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Statement to the Senate Foreign Relations Committee  
On the Authority to Order the Use of Nuclear Weapons  
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Chairman Corker, Ranking Member Cardin, and distinguished members of the Committee.

Thank you for the opportunity to discuss one of the most consequential issues this Committee could ever consider: the authorities and processes by which the United States might use its nuclear arsenal. For the sake of convenience, I will refer to this broad topic as “nuclear command and control.”

Civilian and military leaders have wrestled with nuclear command and control for over 70 years -- and it has been one of the issues I have focused on in 30-some years of studying the theory and practice of American civil-military relations.

My bottom line is simple: in the past Congress has played a vital role in pushing the Executive Branch to strengthen the nuclear command and control system and the time may be ripe for another close look. In the course of reviewing previous choices made, scrutinizing established procedures, and looking at old problems with fresh eyes, we may well identify areas for improvement.

However, we must proceed with some caution. The topic is highly classified and thus hard to discuss in open session. It is also highly complex, with *de facto* operations hinging on crucial details that are hard for outsiders to assess with confidence.

Above all, there are some fundamental dilemmas at the heart of nuclear command and control that mean there are no simple solutions. Context matters and every fix may have unintended second or third order effects that may only be understood after the system has been thoroughly exercised.

I will make four brief points in my opening remarks and then look forward to answering your questions as best I can.

First, at the heart of the nuclear command and control system is what might be called the *always/never dilemma*. For nuclear deterrence to work, we must have a high assurance that the country will *always* be able to present a credible nuclear strike capability to our adversaries, even in the most-dire scenarios. Otherwise, if others believe that some sort of massive or cleverly designed first strike could render our nuclear arsenal unusable, adversaries will have a powerful incentive to strike us first and early in any unfolding crisis.

A significant portion of the nuclear command and control system is thus dedicated to ensuring that the President would have a viable nuclear option, even under very demanding time constraints, or even after the United States has suffered a devastating attack. We spend enormous sums of money making communications systems as robust as they can be and training all echelons of command to be ready to present the national command authority with executable

options under any conditions. Design features that increase the risk of failure – that would cause the system to fail impotent, rather than merely fail safe -- could undermine deterrence.

However, because even a single nuclear detonation would be so consequential and might trigger an escalatory spiral that would lead to civilization-threatening outcomes, we must also have a high assurance that there would *never* be an accidental or unauthorized use of nuclear weapons.

A significant portion of the nuclear command and control system is devoted to safety and security measures designed to minimize these risks. U.S. nuclear weapons are equipped with environmental sensing devices that inhibit nuclear detonation unless the weapon experiences the exact sequence of physical effects – spin, gravity, change in altitude, etc. – that would be associated with an intended use, thus ensuring that the warhead will not detonate simply because it is dropped or bumped. Launch control processes involve complex authentication measures designed to validate that an order is authentically emanating from the national command authority and not some rogue element. During the later period of the Cold War, weapons that were deployed in remote settings close to potential battlefields had protective devices known as Permissive Action Links (PALs) that rendered the weapon inert so that anyone stealing it or trying to use it without proper authorization would be stymied.

The challenge is that measures designed to improve the *always* side of the equation can compromise the *never* side and vice-versa. Pre-delegating the authority to use nuclear weapons and spreading the capability to do so to lower echelons may thwart an enemy's first-strike planning, for example, but it would raise the risk that a weapon might be used in an unauthorized fashion or by someone confused in the fog of battle.

The history of nuclear command and control is a history of civilian and military leaders debating the proper balance between always and never. It is a history of occasional discoveries that the risks on one side or the other side of the ledger were greater than originally understood. And it is a history of improvements – some, like Permissive Action Links, pressed by far-seeing congressional advocates – that may have helped forestall disaster. Even though we never had a truly catastrophic nuclear accident it is now publicly known that there were far too many close calls. Accordingly, our nuclear commanders are wise to be ever-vigilant and open to reexamining existing procedures with fresh eyes.

It is thus of vital national importance that our leaders, our adversaries, our allies, and our citizens have confidence that the nuclear command and control system continues to give due consideration to this always/never dilemma and that we have not inadvertently accepted too much risk of failure on either side. There is no single optimal solution. The right balance depends on the geostrategic context and advances in technology, among other factors, which is why we should never act as if the problem has been “solved.” On the contrary, it is a problem that must be managed on an ongoing basis, adjusting as appropriate with other changes.

This brings me to my second major point: we must be willing to invest the requisite funds to keep our technology up to date, but in the nuclear command and control business hardware is trumped by software, and software is trumped by wetware. Hardware refers to the technology: for instance, permissive action links that block the firing mechanism until a proper code is

inserted. Software refers to the rules and procedures that govern how the hardware is used: for instance, the code-management system that determines who has the PAL codes and who is authorized to disseminate them. Wetware refers to the human element: the reliability of people involved in enforcing the rules and the civil-military relations that form the political context in which the software and hardware operate.

In the past, reviews of the command and control system uncovered hardware flaws that needed to be corrected – for instance, gaps in communications that could be fixed with more modern technology. But more often reviews identified software and wetware problems – for instance, discovering that rules were interpreted in a way that produced unintended effects or discovering that bureaucracies had resorted to understandable “work-arounds” to get around cumbersome procedures and, in the process, introduced uncertainties that were not properly understood by higher authorities. This latter process has been called the “paradox of control:” the more the higher levels of command seek to assert restrictive control of subordinate elements, even at the risk of making those subordinate elements incapable of doing their jobs, the greater is the incentive of those subordinate elements to establish “work-arounds” that the higher authorities may not be aware of or, if they are, may not fully comprehend.

At the end of the day, what would matter most is the human element. Would the President properly understand his/her role and his/her options and wisely weigh the second and third order implications of any decision he/she made? Would the President’s advisors be in a position to provide timely counsel and would that counsel shape the President’s decisions? Would the various echelons in the chain of command recognize a valid authenticated nuclear use order as also being legal, given the military’s deeply ingrained training to refuse to implement any illegal order? Would lower level operators, the proverbial “button pushers,” carry out their fateful assignment in light of what is now known about the risks of nuclear war? Indeed, would subordinate elements of the command and control system do what they were supposed to -- no more and no less -- but with appropriate judgment?

This last point cannot be overemphasized. For decades now, it has been technologically possible to build a nuclear command and control system that would eliminate the human element in the launch sequence altogether. Every generation of strategic leaders has understood that such a system would be foolhardy in the extreme. The human element introduces risks, to be sure, but it also introduces the opportunity to mitigate risks.

This brings me to my third major point. The best reforms to the nuclear command and control system would be ones that maximized the opportunity for the human element to mitigate risks by maximizing time for deliberation and assessment. The best reforms are ones that would increase the time that the President and his advisors would have available so as to make considered decisions incorporating the widest set of inputs, including, if possible, inputs from leaders in Congress. Of course, efforts to extend decision times must not run afoul of the always-never dilemma. Reforms that maximized decision time but rendered the nuclear arsenal unusable in a crisis or conventional conflict would undermine deterrence and could actually make a nuclear war more, not less, likely. Moreover, measures aimed at providing radical solutions at the hardware level risk being undone by workarounds at the software or wetware levels. Nevertheless, investments -- even costly investments -- in systems that buy more decision time in

crises are likely among the wisest expenditures we can make. For instance, enhanced missile defenses may be a prudent option in light of the growing threat from North Korea – one that gives the President more time to assess before reacting. And upgrading communications systems to ensure that the President will have immediate access to all of his/her relevant advisors even under demanding scenarios would be a prudent investment in national security.

Earlier generations of strategic leaders found ways to improve the nuclear command and control system without exacerbating the always/never dilemma and, speaking as a citizen, I would ask the current generation of strategic leaders to do the same. However, I would likewise caution that not every proposed reform would actually reduce nuclear risks.

This brings me to my fourth and final point: the time is ripe for a fresh look. The Trump Administration is going through a Nuclear Posture Review right now and, presumably, the adequacy of the nuclear command and control system is a priority focus of that review. Changes in communications technologies and rapidly evolving cyber threats alone would justify a fresh examination. It is likely that the command and control system is overdue for some major (and expensive) upgrades. At the same time, the geostrategic environment today is markedly different. Threats that were warned about five years ago have become urgent realities today. North Korea is only the most vivid example of this; a confrontational Russia and an assertive China have dramatically changed our threat picture. The nuclear command and control system is likely facing new strains because of these developments. And, finally, our divisive political environment has raised new doubts about the effectiveness of all our branches of government to wield the power they possess responsibly. In that context, a thoroughgoing review of nuclear command and control could help shore up public confidence in this vital area.

Outside experts have suggested many possible improvements that are worth considering. One proposal calls for clarifying the chain of command to ensure that lower-echelons know that any order to use nuclear weapons has been adequately vetted. Another proposed approach recommends requiring certifications by additional cabinet officials of launch orders under certain circumstances. Still another proposal calls for specifying certain scenarios that would require prior consultation with Congress before a nuclear use order would be deemed legal. All of these proposals raise important constitutional questions about usurping the President's authorities; I am not a lawyer but I will point out that the precise distribution of powers among the branches related to military decision-making has never been entirely clear, and so reforms that raise the hoary war powers issue, particularly in the nuclear area, are especially fraught. But there may be reforms that pass constitutional muster while also enhancing the ability of the President to wield his/her commander-in-chief powers in the most effective and responsible way possible. Finding those should be an urgent priority for this and other responsible legislative and executive bodies.

Because the actual operations of the current system are exceedingly complex, I would recommend great caution before legislating any particular fix. Nevertheless, Congress can play an important role in strengthening nuclear command and control. Congress can stipulate that the NPR explicitly address these questions. Moreover, Congress will have multiple opportunities to give input through the authorization and appropriation process for the ongoing modernization of the nuclear arsenal.

Above all, I would recommend diligence and perseverance in oversight of the system, to reassure our friends and to warn our enemies that the nuclear arsenal will function as it is intended.