

## REDUCING THE RISKS FROM NUCLEAR ENTANGLEMENT

JAMES M. ACTON, LI BIN, AND TONG ZHAO | SEPTEMBER 2018

The risk of a nuclear war is growing. Given heightened U.S.-Russian and U.S.-Chinese political tensions, a conflict between two nuclear-armed great powers, while unlikely, is not unimaginable. Meanwhile, ongoing technological developments are increasing the likelihood that, in the event of such a conflict, nuclear weapons might be used, potentially leading to tens or even hundreds of millions of deaths.

The most worrying of these technological developments are advances in *non*-nuclear weapons, including anti-space weapons, ballistic missile defenses, cyber weapons, and high-precision conventional munitions. These capabilities are becoming increasingly entangled with nuclear weapons and their associated command, control, communication, and intelligence (C3I) systems. Such entanglement increases the risk that nuclear weapons could be used as a result of miscalculation, misperception, or an accident.

While risk reduction is likely to prove challenging, initial steps—unilateral ones in particular—can and should be taken urgently. In the short term, simply raising awareness of the escalation risks stemming from entanglement within the governments and militaries of China, Russia, and the United States could help to mitigate those risks. At the same time, to prepare for the possibility of bilateral discussions about coop-

erative approaches, each government should develop and assess proposals for concrete confidence-building measures.

### WHAT IS ENTANGLEMENT?

Entanglement describes interactions between the nuclear and non-nuclear domains. It has various manifestations:

- **New and emerging non-nuclear technologies are increasing the threats—real and perceived—to nuclear forces, both strategic and tactical, and their C3I capabilities.** For example, both China and Russia believe that advanced U.S. non-nuclear weapons and ballistic missile defenses (including land- and sea-based interceptors) pose a threat to their nuclear deterrents. Meanwhile, some C3I capabilities involved in nuclear operations, such as

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ground-based radars and satellites used for early warning and communications, appear to be vulnerable to non-nuclear capabilities, including anti-satellite, high-precision conventional, and, perhaps, cyber weapons.

- **Dual-use weapons that can be armed with either nuclear or non-nuclear warheads, as well as non-nuclear weapons that are superficially similar to nuclear weapons, are being ever more widely adopted.** A number of Chinese ballistic missiles, for instance, have superficially similar nuclear and non-nuclear variants. China's newly deployed DF-26 intermediate-range missile, meanwhile, reportedly comes in a single version that can accommodate a nuclear or a non-nuclear warhead. Russia and the United States both deploy dual-capable bombers and fighters. Russia's new heavy intercontinental ballistic missile (ICBM), Sarmat, which is currently under development, will reportedly be able to deliver either non-nuclear hypersonic gliders or nuclear warheads.
- **Dual-use C3I capabilities are becoming increasingly common.** The United States, for example, openly acknowledges that its early-warning satellites and radars are capable of providing early warning of a nuclear strike and of triggering defenses designed to intercept conventional ballistic missiles (among other non-nuclear tasks). Although the Chinese and Russian governments have revealed less about their nuclear C3I architectures, the Russian system certainly contains dual-use components and its Chinese equivalent may also. Russian radars, for example, are used to provide early warning of an incoming nuclear attack and to track objects in space.
- **Nuclear and non-nuclear forces, as well as nuclear and non-nuclear C3I assets, are sometimes co-located.** In both the United States and Russia, for instance, some ports host submarines that carry nuclear weapons as well as those that do not. Russia bases dual-capable strategic bombers at the same bases as other aircraft. Meanwhile, some Chinese missile bases are responsible for both nucle-

ar and non-nuclear missile brigades, which suggests that some Chinese nuclear and non-nuclear C3I capabilities may be co-located.

## HOW COULD ENTANGLEMENT SPARK ESCALATION?

China, Russia, and the United States all appear to plan to launch non-nuclear attacks against entangled targets, in the event of a conventional war, as a way of undermining the adversary's non-nuclear operations. For a variety of reasons, such attacks could create very real risks of escalation.

### Crisis Instability

China and Russia long have been concerned about the possibility that, in a conflict, the United States might launch a nuclear first strike against their nuclear forces. Today, they are increasingly concerned that they might not be able to deter a U.S. non-nuclear first strike, not least because they worry that a nuclear response might lack credibility. In fact, they even worry that a nuclear response might be infeasible because of the possibility that those nuclear weapons that survived the initial attack could be intercepted by U.S. missile defenses. By contrast, for the time being, Washington is unlikely to be concerned about the possibility of being disarmed by China or Russia (though this could change in the future, most likely if U.S. capabilities for communicating with nuclear forces were to become vulnerable).

For at least three reasons, Chinese or Russian concerns about force survivability could be further exacerbated, in a non-nuclear conflict, by U.S. attacks against entangled assets.

First, the United States might attack dual-use C3I assets, such as communication systems or early-warning radars, to influence the outcome of a conventional war. (For example, given that Russian early-warning radars are used to track space objects and hence could enable anti-satellite operations, the United States might attack those radars to protect its satel-

lites.) The targeted country, however, could mistake U.S. strikes against dual-use C3I assets as the precursor to nuclear or non-nuclear attacks against its nuclear forces.

Cyber operations against dual-use C3I systems might be especially risky; China, in particular, seems to be concerned about this possibility. As with kinetic attacks, there would be the danger that the targeted country might misinterpret cyber operations intended to help win a conventional war as an attempt to undermine its nuclear deterrent. With cyber attacks, there is the added risk that computer code designed solely to collect intelligence might be misidentified as a weapon designed to damage the target system.

Second, U.S. operations to hold non-nuclear forces at risk could be indistinguishable from operations directed against nuclear forces. It may be impossible, for example, for an adversary to determine whether U.S. anti-submarine operations were directed against its attack submarines or its ballistic missile submarines (or both). This risk could be particularly acute with uninhabited underwater vehicles (which are expected to be used more heavily in the future), not least because—without the lives of a crew at risk—these vehicles could be employed in more aggressive ways than inhabited vessels.

Third, the United States might accidentally attack nuclear forces or C3I assets when trying to attack non-nuclear capabilities. For example, the United States might attack nuclear-armed Chinese ballistic missiles after misidentifying them as superficially similar conventionally armed weapons. Similarly, the United States might attack Russian nuclear-armed bombers placed on airborne alert to enhance their survivability if these aircraft were misidentified as conventionally armed aircraft tasked with attacks on U.S. or allied targets. Nuclear C3I assets co-located with non-nuclear C3I assets could also become, in effect, collateral damage in strikes against the latter.

By creating real fear in Beijing or Moscow that their nuclear deterrents were in serious danger, U.S. non-nuclear attacks could generate an escalation risk known as crisis instability—

although there would be some differences between the escalation dynamics in a U.S.-Russian and a U.S.-Chinese conflict.

If Russia perceived a growing threat to its nuclear forces, it might respond by enhancing their survivability by, for instance, dispersing mobile ICBMs or placing bombers on alert. Alternatively, or additionally, Russia might issue nuclear threats to try to coerce the United States into stopping whatever operations Moscow found so threatening. Either of these steps could catalyze further escalation by generating concerns in Washington that Moscow was planning to use nuclear weapons first, even if that were not the case. More seriously, if the United States attacked Russian early-warning satellites (which could, especially in the future, have a role in detecting and enabling defenses against U.S. non-nuclear strikes), Moscow might initiate the sequence to launch ICBMs so it could fire them at very short notice if Russian land-based radars were destroyed or detected an incoming U.S. nuclear strike.

In extreme circumstances, Russia might even use nuclear weapons first. It might respond to non-nuclear attacks on its nuclear forces with limited nuclear strikes (using either tactical or strategic weapons) to try to terrify the United States into backing down. In a prolonged exchange of conventional weapons involving U.S. attacks against conventional forces and urban-industrial infrastructure, Moscow might even launch preemptive, limited strategic strikes if it became seriously concerned that the United States was preparing to launch non-nuclear attacks on its nuclear forces.

In contrast to Russia, China has made a pledge not to use nuclear weapons first. Almost all Chinese analysts place great trust in this pledge. Foreign officials and experts are, however, more skeptical (including about whether this pledge would hold if Chinese nuclear forces were subject to non-nuclear attack). As a result, even if China did not use nuclear weapons first in response to growing concerns about the survivability of its nuclear forces, the steps that it might take—such as dispersing mobile nuclear-armed missiles—could be mistaken by the United States as preparations for nuclear use, thus triggering further escalation.

### **Misinterpreted Warning and the Damage-Limitation Window**

Chinese or Russian non-nuclear strikes against the United States could also spark escalation—a risk that has been overlooked since the Cold War—for reasons other than crisis instability. The risk would be most acute if China or Russia launched non-nuclear attacks against dual-use U.S. C3I assets, including early-warning and communication satellites, as well as ground-based radars and transmitters. Even if conducted exclusively for the purpose of winning (or at least not losing) a conventional war, such non-nuclear attacks could be misinterpreted by Washington as preparations for nuclear use. As a result, Washington might come to believe (wrongly) that it was about to become the victim of a nuclear attack—an effect termed misinterpreted warning. For example, China or Russia might attack U.S. early-warning satellites to enable their regional non-nuclear ballistic missiles (or, perhaps, non-nuclear ICBMs or boost-glide weapons in the future) to penetrate U.S. missile defenses. However, such an attack might be misinterpreted by the United States as an attempt to disable missile defenses designed to protect the homeland against limited nuclear strikes.

Even if the United States did not believe that nuclear use by an adversary was imminent, it might still worry that non-nuclear strikes against its dual-use C3I assets could compromise its ability to limit the damage it would suffer if the war turned nuclear at some later point. Such damage-limitation operations, which are an acknowledged part of U.S. nuclear strategy, would probably involve nuclear or non-nuclear attacks on the adversary's nuclear forces backed up by missile defenses. To have any chance of success, these operations would require very sophisticated C3I capabilities (to target mobile missiles, for example). Attacks on—or even perceived threats to—these C3I assets, many of which are dual use, could lead to concerns in Washington that, unless it took action now, effective damage limitation might be impossible—that is, the damage-limitation window might already have closed—if the war turned nuclear.

The United States might respond to either of these concerns in ways that could further escalate the crisis. Washington

would probably take steps to protect surviving C3I capabilities. It might, for example, attack anti-satellite weapons that were seen as particularly threatening. Such strikes could prove especially escalatory if they were conducted deeper inside the adversary's borders than the United States had previously struck. Alternatively, or additionally, Washington might issue explicit or implicit nuclear threats against nuclear use or further attacks on C3I assets. In fact, the 2018 U.S. Nuclear Posture Review even goes so far as to threaten to use nuclear weapons in response to attacks on C3I assets.

### **WHAT CAN BE DONE TO REDUCE THE RISKS?**

Risk mitigation will likely prove challenging. China may not want to disentangle its nuclear and non-nuclear forces because doing so might weaken its ability to deter U.S. attacks against the latter and because such disentanglement might prove challenging organizationally for the People's Liberation Army Rocket Force (which operates China's land-based nuclear forces). For Russia, the financial costs associated with disentanglement are likely to be a significant barrier. Moreover, inadvertent escalation is not generally regarded as a serious risk in China or Russia. Unfortunately, the belief that inadvertent escalation is unlikely actually makes it more probable because it leaves political and military leaders less inclined, in peacetime, to take steps that could mitigate the risks and more inclined, in wartime, to interpret ambiguous events in the worst possible light.

Although there is more acceptance of the possibility of inadvertent escalation in the United States, there is little evidence that the U.S. government and military have fully factored the risks of entanglement into procurement policies and war planning. There is also little evidence that the administration of President Donald Trump is willing to invest significant political capital in reducing the risk of inadvertent escalation.

Because of poor U.S.-Chinese and U.S.-Russian political relations, unilateral actions are currently the only realistic ap-

proach to risk mitigation. In particular, Beijing, Moscow, and Washington should aim to raise awareness of inadvertent escalation risks among the civilian and military leaders responsible for strategic-level decisionmaking in crises or conflicts. Greater awareness among those leaders of the potential for misinterpreting an adversary's intent—and of the potential for that adversary to misinterpret the state's own intent—could induce restraint in a crisis or conflict. Escalation risks could also be factored into acquisition policy and war planning, a step that might lead states, for example, to develop more resilient C3I architectures or to plan for operations whose purpose would be less likely to be misinterpreted.

Ideally, each state would initiate such unilateral efforts irrespective of whether the others did so. To motivate and inform them, each country should conduct studies (most likely classified) into the risks compared to the benefits of entanglement.

U.S.-Chinese and U.S.-Russian intergovernmental discussions would be more challenging, but could prove valuable. Initially, the main purpose of these dialogues might simply be to assess escalation risks more accurately by better understanding a potential adversary's perspective. Advanced conventional weapons, the survivability of space-based C3I assets, and interactions between cyber weapons and nuclear C3I systems could be initial foci for such discussions.

Over the long term, cooperative confidence building and even formal arms control could play an important role—though the prospects of such measures are currently bleak. Nonetheless, governments should undertake internal preparations for a more cooperative approach so that, if and when one becomes viable, rapid progress can be made.

Russia and the United States have a long history of cooperating to reduce nuclear risks. Today, unfortunately, even informal confidence-building measures—let alone legally binding arms control—are infeasible. That said, to prepare for such discussions, each government can and should assess

proposals for reducing escalation risks and try to develop acceptable alternatives if necessary. Each government could, for example, consider the following:

- An agreement to make intercontinental boost-glide weapons accountable under the central limits of a successor to the U.S.-Russian New Strategic Arms Reduction Treaty (New START). This proposal could enhance confidence that neither state would build up these weapons to the point that they could threaten the other's nuclear deterrent.
- An agreement to preclude the tacit massing of platforms for delivering air- and sea-launched cruise missiles within range of the other's strategic targets. If either state decided to deploy such platforms en masse, it would be required to notify the other and provide an explanation, thus reducing the risk that deployments targeted at a third country could catalyze inadvertent escalation between Russia and the United States.
- An agreement to prohibit the testing and deployment of dedicated anti-satellite weapons. Such a prohibition would not restrain the development of dual-functional capabilities, such as missile defenses, that could be used to attack satellites. Yet, it could reduce nuclear escalation risks, nonetheless, because dedicated anti-satellite weapons may pose a significantly greater threat than dual-functional systems to the most important nuclear C3I satellites (which are mostly located in so-called geostationary orbits high above the equator).

China and the United States have much less of a history of cooperation in this area. To move forward, each state should ask itself what it would be willing to do for confidence building and what it would expect in return. For example, would each state be willing to disclose more information to the other about its plans for developing and deploying nuclear and non-nuclear hypersonic weapons? Or could the two states agree to a joint statement recognizing the risks of non-nuclear attacks against assets involved in nuclear C3I? Such questions

could also be usefully explored in track II discussions. While the challenges of risk reduction today are very real, they are likely to increase in the future. In particular, as new weapons are acquired and integrated into these countries' military forces, the resistance to limitations on their deployment

or use is likely to grow. China, Russia, and the United States, therefore, should not wait until political relations improve before making efforts to manage these technologies, even if, for the time being, their efforts must necessarily be limited to unilateral steps.

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For more information about the risks of entanglement, please see James M. Acton, Li Bin, and Tong Zhao, *Entanglement: Chinese and Russian Perspectives on Non-nuclear Weapons and Nuclear Risks* (Washington, DC: Carnegie Endowment for International Peace, 2017), [http://carnegieendowment.org/files/Entanglement\\_interior\\_FNL.pdf](http://carnegieendowment.org/files/Entanglement_interior_FNL.pdf); and James M. Acton, "Escalation Through Entanglement: How the Vulnerability of Command-and-Control Systems Raises the Risk of an Inadvertent Nuclear War," *International Security* 43, no. 1 (Summer 2018): <https://www.mitpressjournals.org/loi/isec>.

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