deterrence, disarmament, nonproliferation, and nuclear energy.

An expert on hypersonic weapons, Acton is the author of the widely-cited *Silver Bullet? Asking the Right Questions About Conventional Prompt Global Strike*. He has published a technical analysis of boost-glide weapons in the peer-reviewed journal *Science & Global Security,* and has testified on Chinese developments in this area to the U.S.-China Economic and Security Review Commission. His commentary on the subject has been carried by *Foreign Policy*, *Defense One* and the Russian-language *Independent Military Review*.

Acton's other publications span the field of nuclear policy. He is the author of two Adelphi books, *Deterrence During Disarmament: Deep Nuclear Reductions and International Security* and *Abolishing Nuclear Weapons* (with George Perkovich). He wrote, with Mark Hibbs, *Why Fukushima Was Preventable*, a groundbreaking study into the accident's root causes. His analysis of proliferation threats, including Iran and North Korea, has been widely disseminated by major journals, newspapers, and websites.

Acton is a member of the Commission on Challenges to Deep Cuts and of the Nuclear Security Working Group. He is a former member of the International Panel on Fissile Materials and was co-chair of the Next Generation Working Group on U.S.-Russian arms control. He has provided evidence to the UN Secretary General's Advisory Board on Disarmament Matters and the Blue Ribbon Commission on America's Nuclear Future.

Acton has published in the *New York Times*, the *International Herald Tribune, Foreign Affairs*, *Foreign Policy*, *Survival*, and the *Washington Quarterly*. He has appeared on CNN's *State of the Union*, NBC *Nightly News*, CBS *Evening News,* and PBS *NewsHour*.

Prior to joining the Carnegie Endowment, Acton was a lecturer in the Department of War Studies at King's College London and was the science and technology researcher at the Verification Research, Training and Information Centre (VERTIC). He holds a Ph.D. in theoretical physics from the University of Cambridge.

DISCLOSURE FORM FOR WITNESSES
COMMITTEE ON ARMED SERVICES
U.S. HOUSE OF REPRESENTATIVES

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Witness name: James Acton

Capacity in which appearing: (check one)

○ Individual

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If appearing in a representative capacity, name of the company, association or other entity being represented: Carnegie Endowment for International Peace

Federal Contract or Grant Information: If you or the entity you represent before the Committee on Armed Services has contracts (including subcontracts) or grants (including subgrants) with the federal government, please provide the following information:

2015

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
S-ISNCT-14-CA-1005	Department of State	$101,803	Promoting Nuclear Security Brazil
Subaward Z9940001	Univ. of Maryland/Dept of Defense	$65,459	SMA for USSC Israel-Palestine Authority
SAQMMA12C0235	Department of State	$110,485	South Asia
N00244-15-1-0004	Naval Postgraduate School	$149,289	Understanding Chinese Nuclear Thinking
N00244-15-1-0024	Naval Postgraduate School	$101,609	Implications of Indian Tactical Nuclear Weapons

2014

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
SAQMMA12C0235	Department of State	$62,348	South Asia
SAQMMA13M1292	Department of State	$8,000	2013 Nuclear Policy Conference - Chinese

2013

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant

Foreign Government Contract or Payment Information: If you or the entity you represent before the Committee on Armed Services has contracts or payments originating from a foreign government, please provide the following information:

2015

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract or payment
PO#302161767 / £19,592	Foreign & Commonwealth Office, United Kingdom	$33,000	Strengthening Deterrence Stability
412.466.22 / €76, 561	Federal Republic of Germany	$80,905	Nuclear Suppliers Group
No contract number / $50,000	United Arab Emirates	$50,000	2015 Nuclear Policy Conference support
No contract number / $25,000	Federal Republic of Germany	$25,000	2015 Nuclear Policy Conference support
DVB/CU-NW-054/15 / $29,840	Netherlands	$29,840	2015 Nuclear Policy Conference support
No contract number / $25,000	Australia	$25,000	2015 Nuclear Policy Conference support
QZA-12/0413 / 1,000,000NOK	Norway	$159,607	Emerging Powers Support

2014

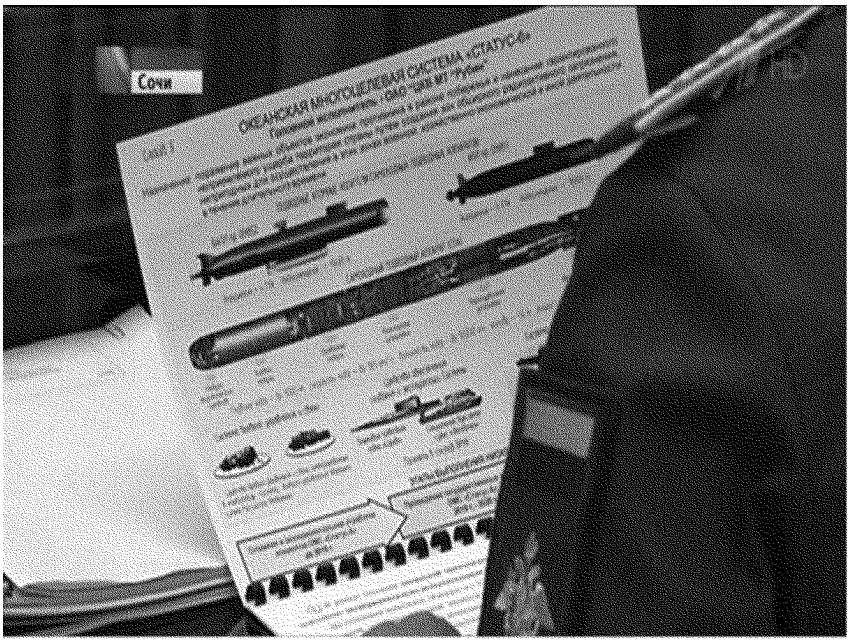
Foreign contract/ payment	Foreign government	Dollar value	Subject of contract or payment
QZA-12/0413 / 1,000,000NOK	Norway	$170,001	Emerging Powers Support
Con No. 82001812 / €5,000	Switzerland	$5,000	Nuclear Policy Memo
No contract number / £11,000	Foreign & Commonwealth Office, United Kingdom	$16,816	Safeguards Engagement in Brazil

2013

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract or payment
QZA-12/0413 / 1,000,000NOK	Norway	$164,837	Emerging Powers Support
$22,181	Netherlands	$22,181	Nuclear Suppliers Group
No contract number / $50,000	United Arab Emirates	$50,000	2013 Nuclear Policy Conference support
No contract number / $50,000	Switzerland	$50,000	2013 Nuclear Policy Conference support
No contract number / $25,000	Federal Republic of Germany	$25,000	2013 Nuclear Policy Conference support

DOCUMENTS SUBMITTED FOR THE RECORD

DECEMBER 8, 2015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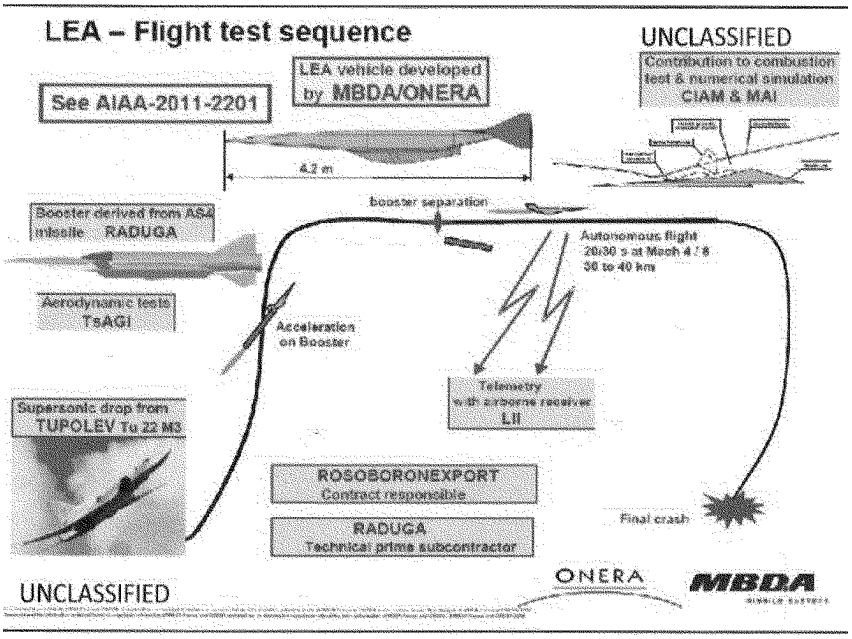
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booster separation
Autonomous flight 20/30 s at Mach 4 / 5 30 to 40 km
Aerodynamic tests TsAGI
Acceleration on Booster
Telemetry with airborne receiver LII
Supersonic drop from TUPOLEV Tu 22 M3
ROSOBORONEXPORT Contract responsible
RADUGA Technical prime subcontractor
Final crash
UNCLASSIFIED
ONERA
MBDA

QUESTIONS SUBMITTED BY MEMBERS POST HEARING

DECEMBER 8, 2015

QUESTIONS SUBMITTED BY MR. ROGERS

Mr. ROGERS. In your opening statement you stated, "we continue to require a deployed conventional prompt strike capability to provide the President a range of flexible military options to address a small number of highest value targets, including in an anti-access and area denial (A2/AD) environment." Do you believe a CPGS system could enhance our power projection capacity in a manner that is unique to and entirely outside the capabilities of other conventional systems

General KEHLER. CPGS is envisioned to be unique from other conventional weapons both in range and time to effect and would definitely enhance U.S. power projection capacity as a precursor to other systems. Existing conventional systems could address the highest value targets in an A2/AD environment if they can respond in an operationally relevant timeframe, have sufficient range, and can penetrate sophisticated defenses. However, existing systems typically lack one or more of these attributes against the type of targets and scenarios envisioned for CPGS.

Mr. ROGERS. Considering the growing risk upon our conventional forces when it comes to projecting power in an A2/AD environment: (1) how might the availability of a CPGS system mitigate or overcome such risks and (2) in your judgment, are there potential force-multiplier benefits from integrating a CPGS capability from a platform based in the continental U.S. (or far from the area in question) with the capabilities of an expeditionary force operating in an A2/AD environment?

General KEHLER. In my view, the A2/AD strategy can be defeated through a combination of strong alliances and coalitions, updated operational concepts, improvements in the resilience of U.S. forces (especially cyber networks and space-based ISR and communications), and enhancements to our power projection capabilities (increased range and penetration capabilities). CPGS could contribute to this by providing commanders with a conventional strike capability that addresses high value targets early in a campaign and from outside the range of enemy kinetic forces. Before a conflict such a capability could contribute to deterrence by eliminating enemy sanctuaries. When used in coordination with other kinetic and non-kinetic strike capabilities early in a conflict, CPGS could help enable and enhance the effectiveness of subsequent U.S. power projection forces.

Mr. ROGERS. Do you believe the U.S. should prioritize the development and acquisition of a specific type of CPGS with specific attributes? If so, which type and with what attributes?

General KEHLER. At this point I would not prioritize a specific type of CPGS with specific attributes. I believe the most effective way to proceed is to develop a variety of potential CPGS approaches and allow performance to determine the way ahead. In my view there is value in continuing research into high-tech means to bring prompt, long-range strike into "third wave" consideration.

Mr. ROGERS. What security challenges do you foresee potentially arising if China successfully fields a CPGS system before the U.S.?

General KEHLER. We cannot allow our qualitative military advantages to decline or disappear. At the strategic level, virtually the entire U.S. defense strategy (to include the reduced role for U.S. nuclear weapons in non-nuclear scenarios) is based on the presumption of continued U.S. conventional superiority. Such superiority is based on a significant qualitative vice quantitative edge. Allowing any country to assume a position of qualitative military superiority over the U.S. would erode the credibility of our strategic deterrent and extended deterrent and threaten our freedom of action in a crisis or conflict. At the operational and tactical levels, a Chinese CPGS could threaten critical targets in the U.S. and allied homelands as well as critical targets associated directly with military operations in the Pacific region.

Mr. ROGERS. In Mr. Acton's opening statement, he raised the concern that, "the Pentagon has no official policy that sets out the specific military missions for which CPGS weapons might be acquired." Is that correct? Regardless, what specific mission or missions would you consider a reasonable justification for the acquisition of a CPGS system?

General KEHLER. As I mentioned in my prepared remarks, CPGS would be valuable in missions against targets that might be presented either by violent extremists or nation-states, that could emerge in day-to-day or conflict scenarios, and would

most likely be highly defended, be found in the most challenging geographic locations, or be mobile (perhaps all three). While it is impossible to predict with 100% certainty what these targets might be, it is likely that they would fall into several general categories: those that pose an immediate threat to the U.S. or allied homelands; those that involve the imminent use or movement of weapons of mass destruction; those associated with key extremist leaders; or those that represent a critical node in an important system that must be eliminated early in a campaign.

Mr. ROGERS. Some have suggested we seek to negotiate arms control to limit hypersonic weapons, including their testing. What do you think of these suggestions as national security policy? Do you foresee challenges in undertaking such a policy and what are they?

General KEHLER. I don't favor placing arbitrary "speed limits" on our military capabilities. We have hypersonic weapons today in the form of ballistic missiles. Hypersonic speed presents both opportunities and challenges for us and our potential adversaries and I fully understand the desire to avoid an "arms race" competition in this type of weapon. However, I would be very concerned about the difficulty of establishing transparency and sustaining high-confidence verification in a treaty-type approach.

Mr. ROGERS. How do you characterize and assess foreign development—primarily Russian and Chinese—of CPGS capability compared to our own?

General KEHLER. I am not current on the classified details of Russian and Chinese activities in this area. While still on active duty I was interested in their progress and concerned about the general inadequacy of U.S. intelligence priorities and resources associated with adversary hypersonic activities (as well as with many other intelligence areas). Again, while still in my active duty capacity I had some concern that Russia and China were seemingly moving faster than the U.S. in this area but had yet to see any material change in military capabilities as a result.

Mr. ROGERS. What does foreign—Russian and Chinese—development of this capability mean to the U.S.? Put another way, does it matter if China and/or Russia have this capability and we do not?

General KEHLER. In my view, having a unique military capability does not automatically translate into a military advantage. I would be very concerned if China or Russia had a hypersonic or CPGS capability that the U.S. was unable to counter. While it isn't necessary in my view for the U.S. to equal China or Russia in individual military capabilities or size, deterrence and crisis stability depend on those countries not achieving an overall military advantage over the U.S.

Mr. ROGERS. You were a military planner. How would you plan for dealing with such a non-nuclear or nuclear capability and would you want to have a defensive capability to deal with it?

General KEHLER. I would first plan to deter it. Deterring conflict remains the preferred approach and is the number one objective of the combatant commands. Deterrence is based on an adversary's belief that the U.S. has both the capability (forces, plans, command and control) and resolve (policy, declaratory statements, visible demonstrations) to deny their objectives or cause unacceptable costs if they try to achieve them. In my view, deterrence will remain credible in the Twenty-first Century if the U.S. tailors its plans and operations to the specific objectives and motivations of individual adversaries and brings a complementary set of offensive (conventional kinetic, non-kinetic, nuclear) and defensive tools to the equation.

Mr. ROGERS. Does it matter if Russia and/or China have this capability with a nuclear warhead as opposed to a conventional warhead?

General KEHLER. I think it does matter. Regarding Russia, nuclear arms are controlled by various treaties that, so long as the parties abide by those treaties, provide a mechanism to address nuclear CPGS matters. We do not have similar arrangements with China; in my view a potential cause for concern if U.S. nuclear arms are further reduced. In effect, all long-range nuclear ballistic missiles are CPGS weapons. Hypersonic nuclear cruise missiles present additional challenges.

Mr. ROGERS. We have been hearing a lot about left-of-launch capability and shooting the archer in addition to the arrows, which is to say, focus on destroying ballistic missile launchers in addition to the ballistic missiles themselves. Does CPGS have a role to play in such a military capability space? Is that role unique, or is it a role that could easily be served by another military capability at less cost?

General KEHLER. I believe CPGS could serve a particularly important role in holding a small number of rogue-state ballistic missile launchers at risk. When combined with missile defenses, such a capability would provide the President with options below the nuclear threshold, even if the enemy ballistic missiles are nuclear-tipped. In my view, CPGS would be ideally suited for this mission since it would meet the following criteria: imminent use of a weapon of mass destruction that posed on immediate threat to the U.S. or allied homelands; located in a challenging

geographic place that is likely to be highly defended; and will move soon. This is not a role easily served by other military capabilities at less cost. Of course, this approach will not work with larger, near-peer or peer nations where the scope and scale of their ballistic threat cannot be held at risk or negated by CPGS and limited defenses.

Mr. ROGERS. What security challenges do you foresee potentially arising if China successfully fields a CPGS system before the U.S.?

Mr. SCHEBER. China is currently developing several versions of precision, prompt strike weapons to support its military strategy which calls for being able to control the western Pacific region out to "the second island chain." If China deploys effective prompt strike weapons and the United States does not, the potential implications for the United States and its allies could be far reaching. Such a capability could strengthen China's anti-access/area denial capabilities and increase the challenge for the United States to defend its allies and protect free access to maritime trade routes in the Pacific. In particular, a Chinese CPGS capability, without an appropriate U.S. response, could weaken the ability of the United States to deter Chinese aggression, to assure U.S. allies in the region, and to limit damage in the event deterrence fails.

Deterrence weakened: Without an effective and appropriate U.S. response, Chinese leaders could be emboldened to continue their "coercive diplomacy" and threaten U.S. allies with non-nuclear strikes from PGS-type systems if they resist China's policies. A U.S. CPGS capability, if available, would provide a capability—a non-nuclear capability—to promptly preempt China's offensive command and control capabilities and could increase the uncertainty of success for China's military leaders. This would likely have the effect of strengthening deterrence.

Assurance weakened: Allies would likely feel threatened by Chinese CPGS capabilities if the United States cannot provide assurances that it can meet its obligations as specified in U.S. mutual defense treaties with western Pacific allies such as Japan, the Republic of Korea, and Australia. China would possess the capability to launch prompt, non-nuclear strikes to degrade U.S. and allied military capabilities in the region, thereby making more difficult for the United States the task of defending U.S. allies and projecting military force in the western Pacific. Effective U.S. counters would include U.S. prompt conventional strike capabilities to degrade Chinese ISR and command and control capabilities. In addition, additional U.S. missile defenses would be needed to intercept any Chinese PGS missiles that are launched and threaten allied assets, on land and at sea. A U.S. CPGS capability would help assure allies that the United States is not falling behind in twenty-first century military technology and that the United States has the competence and capabilities to meet its mutual defense commitments to allies in the face of a hostile China.

If Deterrence fails: Should military conflict erupt between China and the United States and its allies, the United States would be disadvantaged by the asymmetry in which China possessed CPGS-type weapons and the United States did not. China could use these weapons in support of its anti-access/area denial strategy and degrade U.S. military capabilities as far away as Guam, and in the future perhaps farther. U.S. CPGS capabilities, if developed and deployed, could, in combination with cyber and other capabilities, help degrade the Chinese strategy by damaging key elements of its surveillance and command and control capabilities, damaging offensive missile capabilities, and improving the survivability of U.S. and allied military forces being brought to bear on China. This could help to convince its leaders to cease China's aggressive military actions.

Mr. ROGERS. In Mr. Acton's opening statement, he raised the concern that, "the Pentagon has no official policy that sets out the specific military missions for which CPGS weapons might be acquired." Is that correct? Regardless, what specific mission or missions would you consider a reasonable justification for the acquisition of a CPGS system?

Mr. SCHEBER. Skeptics of certain military capabilities sometimes use such assertions to try to refute DOD statements that the military capabilities in question are needed and well conceived. Then, after DOD officials describe a potential scenario in which a capability, such as CPGS, might be of value, the skeptics then try to explain why such a hypothetical situation is unlikely and the proposed capability unnecessary. This type of debating tactic is ill conceived when applied to CPGS.

First, while Dr. Acton often raises valid questions that should be addressed regarding CPGS, he errs in asserting that the DOD has not documented the potential missions for which CPGS would provide a unique and valuable capability. The most recent Congressional Research Service report on Prompt Global Strike summarizes the DOD documents which discuss the rationale for and potential uses of CPGS. For example, the CRS report states, "The need for prompt long-range, or global, strike

capabilities has been addressed in general defense policy studies, such as the 2001, 2006, and 2010 Quadrennial Defense Review (QDR) Reports." [1] In addition, DOD has submitted several reports to the Congress on the need for and programs planned to develop a CPGS capability. And finally, in 2006 the Joint Chiefs of Staff validated the Prompt Global Strike (PGS) Initial Capabilities Document (ICD). This requirements document was reviewed again in 2013 and revalidated. The mission need for CPGS is well documented. Second, secretary of Defense Ashton Carter and other senior DOD officials have recently stressed the important attributes of flexibility and adaptability. This is because war is often accompanied by surprises—surprises in an adversary's technology, tactics, and decisions—and military plans must be rapidly modified. Military history is replete with examples. And, as recently articulated by the congressional testimony of the Director of National Intelligence and the Director of the Defense Intelligence Agency, the global threat assessment is extremely complex, diverse, and the future uncertain. The concept of developing prompt, non-nuclear strike capabilities that are global, or near global, in range is to fill a gap in existing U.S. offensive strike capabilities and, thereby, increase the flexibility of U.S. strategic strike capabilities. U.S. CPGS capabilities could prove of immense value against a variety of serious threats.

Mr. ROGERS. Some have suggested we seek to negotiate arms control to limit hypersonic weapons, including their testing. What do you think of these suggestions as national security policy? Do you foresee challenges in undertaking such a policy and what are they?

Mr. SCHEBER. In my opinion, calls for the United States to negotiate limits on hypersonic weapons, such as current U.S. concepts for CPGS, are ill conceived and should not be pursued.

First, the countries with which the United States would seek to negotiate such an agreement, Russia and China, are unlikely to negotiate in good faith or to abide by signed arms control agreements. China is actively developing several types of prompt strike capabilities that employ hypersonic delivery vehicles. These weapons appear to provide important capabilities for China's anti-access/area denial strategy. In addition, China has never shown an inclination to enter into a negotiation with the United States on limiting strategic capabilities. Indeed, China appears to be working hard to narrow the gap and neutralize several areas of U.S. military superiority. Russia, on the other hand, has been willing to negotiate strategic arms control agreements with the United States but has not proven to be a good-faith partner in complying with such treaties once they are signed. Arms Control Compliance Reports from the Department of State have documented Russia's poor record of compliance. And, nongovernmental organizations have documented the consistent pattern of Russian violations of arms control agreements.[2] Therefore, the prospect a negotiation on such weapons being concluded successfully and with lasting. positive security benefits for the United States and its allies is, in my opinion, extremely remote.

Second, any effort to initiate negotiations limiting the development, testing, and deployment of hypersonic weapons and other prompt strike capabilities is likely to cause U.S. development activities for CPGS capabilities to be slowed further or curtailed entirely. Given the importance of developing U.S. CPGS capabilities to strengthen deterrence and assurance and to provide unique capabilities in the event deterrence fails, the United States should increase, not decrease its efforts to develop CPGS capabilities.

As a matter of policy, I recommend that the United States not seek to initiate an arms limitation negotiation that includes limitations on hypersonic or other nonnuclear prompt strike weapons.

Mr. ROGERS. How do you characterize and assess foreign development—primarily Russian and Chinese—of CPGS capability compared to our own?

Mr. SCHEBER. In a word, I would characterize the United States CPGS development efforts as anemic when compared to similar development programs of China and Russia. After more than a decade of research and a general concept for CPGS capabilities endorsed by both Republican and Democratic administrations, DOD does not yet have a plan for deploying such a capability. In contrast, both China and Russia have claimed to have deployed conventional prompt strike concepts and are continuing to develop improved concepts.

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[1] Amy F. Woolf, Conventional Prompt Global Strike and Long-Range Ballistic Missiles: Background and Issues, CRS Report R–41464, October 2, 2015, p. 3.

[2] For example, Keith Payne, et al., Russian Strategy, Crisis and Conflict (Fairfax, VA: National Institute Press, 2016), pp. 83–102. http://www.nipp.org/wp-content/uploads/2016/01/FINAL-FOR-WEB-1.12.16.pdf

China: China's leaders appear to be pursuing multiple applications for conventional prompt strike weapons for its military strategy in the western Pacific. According to one China analyst, the PLA's conventional prompt ballistic missile inventory includes about 1,200 short-range missiles (DF–11/CSS–7 and DF–15/CSS–6), medium-range missiles such as the DF–21/CSS–5 family which includes an anti-ship version and the DF–16/CSS–11 which can target Okinawa, and development of an intermediate-range missile, the DF–26, to be able to target U.S. capabilities as distant as Guam. In fact, one Chinese Communist Party newspaper has reportedly referred to the DF–26 as the "Guam killer." These missiles do not need to be of global reach to support China's anti-access/area denial strategy in the western Pacific. In addition, in November 2015, China reportedly conducted its sixth flight test of a hypersonic glide vehicle (HGV), designed to be launched from an ICBM missile booster. In general, China appears to have a very active collection of programs to develop and deploy advanced prompt strike weapons—both conventional and nuclear.

Russia: For the twenty-first century, Russian military strategists appear to be increasing reliance on nuclear forces and, in particular, new types of low-yield nuclear weapons, as well as precision conventional weapons, that can be delivered by ballistic or hypersonic glide vehicles. For example, press reports from Russia state that Russia is capable of outfitting its newer submarine-launched ballistic missiles with either low-yield nuclear warheads or conventional warheads with precision delivery. In December 2012, the Commander of Russia's Strategic Missile Forces, Colonel-General Sergei Karakayev said that Russia was also considering developing a conventional payload for its new powerful, liquid-fueled ICBM.[3] Finally, Russian news reports state that Russia has been working with China, France, and India on developing hypersonic missiles. And, a new type of hypersonic delivery vehicle, referred to as the Yu-71 and carried by ICBMs, has reportedly been tested at least four times since late 2011 with mixed results.[4]

In summary, a decade ago the United States appeared to be the clear leader in military technology for CPGS-type capabilities. Based on open source reports on Chinese and Russian development activities, that no longer seems to be the case.

Mr. ROGERS. What does foreign—Russian and Chinese—development of this capability mean to the U.S.? Put another way, does it matter if China and/or Russia have this capability and we do not?

Mr. SCHEBER. In short, Russian and Chinese development of prompt strike capabilities, such as hypersonic glide vehicles, and the absence of such capabilities from the U.S. military force, would have significant negative implications for the United States and its allies.

First, the ability of Russian and Chinese missiles to deliver offensive payloads at hypersonic speeds and delivery vehicles that can rapidly change course would complicate U.S. efforts to defend against such incoming missiles. In fact, senior Russian military officers have said that new Russian missiles were being designed to be able to counter U.S. missile defenses.[5]

Second, modern guidance technology for hypersonic reentry vehicles can significantly improve the delivery accuracy of long-range missiles and makes feasible the potential military employment of low-yield nuclear and even conventional warheads. Such weapons could be launched at U.S. or allied capabilities with little warning or time to respond. If the United States does not have its own CPGS capabilities, this would cede an asymmetric military advantage to Russia and China. Such adversary weapons could be used to degrade U.S. or allied capabilities, support China's area denial plans, intimidate U.S. allies in the region, and accomplish a fait accompli to the ultimate benefit of the country employing such weapons. Adversary leaders could well be willing to gamble that their U.S. counterparts would be unwilling to escalate the conflict by responding with U.S. ballistic missiles which currently carry only high-yield nuclear warheads.

As mentioned in my response to question #5, this asymmetry could disadvantage the United States in ways that would weaken deterrence vis-a-vis Russia and China and also cause allies to question the ability of the United States to meet its security commitments.

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[3] Mikhail Fomitchev, "Russia to Develop Precision Conventional ICBM Option," RIA Novosti, December 14, 2012.

[4] See http://russianforces.org/blog/2015/06/summary_of_the_project_4202_de.shtml. Also, Bill Gertz, "Russia Tested hypersonic Glide Vehicle in February," The Washington Free Beacon, June 25, 2015, http://freebeacon.com/national-security/russia-tested-hypersonic-glide-vehicle-in-february/

[5] "US Missile Shield Unable to Repel Massive Russian ICBM Attack—Chief of Strategic Missile Forces," Russia Today news, December 16, 2015. https://www.rt.com/news/326121-us-missile-shield-russian-icbm/

Mr. ROGERS. Does it matter if Russia and/or China have this capability with a nuclear warhead as opposed to a conventional warhead?

Mr. SCHEBER. Russia and/or China may decide to use hypersonic glide vehicles and long-range missiles to deliver nuclear warheads. Both already have a prompt global strike nuclear capability inherent in their nuclear-armed intercontinental-range ballistic missiles. Development of maneuvering, hypersonic glide vehicles could be motivated to increase the probability of penetrating U.S. missile defenses. In addition, if these newly developed weapons also provide significantly improved accuracy when compared to existing ballistic missiles, these countries may perceive a military advantage to deploying some delivery vehicles with lower-yield nuclear warheads. Deploying more accurate, prompt weapons with low-yield warheads could be used to threaten the United States and its allies with escalation during a conventional conflict. Adversary leaders may even be willing to launch some low-yield nuclear weapons to degrade U.S. capabilities and, with no similar U.S. response capability, gamble that U.S. leaders would be unwilling to escalate a conflict and respond with U.S. missiles armed with high-yield warheads. This would certainly put the United States at a disadvantage. Effective U.S. capabilities to counter such Russian and Chinese threats and negate the effectiveness of these weapons would appear to be a high priority for the United States. Development of a U.S. CPGS capability would contribute significantly toward that goal.

Mr. ROGERS. We have been hearing a lot about left-of-launch capability and shooting the archer in addition to the arrows, which is to say, focus on destroying ballistic missile launchers in addition to the ballistic missiles themselves. Does CPGS have a role to play in such a military capability space? Is that role unique, or is it a role that could easily be served by another military capability at less cost?

Mr. SCHEBER. CPGS capabilities could prove extremely valuable in executing a "left-of-launch" strike against an imminent threat. For example, countries possessing WMD and/or the ability to launch one or more missiles against the United States and/or its allies would likely have key enabling capabilities that would be exposed and vulnerable to a limited non-nuclear strike by the United States. U.S. CPGS capabilities could perform such a mission with little warning for an adversary and with high probability of successful penetration of enemy defenses. If follow-on strikes are needed, CPGS weapons in combination with cyber and other capabilities might be employed to degrade enemy defenses and enable heavier and more sustained follow-on strikes with a decreased risk of loss to enemy defenses. For such a tactic, CPGS weapons could be targeted against ground-based downlink nodes that distribute information to and from space-based assets. This would likely be coordinated with cyber and space defense capabilities.

It is my opinion that by raising the uncertainty in the minds of adversary leaders over whether or not they might be able to successfully execute a surprise attack, the probability of deterring these leaders from attempting such a strike would be improved.

QUESTIONS SUBMITTED BY MR. COOPER

Mr. COOPER. The three hearing witnesses agreed that pursuing cooperative measures (or confidence building measures) would be helpful to reduce the risk of misperception or miscalculation. Specifically what kind of measures would be helpful, and should these be considered as the CPGS technologies are developed?

General KEHLER. I believe any steps (diplomatic or military-to-military) we can take with adversaries or potential adversaries that allow us to better understand intentions, motivations, capabilities and decision-making processes will help build confidence. Regarding CPGS specifically, I believe it is important to build confidence around capabilities, numbers, and the attributes that would clearly separate these weapons from nuclear weapons.

Mr. COOPER. The three hearing witnesses agreed that pursuing cooperative measures (or confidence building measures) would be helpful to reduce the risk of misperception or miscalculation. Specifically what kind of measures would be helpful, and should these be considered as the CPGS technologies are developed?

Dr. ACTON. The first-order task is for the United States to engage Russia and China in dialogues with the goal of reaching a shared understanding about which escalation risks need to be addressed. At the moment, these three states have quite different perceptions. For example, U.S. officials and analysts tend to worry about the possibility of Russia's or China's misidentifying a conventionally armed missile as nuclear armed (warhead ambiguity). By contrast, their Russian and Chinese counterparts have tended to stress concerns about the survivability of their nuclear

forces. Realistically, such a dialogue is likely to be both difficult to start and difficult to conclude, but it is a necessary pre-requisite to confidence building.

The following are examples of confidence-building measures that could help to address concerns about warhead ambiguity:

- The United States could notify Russia and China of the launch of a CPGS weapon. (If such notifications also included the approximate location of the target, they could help reduce the likelihood of Moscow's or Beijing's reaching a mistaken conclusion that they were under attack from highly maneuverable CPGS weapons).
- The United States could permit inspections of CPGS weapons (almost certainly by Russia) to verify that their warheads were nonnuclear. Naturally, such measures could be reciprocal either in the sense that Russia and/or China agreed to provide similar notifications or permit similar inspections, or in the sense that Russia and/or China took asymmetric steps to ease U.S. concerns about their strategic modernization programs.

To address concerns about the survivability of Russian and Chinese nuclear forces, confidence-building measures such as the following could be useful:

- Joint studies (possibly conducted by national academies of science) into the extent to which high-precision conventional weapons can undermine the survivability of nuclear forces.
- Data exchanges about plans for acquiring specified types of long-range, hypersonic, conventional weapons.
- The accountability of specified types of long-range, hypersonic, conventional weapons under the central limits of future nuclear arms control treaties.

It is extremely important that the possibility of cooperative confidence-building be considered at the same time that CPGS technologies are developed. If they are not, certain confidence-building measures may be foreclosed, or at least made much more difficult. For example, Congress has previously expressed understandable concern about basing CPGS weapons on SSBNs because it would lead to the colocation of nuclear and conventional weapons. However, since SSBNs are already subject to arms control inspections, it would be straightforward to permit inspections to verify that any CPGS weapons they carried were indeed nonnuclear. By contrast, such inspections would be much more difficult to orchestrate if CPGS weapons were based on SSNs, which are not subject to any arms control verification regime.