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# Reducing Alert Rates of Nuclear Weapons

Hans M. Kristensen and Matthew McKinzie



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## About the cover

The Ohio-class ballistic-missile submarine USS Wyoming (SSBN 742) approaches Naval Submarine Base Kings Bay, Georgia. Wyoming is the 17th submarine in the Ohio-class and the fourth US Naval ship to be named after the 44th state of the Union. (US Navy photo by Lt. Rebecca Rebarich/Released).

## NOTE

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## EXECUTIVE SUMMARY

Although the Cold War ended more than two decades ago, the United States and the Russian Federation continue to maintain large numbers of nuclear forces on high levels of alert, ready to launch within minutes. France and the United Kingdom also deploy nuclear forces, which can be quickly launched, though at lower levels of readiness. Combined, these four countries deploy approximately 1,940 warheads ready for use on short notice.<sup>1</sup>

These current alert levels—which are deeply rooted in Cold War thinking, vastly exceed current and foreseeable security needs, and undercut efforts to reduce the salience and role of nuclear weapons—are sustained by a circular (though flawed) logic, whereby US nuclear forces are maintained on alert because Russian nuclear forces are on alert, and vice versa for Russian forces. Put in another way, if nuclear forces were not on alert, there would be no requirement to keep nuclear forces on alert.

Despite the end of the Cold War and its nuclear competition, planning for the worst case continues. This leftover from the Cold War is one of the causes of high alert levels. This situation negatively impacts progress in reducing the role of nuclear weapons, arms control and disarmament, costs billions of dollars to maintain and could result in catastrophic consequences from accidental or unauthorized launch of nuclear forces, or from rushed decision-making in a crisis situation.<sup>2</sup>

The international community has repeatedly and overwhelmingly called upon the nuclear-weapon states to reduce the operational readiness of their nuclear forces.<sup>3</sup> US President Barack Obama was one of those voices and promised during his campaign in 2007–2008 to work with the Russian Federation to take nuclear weapons off “hair-trigger alert”.<sup>4</sup> After Obama won the election, the promise initially formed part of the foreign policy agenda on the White House website in early 2009, but it dropped off the list after a few months.

The Obama administration’s Nuclear Posture Review (NPR) from April 2010 considered the possibility of reducing alert response requirements for intercontinental ballistic missiles (ICBMs) and at-sea response requirements of ballistic missile submarines (SSBNs), but “concluded that such steps could reduce crisis stability by giving an adversary the incentive to attack



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before ‘re-alerting’ was complete”. Instead, the NPR recommended that the existing alert posture should be maintained.<sup>5</sup>

Yet the NPR also acknowledged the risk of having nuclear forces on alert, and recommended “that efforts should continue to diminish further the possibility of nuclear launches resulting from accidents, unauthorized actions, or misperceptions and to maximize the time available to the President to consider whether to authorize the use of nuclear weapons”.<sup>6</sup> The possible steps listed did not include reducing alert levels, however, but modernizing nuclear command and control and possibly developing a mobile ICBM.

Since the NPR, the Obama administration has undertaken a post-NPR review to examine, among other factors, “potential changes in ... alert postures that are required for effective deterrence”.<sup>7</sup> The results are not expected until early 2013, but “At this time”, Principal Deputy Under Secretary of Defense for Policy Jim Miller told Congress in November 2011, “I do not anticipate any major changes in the alert posture for U.S. strategic forces”.<sup>8</sup> Moreover, a report on strategic deterrence and mutual assured stability produced by the International Security Advisory Board for the US State Department in August 2012 did not address nuclear alert postures at all.<sup>9</sup>

To our knowledge, the Russian Federation, for its part, has so far not expressed an interest in reducing the alert levels of nuclear forces. As in the United States, military officials argue that it is necessary to keep nuclear forces on alert, use alert levels to illustrate the credibility of Russia’s nuclear deterrent, and warn against the difficulties and risks of changing the posture. Russian officials appear to us to be more concerned about US missile defence systems that cannot threaten the Russian Federation, than about the hundreds of nuclear alert warheads on US, British and French offensive missiles that can completely devastate the country. Yet it is those alert forces—not missile defences—that represent the greatest challenge to Russian military planning.

As far as we can gauge, there is very little debate in the Russian Federation about de-alerting. In the United States the arguments used for and against reducing the alert rates of nuclear forces are presented in the testimony of military and government officials, in the editorial pages of major newspapers, and in the reports of policy analysts at think tanks and advocacy groups. Proponents and opponents of “de-alerting” tend to argue their positions from two different perspectives. Proponents of de-

alerting argue from the standpoint of deterrence—that alert forces are not needed to provide a nuclear retaliatory capability sufficient to deter an adversary from attacking—especially, of course, if the adversary has also de-alerted their forces. Opponents argue from the point of view of war-fighting—that if deterrence fails, it is necessary to have alert nuclear forces to more effectively wage thermonuclear war, weakening an adversary through widespread nuclear strikes against their military forces, military and political leadership, command and control systems, and war-supporting infrastructure.

The very name of the current US strategic nuclear war plan—Strategic Deterrence and Global Strike (Operational Plan 8010-08)—reflects this dual mission of US nuclear forces. The strategic deterrence part of the US plan is focused on deploying a secure retaliatory capability to deter an adversary from attacking the United States and its allies. The global strike part of the US plan is focused on a myriad of war-fighting scenarios including the failure of deterrence.<sup>10</sup> The Nuclear Weapons Employment Policy that this plan is based on—NUWEP-04, signed by Defense Secretary Donald Rumsfeld on 19 April 2004—states in part: “U.S. nuclear forces must be capable of, and be seen to be capable of, destroying those critical war-making and war-supporting assets and capabilities that a potential enemy leadership values most and that it would rely on to achieve its own objectives in a post-war world”.<sup>11</sup>

This dual mission is also reflected by the Obama administration’s ongoing post-NPR review, which is intended to ask, in the words of a senior Pentagon official: “What are the guiding concepts for employing nuclear weapons to deter adversaries, and what are the guiding concepts for ending a nuclear conflict on the least catastrophic terms if one has already started?”.<sup>12</sup> To repeat, current US nuclear weapons planning is based upon two interrelated but nonetheless different objectives: deterrence and war-fighting.

Advocates of de-alerting need to be clear about the distinctions between these two objectives, otherwise they will not address detractors’ concerns. Crisis escalation control is central to the arguments of de-alerting opponents and evident in a series of limited-strike options embedded in the strategic war plan for selective and adaptive targeting of adversary forces and infrastructure to stop escalation and win the war. It is at this stage in a crisis, they argue, after non-nuclear hostilities have broken out, that a nuclear re-alerting race would be most dangerous because it could prompt a nuclear-weapon state to launch its nuclear weapons first.

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As a hypothetical example, as Russian ICBMs return to a state of alert, there would be a strong incentive for the Russian Federation to strike immediately at US nuclear submarine bases, thereby potentially destroying large numbers of the adversary's strategic nuclear weapons with only a few attacking warheads, as both sides desperately race to alert status.

There would certainly be risks of any crisis escalating—alert forces are no guarantee against that. But the re-alerting race argument is a “straw man”. First, it ignores that US and Russian nuclear postures today already include plans to “generate” forces in a crisis, surging and dispersing forces, and increasing alert rates and warhead loading. Although not re-alerting from a completely de-alerted state, those strategic force generation plans would, if executed, have a high probability of being interpreted by the opponent as preparations to strike and thus trigger nuclear force generation on the other side. Therefore, if a re-alerting race is destabilizing in future de-alerted nuclear postures, logically it is also destabilizing today.

Second, nuclear forces can be structured to prevent a re-alerting race, unlike in the previous example, which indeed is a less desirable situation. As will be shown, the strategic nuclear forces of the United States and the Russian Federation can be structured so that a stable deterrent whole is built from vulnerable, de-alerted parts.<sup>13</sup>

But the idea that nuclear conflict can somehow be managed once it starts is highly dubious. For two large nuclear powers it is a fallacy to expect that either side would back down if the other side started using nuclear weapons in order to dictate its terms for ending hostilities. Maintaining alert forces against a smaller nuclear adversary that does not have nuclear forces on alert could push such an adversary toward adopting an alert posture or, as in the case of China, lead to development of more capable mobile nuclear systems in an attempt to reduce vulnerability to an opponent's alert nuclear forces. A smaller adversary would not be able to “win” but could still inflict considerable damage with a limited number of weapons.

As this study illustrates, the use of even several dozen strategic nuclear weapons—a small percentage of the current alert forces of the United States and the Russian Federation—could kill hundreds of millions of people. Given this “surplus” of deterrence, it is reasonable to consider that the de-alerting of nuclear forces could be undertaken in a manner that in no way disturbs stable nuclear deterrence until the process of nuclear disarmament—as agreed to by states under the Nuclear Non-Proliferation Treaty—is finally completed.

As described above, US officials acknowledge that there are inherent risks associated with nuclear alert forces.<sup>14</sup> Nevertheless they argue that it is too risk-filled and difficult to de-alert these forces. In researching this study a plausible scenario was not found where retaining nuclear forces on alert was necessary for stable deterrence. For example, it was found that even if the United States or the Russian Federation launched a first strike that took the other completely by surprise—an unlikely scenario—the surprise strike would not decapitate the attacked forces to the extent that a devastating retaliatory strike could be avoided.

Alert, launch-on-warning nuclear forces become important when considering scenarios involving counterforce strikes against weapons platforms carrying many warheads (e.g. multiple-warhead silo-based or road-mobile ICBMs, SSBNs and bombers), where one attacking warhead can destroy multiple target warheads in a counterforce strike. In scenarios of this type, having forces off alert can result in a huge numerical nuclear imbalance following an initial counterforce strike. Nuclear forces of the United States and the Russian Federation however need not be configured in such a vulnerable way. In addition, an attacker seeking to disarm its opponent would inevitably run some risk of a retaliatory strike against urban targets.

Indeed, a US Department of Defense (DOD) report obtained under the Freedom of Information Act concludes that even a Russian “decapitating” first strike—a scenario the DOD concludes “will most likely not occur”—could not deny the United States the assured ability to retaliate against a significant number of Russian high-value targets, primarily because of the secured retaliatory capability deployed at sea on SSBNs.<sup>15</sup> Retaining that retaliatory capability, we assert, does not require that the SSBNs are on alert, only that a sufficient number are at sea and secure. And as long as the secure retaliatory capability at sea is intact, ICBMs do not need to be on alert either. Consequently, we conclude that it is possible to de-alert nuclear forces and retain the basic deterrence framework that underpins strategic stability.

Opponents of de-alerting argue that maintaining nuclear forces on high alert provides decision makers with additional important options for how to respond in a crisis. That might technically be true, but that does not necessarily mean that the resulting posture is better or safer. Indeed, a group that includes former US Strategic Command (STRATCOM) Commander General James E. Cartwright argues the exact opposite—that the “short-fused Minuteman and strategic submarine alert forces,

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together with the supporting rapid reaction command system, *impose a severe constraint on presidential deliberation and choice during a crisis or conflict*"<sup>16</sup> (emphasis added).

As STRATCOM Commander, General Cartwright had to defend the nuclear alert posture. His change of perspective after retirement is similar to that of another former STRATCOM Commander, General Eugene Habiger, who after retirement has argued that de-alerting is a political decision and that de-alerting is not prevented by technical challenges or risks posed by re-alerting.

Despite the arguments against de-alerting, this study finds that the nuclear-weapon states have already taken considerable unilateral steps to reduce nuclear alert levels during the past two decades. These steps include de-alerting of entire weapon systems or categories, as well as partial de-alerting by reducing warhead loading on the remaining forces. Despite warnings about re-alerting races and crisis instability at the time, none of these steps have proven de-stabilizing but have significantly increased national and international security. Indeed, in many cases, these steps have been precursors for significant reductions of nuclear arsenals. There is no reason why countries with alert nuclear forces cannot continue to take unilateral steps to gradually and responsibly reduce the alert level of the remaining forces.

Overall, this study finds that alert nuclear forces contradict the efforts to reduce the role—and to some extent the numbers—of nuclear weapons by locking nuclear-weapon states in unnecessarily threatening and dangerous postures that drive high requirements for nuclear weapons capability and war-fighting preparations, motivate mistrust and worst-case planning, and contradict the hopes and aspirations of the overwhelming part of the international community to end the threat of nuclear war. The nuclear arms race may be a thing of the past, but nuclear alert plays an important role in ensuring that a dynamic of nuclear competition is not.



## STATUS AND TREND OF NUCLEAR ALERT FORCES

Of the world's nine states in possession of nuclear weapons, we estimate that only two states—the United States and the Russian Federation—maintain their nuclear forces on a high level of alert, able to launch within minutes. The United Kingdom and France have some nuclear weapons on lower levels of alert that would take longer to launch than US and Russian alert forces, but they are nonetheless fully operational and deployed. We estimate that the nuclear forces of China, Pakistan,<sup>17</sup> India and Israel are likely not on alert on a normal basis, and two of them (China and India) have no-first-use policies in effect.<sup>18</sup> In total, there are currently roughly 1,940 nuclear warheads on alert (see table 1). Details of the assessment of the numbers are given in the section “Analysis of nuclear alert scenarios”.

### THE UNITED STATES

We estimate that the United States deploys approximately 920 warheads on alert, split almost evenly between intercontinental ballistic missiles (ICBMs) and submarine-launched ballistic missiles (SLBMs). Yet the two legs of the US alert nuclear forces are postured very differently. Of the ICBM force, nearly all (98%) of the 450 missiles are on high alert at any given time, capable of launching within five minutes of the president issuing the launch codes. Nearly all the US ICBMs carry a single warhead each, although a small number still carry multiple warheads (MIRVs)—either two or three warheads per missile.<sup>19</sup> The George W. Bush administration initiated a download of the ICBM force to single-warhead configuration, a plan the Obama administration's Nuclear Posture Review (NPR) embraced by deciding to “de-MIRV” the deployed ICBM force.<sup>20</sup> A couple of hundred non-deployed warheads will be retained to upload or re-MIRV the ICBM force if deemed necessary.

Four to five ballistic-missile carrying submarines (SSBNs) are maintained on alert (on station) within reach of their designated targets and capable of launching their SLBMs within 15 minutes of presidential authorization. The missiles are MIRVed, carrying an average of four to five warheads each for an estimated total of 540 warheads on alert. In addition to the SSBNs on alert, another four to six SSBNs at sea could be brought to alert within a few days, if deemed necessary.<sup>21</sup> Combined, the eight to ten US SSBNs at sea at any given time conduct approximately 33 deterrent patrols per year, an average of three per submarine, each lasting 60 to 100 days.<sup>22</sup>

**Table 1.** Estimated alert nuclear forces, 2012

Country	Stockpiled warheads <sup>a</sup>	Alert warheads <sup>b</sup>	Remarks
United States	5,000	920	Split more or less evenly between ICBMs and SLBMs
Russian Federation	4,500	890	Mainly warheads on ICBMs; alert levels vary greatly depending on type
France	300	80 <sup>c</sup>	One SSBN on patrol
United Kingdom	225	48 <sup>c</sup>	One SSBN on patrol
China	240	0	Warheads are not mated with delivery systems or in military custody
Pakistan	100	0	Warheads are not mated with deployed delivery vehicles
India	90	0	Warheads are not mated with deployed delivery vehicles
Israel	80	0	Warheads are not mated with deployed delivery vehicles
Total	~10,540	~1,940	

<sup>a</sup> This includes warheads in the military stockpile assigned to nuclear forces. Additional retired, but still intact, warheads may be in storage awaiting dismantlement. The United States and the Russian Federation each have several thousand warheads in this category.

<sup>b</sup> Warheads are considered on alert if they are deployed on a delivery system that is deployed and ready to launch the weapons within minutes or hours.

<sup>c</sup> Although deployed and fully operational, SLBMs on French and British SSBNs are thought to require longer preparation to launch than US and Russian alert weapons.

US long-range B-2 and B-52 bombers do not carry nuclear weapons on a daily basis but could be loaded within a few days if necessary. Only a few hundred of the roughly 1,300 warheads thought to be assigned to US bombers are stored at two of the three strategic bomber bases in the continental United States (Minot Air Force Base in North Dakota and Whiteman Air Force Base in Missouri), with the rest of the nuclear



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warheads kept in central storage.<sup>23</sup> After an incident in 2007, where a B-52 bomber flew across the United States without anyone realizing that it was carrying six nuclear cruise missiles, the Pentagon's final incident report recommended that "the Air Force dedicate the full rapid response commitment to the nuclear mission on a continuous basis, rotating the commitment among the B-52 squadrons".<sup>24</sup> In response, the Air Force established a fourth B-52 squadron to enable one of the squadrons to focus entirely on the nuclear mission for six-month intervals in an effort to increase nuclear proficiency in the bomber force. As a result, according to the US Air Force, "the B-52 has recently seen some of the highest readiness rates in its 60 year history".<sup>25</sup> These nuclear-capable bomber squadrons forward deploy to the Pacific island of Guam on multi-month rotational deployments, a practice established by the US Air Force in 2004.<sup>26</sup>

Non-strategic fighter-bombers also are also not kept on alert, but nearly 200 bombs are deployed inside roughly 85 aircraft shelters at six bases in five European North Atlantic Treaty Organization (NATO) countries for delivery by F-15E, F-16 and Tornado aircraft. Some of the weapons can be readied for use within 30 days.<sup>27</sup>

As part of implementing the New START Treaty,<sup>28</sup> the United States plans to withdraw up to 50 ICBMs and reduce the number of deployed SLBMs by 48. This is estimated to reduce the US alert warhead loading to approximately 790 by 2018.

In addition to nuclear warheads deployed on operational missiles, the United States keeps a sizeable reserve of so-called Responsive Force warheads that can be uploaded onto missiles and bombers to increase warhead loading if necessary. The Responsive Force includes fully intact, so-called "active" warheads and was described by the 2001 NPR as intended to provide "the option ... to increase the number of operationally deployed forces in proportion to the severity of an evolving crisis".<sup>29</sup> Consequently, the number of alert warheads could also increase significantly.

During the 2008 US presidential campaign, Barack Obama pledged to work with the Russian Federation to take nuclear weapons off "hair-trigger alert". Obama stated: "Maintaining this Cold War stance today is unnecessary and increases the risk of an accidental or unauthorized nuclear launch".<sup>30</sup> After winning the election, this pledge formed part of the new administration's description of its foreign policy on the White House website for several months in early 2009. But once preparations

got underway for the NPR, the de-alerting language disappeared from the White House website and it was not included in Obama's Prague speech later that year. When the NPR was published in 2010, it concluded that "the current alert posture of US strategic forces—with heavy bombers off full-time alert, nearly all ICBMs on alert, and a significant number of SSBNs at sea at any given time—should be maintained for the present".<sup>31</sup> At the time of writing, the pledge to take nuclear weapons off alert is not on the White House website's foreign policy page.<sup>32</sup>

## THE RUSSIAN FEDERATION

We estimate that the Russian Federation deploys approximately 890 warheads on alert, primarily on ICBMs, which carry more than 85% of Russian alert warheads. Unlike US ICBMs, Russian ICBMs have not been downloaded to one warhead. The START II Treaty,<sup>33</sup> signed by the Russian Federation and the United States in January 1993, required downloading of all ICBMs to single-warhead configuration and elimination of so-called "heavy" ICBMs,<sup>34</sup> but the treaty was abandoned after the United States withdrew from the Anti-Ballistic Missile Treaty in 2002. As a result, we estimate that Russian ICBMs currently carry their full complement of MIRV warheads, with more than 85% of alert warheads on ICBMs carried on only two heavy systems, the SS-18 and SS-19.<sup>35</sup> Most of these two missiles are expected to be phased out by the early 2020s due to their aging, along with the mobile single-warhead SS-25 ICBM.<sup>36</sup>

The remaining warheads are deployed on 89 SS-27 missiles of various types. Most of these are silo-based SS-27 Mod 1 (Topol-M), each equipped with a single warhead. To compensate for the phase-out of the warhead-heavy SS-18 and SS-19, the Russian Federation is producing the new SS-27 Mod 2 (RS-24 Yars) that can carry up to six warheads. Yet even with an intended increased production rate, we estimate that the overall ICBM warhead loading might decline by 30% to some 750 warheads by the time the New START Treaty enters into effect in 2018.

In the case of the Russian Federation, specific information on the alert status of its nuclear forces is hard to come by, and statements by government officials on the percentage of missiles on alert vary considerably. In 1997, Russian Defence Minister Designee Igor Sergeyev stated that two thirds of Strategic Rocket Forces (SRF) ICBMs were ready to launch in "a few tens of seconds".<sup>37</sup> A US Strategic Command (STRATCOM) briefing in 1997 reportedly listed 66% of Russian ICBMs on alert.<sup>38</sup> Ten years later, SRF

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Commander General Nikolai Solovtsov stated at a press conference: “Out of every hundred missiles on combat duty, 97 or 98 are ready to complete their mission every minute and every second”.<sup>39</sup> The rate was similar to the alert rate for US silo-based ICBMs, but would probably be too high for mobile missiles. General Solovtsov referred to the “technical readiness coefficient”, but it was unclear exactly what that meant.

In June 2008, General Solovtsov said that the SRF had managed to bring the number of ICBMs “ready for immediate use” to the 96% goal set by the president. Russian analysts concluded that Solovtsov apparently implied that 93% of road-mobile ICBMs were on patrol during four months of 2008, and the analysts described the following increase in the readiness of mobile ICBMs:<sup>40</sup>

- 2005: 60%
- 2006: 78%
- 2007: 90%
- 2008: 93%

In early 2009, General Solovtsov stated, “At least 96 percent of all missile systems are ready for deployment within several dozen seconds” and that this is “the highest readiness level” within the Russian Federation’s nuclear triad.<sup>41</sup> Since that was the number given for all ICBMs, the readiness level for mobile missiles is probably lower. It is interesting that Russian statements on the launch-ready status of their nuclear forces are given in a time frame of seconds, rather than minutes. It would mean that the Russian readiness level is either higher than that of the US ICBM force, or that the statement is exaggerated.

This study finds that there is considerable uncertainty in official statements about Russian alert levels. The statements themselves, the way they are described in news media reports (perhaps as a result of unofficial translations), and subsequent analysis use different terminology that has not been officially defined: “complete their mission”, “technical readiness coefficient”, “ready for immediate use” and “ready for deployment” can potentially refer to different elements or conditions of the alert posture. Moreover, our private conversations with retired Russian military officials indicate that the actual portion of the ICBM force—especially road-mobile missiles—that can launch within a few minutes is somewhat lower. Based on those conversations, we estimate that older missiles, the SS-18 ICBMs, have a high alert rate of 90% to 95%; the SS-19 ICBM alert rate is less than

70%; and the SS-25 mobile ICBMs only have about a 15% alert rate.<sup>42</sup> Among the newer Russian missiles, we estimate that the silo-based SS-27 ICBMs have a high alert rate of around 90%, while approximately 20% of the mobile versions of this new missile may be on alert. Based on these assumptions, the Russian Federation currently has approximately 890 warheads on alert.

There are indications that the Russian Federation is increasing the time that road-mobile ICBMs spend on combat patrol outside their garrisons. During an ICBM field exercise conducted 16 January to 3 February 2012, road-mobile SS-25 (Topol), SS-27 Mod 1 (Topol-M), and SS-27 Mod 2 (RS-24 Yars) were tasked to “practice patrolling, camouflaging and launch preparation procedures during high alert drills”.<sup>43</sup> After the exercise, the Russian Ministry of Defence stated: “this year a characteristic of the practicing of alert duty tasks in combat patrol routes (field positions) for the mobile land-based missile system grouping is an increase in the periods spent in field positions (combat patrol routes) compared with last year”.<sup>44</sup>

An SRF spokesman explained further in April 2012 that the mobile ICBM units would nearly double the time spent on combat patrol routes. “Longer presence in field positions (combat patrol routes), increased by a factor of 1.8 to 2 compared on [sic] last year (to up to 18 days), which was tested in 2011, will be a feature of combat duty drills on combat patrol routes (field positions) for the grouping of ground-mobile Topol, Topol-M and Yars systems in 2012”.<sup>45</sup> During the winter 2011–2012 training period, the SRF planned over 100 tactical training events involving “tactical exercises and drills involving missile regiments and missile battalions, as well as a number of command post exercises involving large formations and formations under the direction of the [SRF] commander and the commanders of missile armies”.<sup>46</sup> Compared with previous week-long deployments, Guards Major General Sergey Viktorovich Siver, in command of the 27th Missile Army with ICBM deployments at five locations in Western Russia, later explained that the mobile ICBMs now would deploy “on combat alert duty in the highest states of combat readiness, for up to 20 days”.<sup>47</sup>

These reports describe combat patrol deployments outside garrisons, but road-mobile ICBMs are also capable of launching from inside their garrisons. Satellite images show that garages used by SS-25 and SS-27 Mod 1 and Mod 2 (RS-24) road-mobile ICBMs have roofs that can open to erect and launch the missile from inside the garages. It is unknown if road-mobile ICBMs inside garrisons are maintained at the same readiness level as those on combat patrol deployment in the field.

Notably, SSBNs play a less significant role in the Russian alert posture than in the US posture. There are no official Russian numbers for how many SLBMs are on alert. In 1997, STRATCOM suggested about 60% of these weapons were maintained on alert onboard four SSBNs,<sup>48</sup> but that was at a time when the Russian SSBN fleet conducted 13 deterrent patrols. The number of deterrent patrols then declined, reaching zero SSBN patrols in 2002. In the last decade an average of five patrols have been conducted each year, but the pace has been insufficient to maintain a continuous at-sea deterrent. Instead, the Russian Navy has sent an SSBN on occasional patrols for training purposes.<sup>49</sup> The New START Treaty exchange data suggests that only about six or seven Russian SSBNs may be loaded with SLBMs at any given time. For the purpose of this study, it is estimated that only two SSBNs are deployed on alert, although others probably can launch from pier-side.

Despite the decline, the Russian Federation is working on revamping its SSBN force. Construction of at least eight Borei-class SSBNs is underway with the first scheduled to enter service with the Pacific fleet in late 2012 or early 2013. The submarines will be equipped with the SS-N-32 (Bulava) SLBM, which are thought to carry six warheads each, more than carried on the current SS-N-23 (Sineva) and SS-N-18 SLBMs.<sup>50</sup> Moreover, the former head of the Russian Navy, Admiral Vladimir Vysotsky, announced at the beginning of 2012 that the navy would resume “constant patrolling of the world’s oceans” with SSBNs in June 2012.<sup>51</sup> Depending on how many SSBNs have been on alert at pier-side, this development might increase the number of Russian SLBM warheads on alert.

Russian Tu-95 and Tu-160 heavy bombers are not on alert and do not carry nuclear weapons under normal circumstances. Russian bomber alert ended with the Cold War, but with the fleet’s capability to carry an estimated 800 nuclear weapons, Russian bombers represent a significant upload or re-alerting capability. As is the case with the US strategic bomber posture, this study estimates that the Russian Federation retains no more than a few hundred weapons at its two heavy bomber bases (Engels Air Base along the Volga River in western Russia, and Ukrainka Air Base in the far east), with the rest in central storage facilities.<sup>52</sup>

Moreover, although Russian strategic nuclear forces have the capability to hold at risk US nuclear bases, it is unclear how focused Russian nuclear strategy is on counterforce strikes versus holding at risk more general countervalue targets. During the analysis conducted in preparation for the New START Treaty, according to one recent study co-authored by

former Russian military officials, Russian planners assumed that in order for deterrence to be stable and predictable, a country had to be able to retaliate against 150 to 300 urban targets.<sup>53</sup>

## FRANCE

Of France's four SSBNs, at least two are always fully operational with missiles and warheads loaded, and with one of these submarines at sea on deterrent patrol. A deterrent patrol reportedly lasts up to 10 weeks. France has only produced enough SLBMs to arm three SSBNs, the fourth SSBN being in overhaul at any given time. Each of the 16 SLBMs on the deployed SSBN is thought to carry an average of five warheads for a total of 80 warheads on patrol, although some missiles may have been partially downloaded to increase utility in limited strike scenarios. It is unknown how quickly the SSBNs could launch their missiles but the timeline is probably similar to the British posture described below.<sup>54</sup>

The air-delivered component of France's nuclear forces is not thought to be on alert, but that all approximately 50 ASMP-A cruise missiles are kept in storage. Some of the missiles might be stored at the air bases, however, near the aircraft. The portion of the missiles assigned to the strike squadron on the aircraft carrier *Charles de Gaulle* are not carried on-board the ship under normal circumstance but could be deployed in a crisis.<sup>55</sup>

## THE UNITED KINGDOM

The United Kingdom deploys one of its four SSBNs at sea under normal circumstances with 16 SLBMs each carrying an average of three warheads for a total of 48 alert warheads. A second SSBN is fully loaded and could be deployed on short notice, while a third submarine would need to load missiles before it could deploy. The fourth submarine is in overhaul. Britain only has enough SLBMs to arm three SSBNs.<sup>56</sup>

The British government has announced plans to reduce the loadout of the deployed SSBN, so in the future only eight of the 16 SLBMs would be operational and the total number of alert warheads on the deployed submarine would be 40.<sup>57</sup> Such a posture would require increasing the average loading of each operational SLBM from three to five warheads.

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## PREVIOUS DE-ALERTING INITIATIVES AND OPERATIONAL READINESS REDUCTIONS

There is a widespread perception that de-alerting of nuclear forces is dangerous and expensive, but nuclear powers have actually de-alerted large numbers of nuclear forces over the past two decades, de-alerting some weapons systems partially and completely de-alerting many types of nuclear warheads (see table 2). It should be noted that, throughout this study, the terms “de-alerting” and “reducing operational readiness” of nuclear forces are used to describe different but related changes to nuclear delivery systems. De-alerting refers to weapons that are removed from alert status, for example by removing warheads, and can be full or partial. Reducing operational readiness refers to reducing how quickly a weapon system can be used, for example by delaying launch procedures or targeting requirements. (There are many grey areas, for example if submarines are deployed on “modified alert” requiring days to return to full alert.)

Throughout the Cold War and until the early 1990s, the United States and the Russian Federation kept most of their nuclear forces on a high level of operational readiness. Numbers fluctuated, but the general principle was that deployed warheads had to be ready to use on short notice. This included not only warheads on strategic delivery vehicles but also non-strategic nuclear weapons systems on land and at sea. With the end of the Cold War, the United States, the Russian Federation, France and the United Kingdom started removing all non-strategic and many strategic forces from alert status and adjusted the readiness levels of the remaining forces.

**Table 2.** Previous de-alerting initiatives and partial de-alerting measures\*

Year	De-alerting initiative	Partial de-alerting measure
1991	<ul style="list-style-type: none"> <li>• US declares that all strategic bombers will stand down from alert.</li> <li>• Soviet Union announces that strategic bombers will not be kept on combat alert and their weapons would be stored in military depots.</li> <li>• US declares that non-strategic naval nuclear weapons will be removed from naval vessels and anti-submarine aircraft and stored on land.</li> <li>• UK announces that the Royal Navy will no longer routinely carry nuclear weapons on its ships.</li> </ul>	
1992	<ul style="list-style-type: none"> <li>• Russian Federation declares that non-strategic warheads for ships, submarines and aircraft will be removed and placed in central storage.</li> <li>• Russian Federation declares that air-defence warheads will be removed from operational forces and concentrated at central bases.</li> </ul>	<ul style="list-style-type: none"> <li>• US proposes to download ICBMs to single-warhead configuration and reduce the number of warheads on SSBNs by one third.</li> <li>• Russian Federation declares that SSBN patrols had been cut by half and further reductions would occur.</li> </ul>
1994		<ul style="list-style-type: none"> <li>• US NPR decides that TLAM/N will be retained for deployment on SSBNs but stored on land.</li> </ul>
1995		<ul style="list-style-type: none"> <li>• NATO reduces the alert level of DCAs so their nuclear readiness is measured in weeks rather than in minutes.</li> </ul>



Year	De-alerting initiative	Partial de-alerting measure
1997		<ul style="list-style-type: none"> <li>• US Air Force B-1B is “de-nuclearized” but retained in a “Nuclear Rerole Plan” to return to nuclear mission in six months if necessary.</li> </ul>
1998		<ul style="list-style-type: none"> <li>• UK declares that only one SSBN with 48 warheads would be on deterrent patrol, down from up to two SSBNs with 48 warheads each.</li> <li>• UK declares that SSBNs on patrol are at a “notice to fire” measured in days rather than the few minutes’ quick reaction alert sustained during the Cold War.</li> </ul>
2002		<ul style="list-style-type: none"> <li>• NATO further reduces the readiness requirements for DCAs so it is now being measured in months instead of weeks.</li> </ul>
2005		<ul style="list-style-type: none"> <li>• US SSBNs in the Pacific downloaded from an average of six to four warheads per SLBM, with capability to upload if necessary.</li> <li>• The US begins downloading of ICBMs to single-warhead configuration with capability to upload if necessary.</li> </ul>
2006		<ul style="list-style-type: none"> <li>• France declares that it has reduced the number of warheads on some SLBMs.</li> </ul>
2010		<ul style="list-style-type: none"> <li>• The US NPR decides to “de-MIRV” the ICBM force; a capability to re-MIRV will be retained.</li> <li>• UK declares that the number of warheads on the SSBN on patrol would be reduced from 48 to 40.</li> <li>• UK declares that the number of SLBM tubes on each SSBN would be reduced from 16 to no more than eight.</li> </ul>

Year	De-alerting initiative	Partial de-alerting measure
<p>* A de-alerting initiative is defined as a removal of nuclear warheads from a delivery vehicle as part of an official de-alerting announcement. A partial de-alerting measure is defined as a reduction of warheads on an alert delivery vehicle that retains an upload capability, or a reduction of the operations of that delivery vehicle in a way that reduces the number of deployed alert warheads, or the time it would take to launch them.</p> <p>Note: DCA = dual-capable aircraft; TLAM/N = nuclear Tomahawk land-attack missile.</p>		

## STRATEGIC WEAPONS

On 27 September 1991, US President George H.W. Bush ordered the immediate stand-down of all US strategic bombers from alert and the offload of non-strategic nuclear weapons from ships and submarines. Furthermore, in early 1992, President Bush informed the Congress that he had proposed downloading all ICBMs to a single warhead each and offered to reduce the number of warheads on SSBNs by one third.<sup>58</sup>

The Russian Federation followed suit with reciprocal initiatives, and operations of some strategic systems were significantly curtailed due to financial constraints. For example, all Russian bombers were taken off nuclear alert and their nuclear weapons stored in “military depots”. Although not officially described as partial de-alerting, field deployments of mobile ICBMs were also reduced from Cold War levels, and the number of SSBN alert patrols plummeted until they ended altogether in 2002.<sup>59</sup>

In 1997, the United States undertook an interesting strategic de-alerting measure (although it was not officially characterized as such at the time) by de-nuclearizing the B-1B bomber. The aircraft had already been removed from day-to-day alert in 1992, but in 1997 the B-1B was removed from the nuclear strike plan and dedicated entirely to conventional operations. Yet the Air Force was tasked to retain the B-1B in a “Nuclear Rerole Plan” designed to allow the aircraft to be returned to the nuclear mission within six months if necessary.<sup>60</sup>

Many of the reductions in alert forces in the 1990s were an indirect result of reductions of strategic delivery vehicles required by arms control treaties. In March 1998, at a time when the US nuclear weapons stockpile included 10,800 warheads and 6,300 strategic warheads, STRATCOM Commander General Eugene Habiger said the United States had “a little

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over 2,300 nuclear weapons on alert". Under START II, there would be less than 1,000 nuclear weapons on alert, and under START III there would be less than 700, he said.<sup>61</sup> Those numbers indicate about one third of US strategic warheads on alert under successively reduced force levels.

One year later, after he retired as STRATCOM Commander, General Habiger stated in a television interview that the Russian Federation at the end of the Cold War had "12,000 [strategic] nuclear weapons, most of those on alert ... . Today, under START I, the Russians have about 2,000 nuclear weapons on alert [out of a total of 6,100 strategic warheads that year]. Under START II [out of 3,000–3,500 deployed strategic warheads], they'll be down to about 1,000 nuclear weapons on alert. Under START III, if all goes [as planned, that number will] be around 700 nuclear weapons".<sup>62</sup>

The 2001 NPR determined that warheads offloaded from delivery systems as part of the 2002 Moscow Treaty<sup>63</sup> would be placed in a Responsive Force of active reserve warheads that could be uploaded to increase warhead loading if necessary. Although not formally characterized as a de-alerting measure, it certainly appeared to be so, which resulted in the following notable statement during the Pentagon's briefing on this measure:

Q: When you talk about taking warheads off of the operationally deployed force, but keeping them available for return, are you effectively saying that they're going to be de-alerted?

J.D. Crouch [Assistant Secretary of Defense for International Security Policy]: De-alerting usually refers to taking off alert the weapons platforms that you have decided to retire. All right? So in this context, no, because the—basically we're actually—and those, of course, could be brought back up to alert in a few minutes to, you know, maybe a few hours. What we're talking about is a responsive capability that would take, at the very least weeks but likely months and even years to be able to regenerate—would not be something that you would respond, let's say, under a tactical threat. It would be a major change in the security environment, for example.<sup>64</sup>

In this case, this senior Pentagon official apparently thought de-alerting only concerned taking off alert delivery vehicles that were also scheduled for retirement—even though US strategic bombers remained operational even after being removed from alert in 1991. Several decisions in the 2001 NPR to reduce the number of warheads on the alert force were not explicitly characterized as partial de-alerting measures—even though

they constituted a significant capability to increase the number of alert warheads on delivery vehicles in a crisis.

One of the decisions in the 2001 NPR was to implement plans made during the START II negotiations to phase out the MX/Peacekeeper ICBM. As this 10-warhead alert ICBM was phased out between 2003 and 2005, its alert mission was taken over by Trident II D-5 missiles being introduced in the Pacific. "The elimination of the Peacekeeper ICBM will be phased to correspond with the introduction of the Trident II (D-5) SLBM in the Pacific. As they are eliminated, those Peacekeeper missiles remaining during the elimination process will be kept on alert to provide a necessary contribution to the U.S. portfolio of capabilities".<sup>65</sup> As the D-5 was introduced in the Pacific, the warhead loading was reduced from six to four to prepare to meet the warhead limit of the Moscow Treaty and possibly to take advantage of the greater accuracy of the new missile.<sup>66</sup>

Another part of the alert-warhead reorganization was that nearly all of the Minuteman III ICBMs were downloaded to single-warhead configuration between 2005 and 2009, a process that involved replacing W62 warheads with single-warhead W87s on part of the ICBMs and retaining W78 warheads on the rest. Nearly all of the W78-equipped ICBMs were downloaded to single-warhead configuration, but about 25 remained MIRVed.<sup>67</sup>

That will change in the near future as a result of the Obama administration's 2010 NPR that decided that the "United States will 'deMIRV' all deployed ICBMs, so that each Minuteman III ICBM has only one nuclear warhead".<sup>68</sup> Yet even this decision, according to US Air Force officials, will still retain a W78 upload capability to re-MIRV if necessary.<sup>69</sup>

The United Kingdom has also taken initiatives to reduce the operational readiness of its strategic nuclear forces. The 1998 Strategic Defence Review announced that only one SSBN with 48 warheads would be on patrol at any given time, down from up to two SSBNs with 48 warheads each. Moreover, the SSBN on patrol would "routinely [be] at a 'notice to fire' measured in days rather than the few minutes' quick reaction alert sustained throughout the Cold War".<sup>70</sup> Over the next few years, the government plans to reduce the number of warheads on each SSBN from 48 to 40 and the number of operational missiles from 16 to no more than eight.<sup>71</sup>

Likewise, French initiatives to reduce the operational readiness of nuclear weapons involve reducing the number of SSBNs on patrol from two to

one (although a second boat could be deployed on short notice).<sup>72</sup> Furthermore, President Jacques Chirac declared in 2006 that “the number of nuclear warheads has been reduced on some of the missiles in our submarines” to improve flexibility against regional adversaries.<sup>73</sup> According to the French government, “reductions in alert levels have effected both the forces’ response times and the number of weapons systems”.<sup>74</sup>

## NON-STRATEGIC WEAPONS

Important de-alerting initiatives and partial de-alerting measures have also involved non-strategic nuclear warheads. Most of these were initially de-alerted in the early 1990s and then later retired, but significant numbers have been retained in de-alerted status since.

The initial non-strategic de-alerting initiative (although it was not characterized as such officially) was the US announcement on 27 September 1991 to offload all non-strategic nuclear weapons from ships, attack submarines and maritime aircraft.<sup>75</sup> While nearly all of these weapons have since been retired, it was decided in 1994 to retain the nuclear Tomahawk land-attack sea-launched cruise missile (TLAM/N) for attack submarines but store them on land in a posture that would have required re-alerting.<sup>76</sup>

The Soviet Union reciprocated by announcing on 5 October 1991 that tactical naval nuclear weapons from ships, submarines and aircraft would be removed from delivery vehicles and stored in centralized depots (some were to be eliminated). Air-defence nuclear weapons would also be removed from operational forces and concentrated at central bases (some were to be eliminated).<sup>77</sup>

Air-delivered weapons were also taken off alert. Following completion of the withdrawal of US ground-launched and naval nuclear weapons from Europe in 1993, NATO declared that these reductions had been accompanied by a relaxation of the remaining dual-capable aircraft (DCA). J. Gregory L. Schulte, Director of NATO’s Nuclear Planning Directorate, said in 1993: “With the disappearance of an immediate, overwhelming threat, NATO no longer needs sub-strategic forces planned and postured to react at a moment’s notice”.<sup>78</sup>

In 1995, “in a first major step of relaxation, the readiness posture of dual-capable aircraft was greatly reduced, so that nuclear readiness was measured in weeks rather than in minutes. In 2002, in a second step, the readiness requirements for these aircraft were further reduced and are

now being measured in months".<sup>79</sup> Under current readiness plans, US and allied DCAs are required to maintain the ability to go on alert for nuclear operations within a 30-day, 180-day or 365-day period.<sup>80</sup>

Unlike the naval non-strategic weapons, which in the case of US weapons were withdrawn to the United States, the de-alerting of the DCAs did not involve removal of nuclear bombs from the bases (although some reductions took place). In fact, as naval weapons were shipped back to the United States, the air force was completing installation of new underground weapons storage vaults at 13 bases in six NATO countries. Although some of these bases were later closed or lost the nuclear mission, five continue to store nuclear weapons inside protective aircraft shelters a few metres below the wings of the de-alerted aircraft.<sup>81</sup>

In summary, the list of de-alerting initiatives and partial de-alerting measures that have reduced the number and readiness of nuclear alert forces is long and comprehensive. The majority of these efforts have been made by the United States and the Russian Federation, although the United Kingdom and France have followed suit. The United Kingdom first offloaded its non-strategic naval weapons from the fleet and later retired them, and air force bombs have also been scrapped.<sup>82</sup> France at some point offloaded nuclear weapons from its aircraft carrier.<sup>83</sup>

What remains of US and Russian forces more than two decades after the end of the Cold War are two comparable alert nuclear postures with key differences. Whereas the United States deploys relatively few warheads on its ICBMs, they are all on very high alert and there are more missiles with a significant upload capability. The Russian Federation deploys a maximum number of warheads on each ICBM at a high readiness level, but has fewer missiles and little if any upload capability.

For SSBNs the United States deploys a large number of submarines each with a large number of missiles at a medium (overall) readiness level with a relatively large number of warheads and a large upload capability. The Russian Federation deploys a small number of submarines with fewer missiles and fewer warheads with little upload capability.

## **ARGUMENTS FOR AND AGAINST DE-ALERTING**<sup>84</sup>

Advocates and opponents of de-alerting and reducing operational readiness of nuclear forces focus their arguments on the risks of having nuclear weapons on alert or taking them off alert. Advocates of de-alerting

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measures argue that the consequences of inadvertent launch, however unlikely, are so significant that they outweigh any benefits that may come from having nuclear weapons on alert in the current global strategic context, and that alert nuclear force postures are an outdated Cold War relic that is inappropriate for today's security environment.<sup>85</sup>

Opponents argue that the risk of inadvertent launch is exaggerated and less than the risks posed by de-alerting, because reducing operational readiness of nuclear forces would increase crisis instability by triggering a re-alerting race in a period of international tension that could make nuclear use more likely.<sup>86</sup> In addition, some of the debate has focused on whether the nuclear forces deployed at a high readiness level can be characterized as on "hair-trigger" alert or not. As noted above, the argument for retaining alert strategic nuclear forces to more effectively wage thermonuclear war is inconsistent with the obligations of the five original nuclear-weapon states (P-5) under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), and with pledges made to reduce the role of nuclear weapons and put an end to Cold War thinking.

Proposals for de-alerting emerged quickly after the end of the Cold War, and immediately the concern over a re-alerting race was raised. Two years before the US decision to unilaterally offload nuclear weapons from the US surface fleet, Chairman of the Joint Chiefs of Staff Colin Powell warned in a letter to Thomas Cochran of the Natural Resources Defense Council that "loading such weapons in a period of rising tensions could send an unintended and possibly exaggerated signal to observers".<sup>87</sup>

However, two years later, none of that apparently mattered, and General Powell instead ordered the de-alerting (offloading) of the entire US nuclear surface fleet, even though both the United States and the Russian Federation at the time retained thousands of non-strategic nuclear weapons in their arsenals. While nearly all of the US non-strategic naval nuclear weapons have since been retired, as noted above, a decision was made at the time to retain TLAM/Ns for attack submarines but store them on land in a posture that would have required re-alerting.

Likewise, as also noted, after the B-1B bomber was officially "de-nuclearized" in 1997, the US Air Force retained the aircraft in a "Nuclear Rerole Plan" intended to return the bomber to the nuclear mission within six months if necessary, a nuclear reconstitution process that would have been highly visible to the Russian Federation (see p. 12).

Finally, concerns about a re-alerting race also did not prevent NATO from de-alerting all its remaining nuclear-tasked DCAs and significantly reducing their combat readiness level. As noted, the nuclear bombs are currently stored in underground vaults underneath the aircraft inside protective aircraft shelters and re-alerting could hypothetically take place out of sight, but related activities would probably make re-alerting detectable to the Russian Federation.

In fact, the early 1990s were characterized by a willingness to look beyond many of the hypothetical worst-case scenarios in changing alert postures for nuclear forces in favour of taking advantage of the political opportunities, and such initiatives were rapidly enacted and did not get stuck in lengthy and complicated negotiations. Similar to the attitude today that prioritizes negotiated arms agreements, NATO in the 1990s wanted to set preconditions on the elimination of nuclear artillery shells from Europe on the outcome of negotiations with the Soviet Union, but in his unilateral Presidential Nuclear Initiative (PNI) of September 1991, President George H.W. Bush explicitly chose to bypass the negotiations process. “But starting these talks now would only perpetuate these systems, while we engage in lengthy negotiations”.<sup>88</sup> This is important because the decision was made at a time when the world was much more uncertain than today, with the recent break-up of the Soviet Union and thousands of nuclear weapons remaining in the newly independent countries of Belarus, Kazakhstan and Ukraine.

After the US and Russian PNIs in 1991 and 1992, Russian President Boris Yeltsin proposed in 1993 that the Russian Federation and the United States de-target their strategic missiles on a day-to-day basis. Although not strictly a de-alerting initiative, this proposal led to a de-targeting agreement at the January 1994 Moscow Summit that targeted alert missiles on open ocean areas instead of at each country.<sup>89</sup> The United Kingdom followed up with a similar de-targeting agreement with the Russian Federation one month later,<sup>90</sup> and France announced in 1997 that its nuclear weapons were no longer aimed at the Russian Federation<sup>91</sup> and in 2008 added that, “none of our weapons are targeted against anyone”.<sup>92</sup> China also reached de-targeting agreements with the Russian Federation in 1994, and the United States in 1998, and in November 2009 reaffirmed the de-targeting policy in a joint US–Chinese statement.<sup>93</sup> All five nuclear-weapon states party to the NPT declared at the 2000 NPT Review Conference: “none of our nuclear weapons are targeted at any State”.<sup>94</sup> Disturbingly, the de-targeting



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pledge was not included in the joint statement made by these countries at the 2010 NPT Review Conference.<sup>95</sup>

De-targeting is not the same as de-alerting, however, because it does not change the deployment of weapons and because target coordinates can be reloaded within minutes. Indeed, STRATCOM accepted de-targeting as “an easy-to-reverse action with significant political potential *but no deterrent or war fighting impact* ... [that] would mitigate consequences of accidental launch and further disengage from confrontational postures of the Cold War” but allow nuclear missiles to “remain on alert, with the ability to return to [*Single Integrated Operational Plan*] targets within minutes”<sup>96</sup> (emphasis added).

The de-targeting agreement was acceptable to the nuclear war-fighters because it did not require changing the alert posture. But the agreement and the sweeping initiatives of the early 1990s triggered a series of studies conducted by US military and defence contractors which cautioned about moving forward with some of the ideas. In the early 1990s, for example, the US Joint Staff, STRATCOM, the US Air Force and the US Navy undertook a collaborative study of approximately 100 de-alerting ideas. Although details are still classified, some of these ideas reportedly were implemented; others were not.<sup>97</sup>

The 1994 NPR also examined the issue of alert nuclear forces in the context of the changing US–Russian relationship. Although the NPR failed to produce a final report, the process generated several papers and studies that formed the basis of the NPR decisions. One of these was a white paper produced by STRATCOM’s Strategic Advisory Group for Commander Admiral Henry Chiles in July 1994 that examined US nuclear strategy and force structure beyond 1994 to assist in building a stable relationship with the Russian Federation. Because it found “no evidence that Russia has abandoned traditional launch options”, the paper concluded that there was a “need to not abandon the core of U.S. targeting policy, nor its strategic rationale: to threaten that which the Russian leadership values most and to limit damage to the extent possible should deterrence fail”. Instead, the United States should adopt a “hedging” strategy that included the ability to “reconstitute” strategic delivery platforms fast enough to counter a resurgent Russian threat, perhaps in as little as a few weeks to months. “This is not a proposal for standing down U.S. alert forces unilaterally”, the paper concluded up front.<sup>98</sup>

Following completion of the NPR, publication in the United States of in-depth non-governmental studies that supported de-alerting nuclear weapons<sup>99</sup> triggered a series of studies from US government institutions that reiterated and refined the objections from the early 1990s to de-alerting nuclear forces. In April 1998, for example, a study by the Defense Special Weapons Agency—formerly the Defense Nuclear Agency and currently known as the Defense Threat Reduction Agency—determined that de-alerting incurred risks and would likely be as difficult as an arms control agreement to negotiate. Moreover, the study concluded that the Russian Federation was not particularly concerned about the loss of security and the surety of its nuclear forces, or the state of its early warning systems, and therefore was uninterested in de-alerting.<sup>100</sup>

Four months later, in August 1998, Lawrence Livermore National Laboratory published *De-alerting of U.S. Nuclear Forces: A Critical Appraisal*, which critiqued de-alerting proposals and assessed the dangers of accidental, unauthorized or unintended use of nuclear weapons. The study concluded that “de-alerting nuclear forces would be extremely destabilizing, principally because it would increase the value to an opponent of launching a first strike”.<sup>101</sup> The conclusion appeared to assume the United States would de-alert without the adversary de-alerting as well.

The Pentagon’s Defense Science Board Task Force on Nuclear Deterrence in October 1998 set up a list of perceived reasons for de-alerting against a list of “realities” that dismissed de-alerting and concluded that before any additional de-alerting be made, the United States first needed to define a set of objectives that improve stability, and undertake negotiations for agreed mutual actions. Although unilateral US de-alerting initiatives of strategic bombers and naval non-strategic nuclear weapons had been met by reciprocal Russian initiatives, the Board concluded that unilateral US actions were counterproductive and recommended: “Before moving to additional de-alerting, the National Security Council should require in-depth, convincing rationale on how such measures benefit stability”.<sup>102</sup>

A Sandia National Laboratories study published in March 1999, *De-alerting Strategic Ballistic Missiles*, examined the technical merits of strategic ballistic missile de-alerting measures and evaluated a variety of possible measures for silo-based, land-mobile and submarine-based missiles.<sup>103</sup> This study was more interesting because it examined options for de-alerting rather than simply dismissing it.

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By this time, however, the conclusions of these (and presumably many others yet to be declassified) studies had risen to the top of the Pentagon and during testimony before the US Congress in April 1999, in a critical moment for the effort to de-alert US nuclear forces, the Pentagon formally rejected de-alerting as unverifiable and dangerous. “We have studied a number of options for ‘dealerting’”, Assistant Secretary of Defense for Strategy and Threat Reduction Ted Warner told the lawmakers. “Many of these are not verifiable, an essential requirement for increased strategic stability. Those measures that could be verifiable, such as the removal of warheads from missiles, were seen to be highly destabilizing in a crisis in that steps to realert these forces could very easily set off a dangerous chain of events”, he warned.<sup>104</sup>

In the United Kingdom, the Labour government’s Strategic Defence Review from July 1998 also responded to the de-alerting debate by rejecting proposals to take submarines off deterrent patrol and remove warheads from their missiles, storing them separately ashore. The government concluded that “neither step would be compatible in current circumstances with maintaining a credible minimum deterrent with a submarine-based nuclear system”. Even though British nuclear strategy involves increasing the number of SSBNs on patrol in a crisis, the review concluded that ending continuous deterrent patrols “would create new risks of crisis escalation if it proved necessary to sail a Trident submarine in a period of rising tension or crisis”. The government pointed out that removing warheads from missiles “would also add a new vulnerability to our deterrent posture” given Britain’s reliance on a single nuclear weapon system. “It could force a government into earlier and hastier decision making if strategic circumstances were to deteriorate”, the review warned. Either step, the government concluded, “would undermine the stabilising role that Britain’s nuclear deterrent forces would otherwise play in a developing crisis”.<sup>105</sup>

The analytical bases for these conclusions have never been made public but it appears that the core argument is that de-alerting could lead to a destabilizing “re-alerting race” in a crisis where the United States or the Russian Federation—having previously de-alerted their nuclear forces by removing warheads from missiles or other measures to delay response time—detects that the other is secretly re-alerting their nuclear forces in what appears to be preparations for a first strike, and consequently decides to re-alert its forces as well, thus potentially creating a re-alerting

race during which one of the countries might decide to launch nuclear weapons first.

Despite this concern about re-alerting in a crisis, however, the George H.W. Bush administration's Nuclear Posture Review decided to offload significant numbers of nuclear warheads from alert missiles and place them in a Responsive Force reserve or "hedge" with the explicit purpose to provide "the option for [the] leadership to increase the number of operationally deployed forces in proportion to the severity of an evolving crisis".<sup>106</sup> Apparently, some level of de-alerting is acceptable and does not create potential crisis instability issues.

Such partial or gradual de-alerting appealed to the author of a second Sandia study, *De-alerting and De-activating Strategic Nuclear Weapons*, published in April 2001, which established a set of criteria for a stable de-alerting regime. Although it concluded that it could not find de-alerting measures that met the criteria, the study nonetheless found that some de-alerting measures have promise as de-activation measures for weapons that are due for elimination under arms control treaties. Moreover, once these systems are deactivated, the study concluded, a considerable part of the perceived need to keep nuclear forces on high alert as a survivability hedge would be reduced.<sup>107</sup>

The idea of letting reductions do the de-alerting was also a central theme of a paper written by two analysts with the US defence contractor Science Applications International Corporation (SAIC) in 2009. The paper concluded that although it is theoretically possible to de-alert, doing so would be difficult and expensive. More importantly, the paper questioned whether "the strategic relationship between the United States and Russia [is] such that de-alerting is appropriate", and concluded that "There are several indicators that seem to imply that de-alerting does not yet make sense". Instead, the paper recommended keeping "appropriate amounts of force promptly-alerted and seeking incremental retirement of forces in reciprocal fashion at a pace that reflects the improvement in the underlying United States–Russian relationship".<sup>108</sup>

The conclusion of a US alert posture that is driven by nuclear planning against the Russian Federation appears to contradict the statement in the George W. Bush administration's NPR that "the force size that we have here was not driven by an immediate contingency involving Russia".<sup>109</sup> Yet the SAIC paper, according to one former official, played an important role

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in shaping the Joint Chiefs of Staff position on de-alerting for the 2010 NPR, which decided to retain the existing alert posture.

The US Strategic Posture Commission Report published at the same time as the SAIC paper rejected—like so many other studies—President Obama’s characterization of the posture as being on “hair-trigger” alert. Yet it acknowledged that nuclear forces postured for prompt launch represent risks that need to be addressed. The report recommended increasing decision time and information available for US and Russian decision makers to avoid hasty launch decisions. Specifically, the report recommended the US President should ask STRATCOM to give him “an analysis of factors affecting the decision time available to him as well as recommendations on how to avoid being put in a position where he has to make hasty decisions”. The Commission added that it was “even more concerned about the possibility that the president of Russia might authorize a launch as a result of decision made in haste that is deliberate but mistaken”. It recommended that the Russian warning systems should be improved, efforts to establish a joint US–Russian warning centre should be revived, and a crisis hotline should be re-established.<sup>110</sup>

Despite disagreement about the details of de-alerting and whether the current posture should be called “hair-trigger” or not, most seem to agree that it is beneficial to reduce alert rates to some extent, increasing decision time to avoid hasty launch decisions, and improve safeguards intended to make inadvertent launch even less likely than it is today. Indeed, the series of de-targeting declarations made by some of the nuclear-weapon states in the 1990s, according to which target coordinates in nuclear weapons’ guidance systems are aimed at broad ocean areas instead of actual targets, acknowledge the risk of having nuclear weapons on alert.

The “open-ocean targeting” practice was reaffirmed by the 2010 NPR, which also acknowledged risks associated with nuclear alert postures by concluding that “efforts should continue to diminish further the possibility of nuclear launches resulting from accidents, unauthorized actions, or misperceptions and to maximize the time available to the President to consider whether to authorize the use of nuclear weapons”.<sup>111</sup>

At the same time, however, the NPR decided to retain the existing alert posture of keeping nearly all ICBMs on alert, a large number of SSBNs at sea, and bombers off alert. In explaining the reason for this choice, the NPR stated that it “considered the possibility of reducing alert rates for ICBMs and at-sea rates of SSBNs, and concluded that such steps could

reduce crisis stability by giving an adversary the incentive to attack before ‘re-alerting’ was complete”.<sup>112</sup>

Yet the NPR also reaffirmed the posture of keeping large numbers of nuclear weapons in reserve for potential upload in a crisis, a continuation of the “hedge” posture described in the NPRs from 1994 and 2001, whereby the reserve “is intended to provide a capability to augment the operationally deployed force to meet potential contingencies” and provide “the option for leadership to *increase the number of operationally deployed forces in proportion to the severity of an evolving crisis*”<sup>113</sup> (emphasis added).

According to the 2010 NPR, the bombers and SSBNs would be the preferred platforms for this upload capability.<sup>114</sup> In addition to the four to five SSBNs currently on alert, in a crisis the remainder of the SSBN fleet would likely be “surged” to maximize the number of sea-based nuclear weapons. As STRATCOM Commander General Robert Kehler explained in July 2012, the 12 new SSBNs planned for the future will provide “the right capacity we think for warheads that we are going to have survivable on a day-to-day basis *that we could surge in a crisis*”<sup>115</sup> (emphasis added). The bombers would be re-equipped with cruise missiles and bombs and dispersed to alternative bases, operations that would be highly visible to an advanced adversary.

Since the NPR, the Obama administration has undertaken a post-NPR review to examine, among other factors, “potential changes in ... alert postures that are required for effective deterrence”.<sup>116</sup> The results are not expected until early 2013, but “At this time”, Principal Deputy Under Secretary of Defense for Policy Jim Miller told Congress in November 2011, “I do not anticipate any major changes in the alert posture for U.S. strategic forces”.<sup>117</sup> Moreover, a report on strategic deterrence and mutual assured stability produced by the International Security Advisory Board for the US State Department in August 2012 does not address at all what kinds of nuclear alert postures are appropriate for mutual assured stability with the Russian Federation.<sup>118</sup>

In July 2012, a proposal backed by former STRATCOM Commander General James Cartwright to eliminate the ICBM force, partly due to limited utility against adversaries other than the Russian Federation, triggered the following defence of alert nuclear forces during a congressional hearing:

This is an example, I think, of conflating issues of deterrence and issues of war-fighting. Remember that deterrence is all about withholding the weapon—not about using the weapon. And I’m looking at the

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ICBM as a withheld weapon for the purposes of deterrence. And as a withheld weapon, *it gives the President the most time to consider options because it is prompt.*<sup>119</sup> (Emphasis added.)

According to this line of thought, presented by Keith Payne, a member of the Strategic Advisory Group to STRATCOM and as former Deputy Assistant Secretary of Defense a primary architect of the 2001 NPR, nuclear alert forces *increase* decision time, a conclusion that appears to be the opposite of what General Cartwright and others argue in support of decreasing the operational readiness of nuclear forces: the “short-fused Minuteman and strategic submarine alert forces, together with the supporting rapid reaction command system, *impose a severe constraint on presidential deliberation and choice during a crisis or conflict*”<sup>120</sup> (emphasis added). According to the group:

The timelines and deadlines for existential decisions on both sides can be exceedingly short. U.S. teams in early warning centers responsible for assessing whether missile attack indications are real or false, a situation that happens daily, may be allowed only three (3) minutes to report their findings. In an emergency, senior U.S. nuclear commanders convened by phone to brief the President on his nuclear strike options and their consequences may be allowed as little as thirty (30) seconds to give the briefing. The President, if led to believe the attack indications are real, would have at most twelve (12) minutes to decide whether and how to respond with nuclear weapons or else risk nuclear command-control decapitation and the decimation of U.S. retaliatory forces. Upon receipt of a launch order sent without prior warning and preparation, U.S. missile launch crews in underground command posts and submarines would be allowed only two (2) and twelve (12) minutes, respectively, to get their missiles out of their silos and tubes on their thirty (30) minute or shorter flights to targets on the other side of the planet. The missiles in peacetime are always ready to fly—silo-based missiles are armed, fueled, targeted and will launch instantly upon receipt of a short stream of computer signals from their launch crews. Submarine-based missiles are nearly as ready. Russia’s alert posture is comparably poised for equally rapid operations.<sup>121</sup>

In conclusion, the argument that nuclear powers would race to re-alert their de-alerted nuclear forces in a crisis and that this could lead to instability and prompt one side to launch a first strike is widely used by opponents of de-alerting and has become the most frequently used argument against de-alerting. But as shown in the following section of this study, the re-alerting race can be considered a “straw man” argument, in part because existing highly alerted postures already involve plans for

increasing the alert rate and “generating” substantial numbers of nuclear forces in a crisis, and because striking first in a crisis situation could not give either side confidence that it could decapitate the other side’s nuclear forces to prevent significant retaliation.

A US Department of Defense (DOD) report obtained under the Freedom of Information Act appears to confirm that conclusion. The report, which was sent to Congress in May 2012, concludes that the “only” Russian effort that could threaten strategic stability and the basic deterrence framework would be a disarming first strike that denied the United States the assured ability to retaliate against a significant number of Russian high-value targets. Such a disarming first strike, the DOD concludes, “will most likely not occur”.<sup>122</sup> Even if the Russian Federation decided to significantly increase its nuclear forces, the DOD concludes, it would have “little to no effect” on the US ability to launch a retaliatory strike, primarily because of the secured retaliatory capability deployed at sea on SSBNs.<sup>123</sup>

## **ANALYSIS OF NUCLEAR ALERT SCENARIOS**

An unclassified analysis of reducing the alert rates of nuclear forces must contend with the high level of secrecy that surrounds nuclear postures. Not only are details about the alert postures secret, but studies that analyse and are used to reject de-alerting proposals are also secret. Nevertheless, by combining open-source data with computer calculations, a sufficiently clear picture emerges that the main argument against de-alerting—the “re-alerting race”—is in fact a “straw man”. Our characterization of opponents of de-alerting as “attacking a straw man” in this context is the false appearance of having refuted de-alerting proposals using assumptions that do not exclusively or necessarily apply to de-alerted nuclear forces. These incorrect assumptions are that the current nuclear forces of the United States and the Russian Federation would not undergo force generation in a crisis—which would be, effectively, no different than re-alerting—and that, even with a seemingly high probability of disarming an opponent, a pre-emptive nuclear strike during a period of force generation could be a rational decision. As will be shown, current nuclear force postures would involve substantial force generation in a crisis situation, and conducting a first strike brings with it unacceptable risks to the attacker even with grossly asymmetric nuclear alert levels.

Our criticism of the re-alerting race argument first focuses on the large numbers of strategic warheads that are off alert in the current military



postures of the United States and the Russian Federation, but would be “generated”—brought to launch-ready status—in a crisis. Such force generation would be readily visible from remote sensing data: many nuclear weapons would be brought to launch-ready status, and many nuclear weapons would thereby achieve invulnerability to attack (e.g., SSBNs deployed to sea, road-mobile ICBMs deployed to forests). If executed, current strategic force generation plans could be interpreted by the opponent as a looming intent to strike, and so trigger nuclear force generation on the other side. The opponents of de-alerting who put forward a hypothetical re-alerting race ignore the fact that this potential exists today. Therefore, if a re-alerting race is destabilizing in future de-alerted nuclear postures, logically it is just as destabilizing in today’s highly alerted postures.

As discussed above, the United States and the Russian Federation have rough parity in the total numbers of strategic weapons and warheads and alert warheads, but significantly there exists a disparity in the number of alert weapons favouring the United States. The nearly completely de-MIRVed US Minuteman III silo-based ICBMs are the cause of this disparity. This difference in the total number of alert weapons in the US and Russian nuclear postures introduces a disparity in the number of warheads required for a counterforce strike—this study finds that the Russian Federation would require almost twice as many warheads today to field a counterforce strike compared with the United States, and in fact the number of warheads required for a counterforce strike against the United States is greater than the total number of alert Russian warheads (see table 3, below). This situation can plausibly be appreciated as a strategic advantage by the United States, one that would be significantly increased by the uploading of “hedge” warheads onto ICBMs and SLBMs in a crisis, and from a Russian perspective could add brittleness to strategic stability. It is possible, but unknown, that this imbalance is what drives the Russian Federation’s current efforts to increase warhead loading of its ballistic missiles. It could also indicate that Russian nuclear strategy is less focused on counterforce than is the case for the United States.

Taking into account the current launch-on-warning capabilities of US and Russian alert forces, both sides could field a retaliatory strike of about 900–1,000 weapons each without further force generation. This is a very large number of nuclear strikes, between one and two orders of magnitude (10 to 100 times) larger than a devastating retaliation against urban targets—the so-called “countervalue” retaliation—that would ruin

either country. Despite the decades that have passed since the end of the Cold War, US and Russian nuclear forces are still numerically far within the realm of “overkill”. Therefore it is of interest to explore the scenario of taking all *current* US and Russian strategic nuclear forces off alert, in order to understand the consequences, in that scenario, of a surprise first strike by either side against the opponent’s nuclear forces. If the Russian Federation or the United States unilaterally decided to de-alert all nuclear forces today, would the other side no longer be deterred from executing a first strike if it could secretly generate missiles to alert status?

Based on ICBM silo survivability from a 2-on-1 strike<sup>124</sup> (which this study estimates is four times worse for the Russian Federation than for the United States based on the Stanford Kataev archive<sup>125</sup> data on Russian Circular Error Probable), this study calculates that if all current strategic nuclear forces were taken off alert, a retaliation of 37 Russian silo-based ICBMs warheads and 88 US silo-based ICBMs warheads could likely occur in response to a counterforce strike, since statistically this number would be expected to survive a surprise attack.<sup>126</sup> A summary table on alert forces, counterforce requirements, and retaliation levels is given in table 3 below.

**Table 3:** 2012 strategic forces—current alert levels

	United States	Russian Federation
Strategic weapons	524	408
Strategic warheads	2,694	2,547
Alert weapons	446	159
Alert warheads	921	893
Warheads estimated to be required to execute a counterforce strike	516	943
Estimated surviving alert warheads	921	893
Estimated surviving warheads all off alert	88	37

To model a retaliation with these numbers of surviving warheads, this study utilized the US DOD computer code HPAC5<sup>127</sup> to explicitly calculate casualties from a Russian retaliation of 37 strategic warheads targeted at

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US cities following a US strike on Russian nuclear forces all off alert. Such calculations, employing the benchmarked weapons effects modelling and data of the US DOD, paint a stark picture of the horror and destruction from retaliation by low numbers of retaliating forces. An attack by 37 300kt warheads on US cities could cause upwards of 115 million casualties in the immediate aftermath of the attack. A US retaliatory strike with more warheads could cause even higher Russian casualties.

Our findings are clear that this level of retaliation alone is sufficient to deter an adversary from conducting a first strike, and that in fact de-alerting all strategic forces today would not make a surprise counterforce strike still anything less than suicide for the attacker, based on the expectation of a countervalue retaliation. Thus not only is the re-alerting race very much an aspect of current nuclear postures of the United States and the Russian Federation, but in fact simply taking all forces off alert would still leave deterrence robust, in that deterrence relies on assured retaliation.

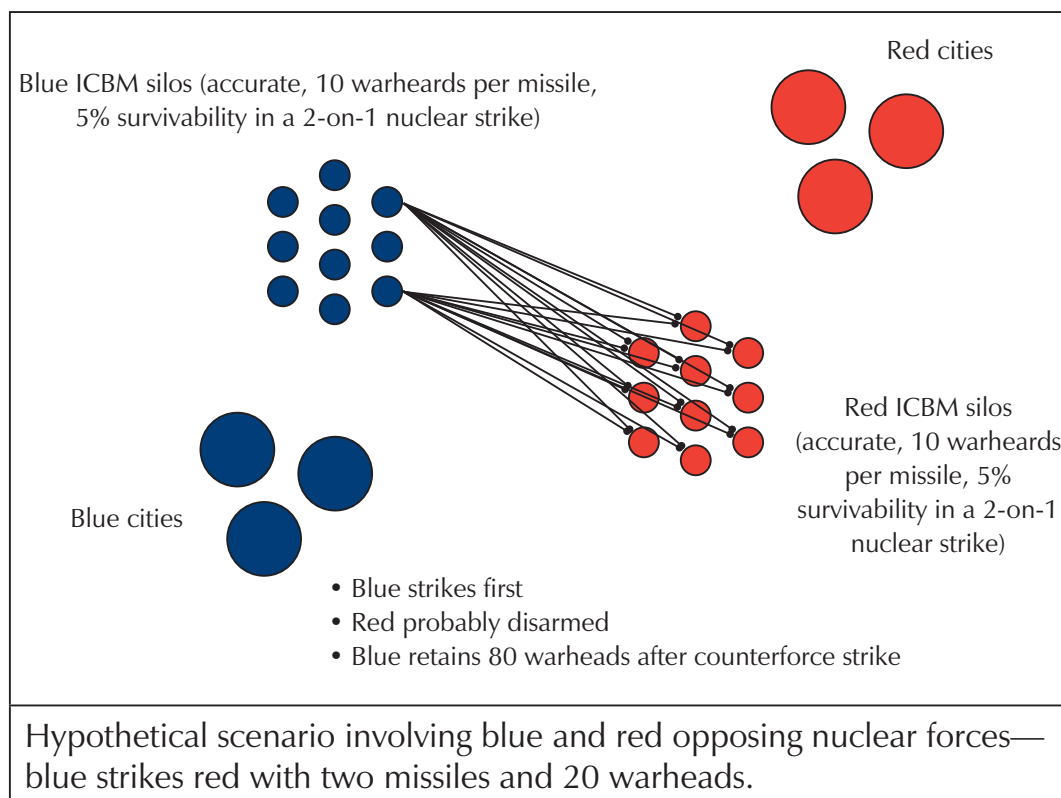
Our second, and more important, criticism of the re-alerting race argument against de-alerting is the observation that nuclear postures can be structured to prevent crisis instability while having forces normally off alert. Indeed, some configurations of strategic nuclear forces are less stable in a crisis and would be more prone to a re-alerting race. But our findings are that the United States and the Russian Federation could reap the benefits of de-alerting while avoiding the risks; a stable deterrent whole can be built from vulnerable, de-alerted parts. Furthermore, even a configuration of opposing de-alerted forces that appears on the surface to be unstable has an underlying robustness, due to the destructive power of even a handful of high-yield nuclear explosions.

Consider a hypothetical red versus blue scenario of two opposing countries, each possessing only 10 silo-based ICBMs carrying 10 warheads each, for a total of 100 warheads on each side, all off alert. This study furthermore postulates a crisis situation between red and blue, and that both countries urgently bring their forces to launch-ready status. Opponents of de-alerting would view this hypothetical scenario as a classic example of the dangers of de-alerting due to the fact that one side would experience a strong inclination to strike first to disarm the opponent. As described above, current strategic nuclear forces of the United States and the Russian Federation are a mix of single-warhead and MIRVed missiles, targetable and non-targetable weapons systems. However, in this hypothetical example, this study considers only MIRVed, targetable weapons, assuming the 10 warheads on one missile could strike all of the

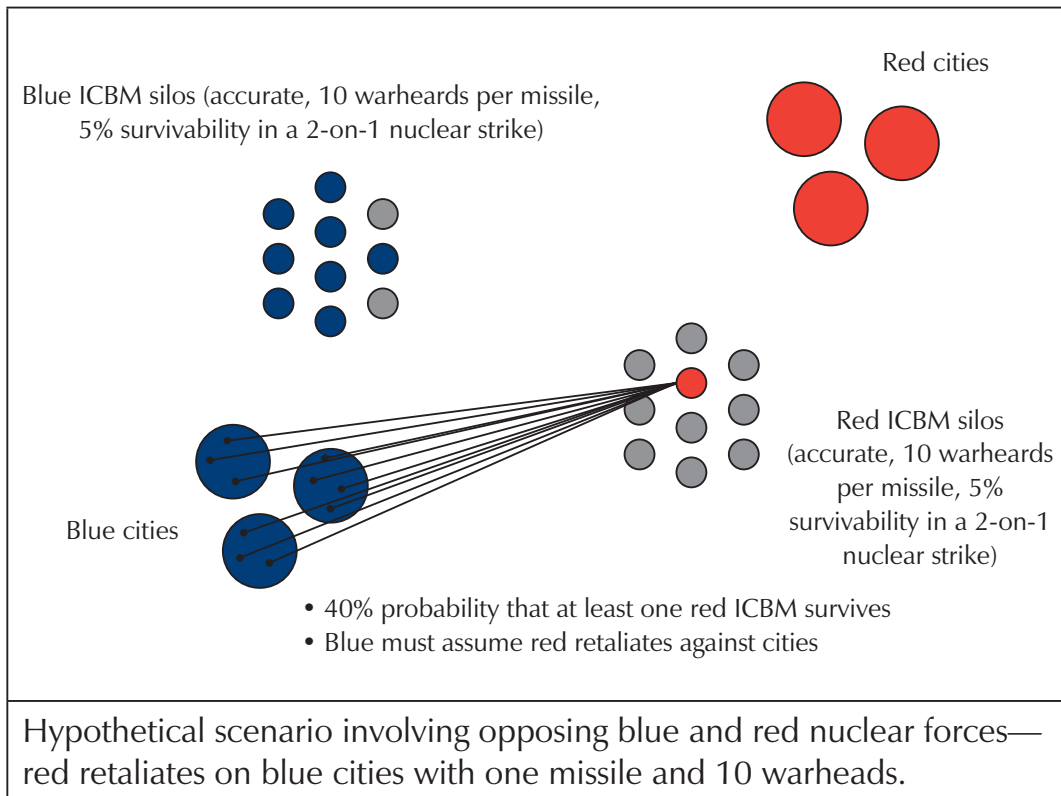
missiles of the opposing side. One side could strike to disarm the opponent while retaining a substantial fraction of nuclear weapons in reserve.

However, the laws of probability are such that even if red had a 95% chance of destroying each of blue's missiles in a first strike, blue would still have a 40% chance of being able to retaliate with at least one missile, holding 10 of red's cities at risk (the chance of all of red's missiles being destroyed would be  $0.95^{10} = 0.599$ ). Striking first even in this simplified hypothetical example of forces much smaller than current US and Russian forces, and smaller even than envisioned for the arms control process for decades to come, still brings with it unacceptable risk to an attacker from striking first. This scenario is illustrated in figures 1, 2 and 3, below.

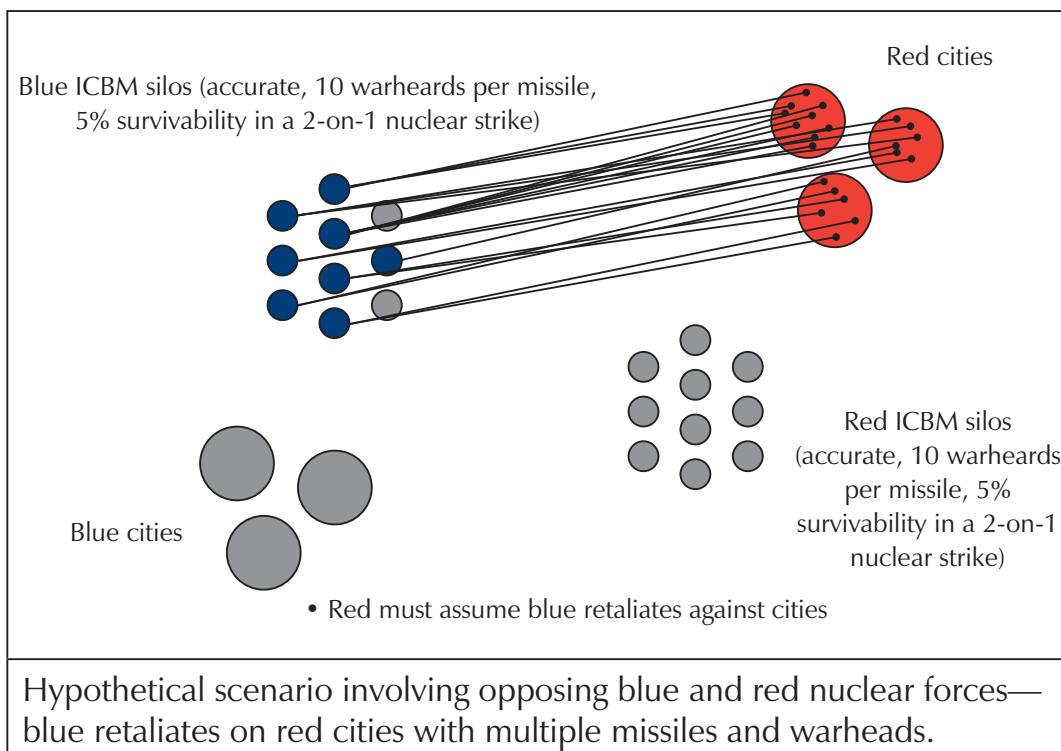
**Figure 1:** Red versus blue hypothetical re-alerting race: part 1



**Figure 2:** Red versus blue hypothetical re-alerting race: part 2



**Figure 3:** Red versus blue hypothetical re-alerting race: part 3



Consider first a phased approach to de-alerting, in which, for each side, lower-priority pieces of the nuclear deterrent forces are taken off alert as a first phase in a gradual approach to de-alerting (see annex). For the United States, this could be a fraction of Minuteman III ICBMs, and for the Russian Federation this could be the SS-19 ICBMs, slated for retirement in this decade. For this proposal, this study postulates strong de-alerting technical measures, with verified removal of warheads from missiles, and monitored storage at a centralized location—therefore bringing weapons to combat readiness would take days to weeks.

This study finds that if two thirds of the US Minuteman III ICBMs are de-alerted, and all the Russian SS-19s are de-alerted, then the previous summary table results (table 3) are changed to those presented below in table 4.

**Table 4:** 2012 strategic forces—phase I de-alert levels

	<b>United States</b>	<b>Russian Federation</b>
Strategic weapons	524	408
Strategic warheads	2,694	2,547
Alert weapons	185	127
Alert warheads	660	700

This change enhances the stability of deterrence by achieving a greater parity in alert *weapons* (missiles), thereby creating parity in what would be required for a first strike, while retaining parity in alert warheads and surviving alert warheads. Surviving alert warheads would still number some 700 strategic nuclear warheads, thus such an initial phase of de-alerting US and Russian forces is in fact not changing the strategic stability picture very much from what it is today; this would still very much be in the realm of “overkill”. However a small change to current postures would allow for a first phase of de-alerting, and by doing so the United States and the Russian Federation could establish a process for verification and monitoring of de-alerting that could be built upon for later steps in the de-alerting process. We describe in greater detail such a phased approach to de-alerting in the annex.

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## CONCLUSIONS

The United States, the Russian Federation, and to a lesser extent the United Kingdom and France, maintain large numbers of nuclear forces deployed at high levels of readiness capable of launching nearly 2,000 warheads on short notice—more nuclear warheads than held by all the other states in possession of nuclear weapons combined. Other than the United States, the Russian Federation, the United Kingdom and France, no other state argues that it needs to keep nuclear forces on alert for national security. The international community favours reducing the operational readiness of nuclear weapons and many retired military officials argue that doing so is possible with proper care and planning. Yet the nuclear establishments of the four nuclear-alert countries oppose de-alerting nuclear forces and argue that doing so would create crisis instability and be difficult and expensive to verify. Their arguments have so far largely managed to hold proponents of nuclear de-alerting at bay from effecting changes to alert nuclear postures.

In researching options for de-alerting nuclear forces, we reviewed a large number of studies conducted by US government agencies, defence contractors and non-governmental organizations. We have not been able to identify any official Russian studies. Nearly all the studies we reviewed were narratives where the authors discussed arguments for or against nuclear de-alerting. Many present practical measures that might work, while others dismiss them as too difficult to achieve or verify. The most important argument against reducing the operational readiness of nuclear forces is the claim that de-alerting would create crisis instability by triggering a race to re-alert that could prompt a nuclear-weapon state to launch its nuclear forces first. But almost none of the studies provided actual analysis of the crisis stability scenarios that opponents of de-alerting warn against. Indeed, as far as we could determine, studies that do contain such analysis are secret and their assumptions and scenarios unavailable for independent review and out of reach for public debate. Moreover, as we experienced in researching this report, some of those studies appear to be missing.<sup>128</sup>

The current nuclear alert posture, the Pentagon explains, “supports strategic stability through an assured second-strike capability. It ensures that, in the calculations of any potential opponent, the perceived gains of attacking the United States or its Allies and partners would be far outweighed by the unacceptable costs of the response”.<sup>129</sup> We find that the same objective

could be achieved with de-alerted nuclear forces. But it is not accurate to simply describe the requirement for the current alert posture based on a need for “an assured second-strike capability” because it is also based on a requirement to promptly destroy an adversary’s military forces before they can be used. There is simply no need to keep hundreds of nuclear warheads on alert unless the mission is to destroy an adversary’s military forces first or launch under attack. According to STRATCOM, “Our nuclear forces ... enable the United States to restore the military status quo ante, *trump the adversary’s escalation in a manner that improves the U.S. position in the conflict, or promptly terminate the conflict*”<sup>130</sup> (emphasis added).

Our analysis presented in this study finds that the basis for the arguments against de-alerting is questionable. In fact, we find that most opponents of de-alerting over-represent potential risks and difficulties of transitioning to a de-alerted posture, while under-representing the serious risk they acknowledge that alert nuclear forces create.

Even if all US ICBMs were removed from alert, the presence of SSBNs at sea would still be able to provide more than sufficient retaliatory capability to deter a nuclear attack on the United States or its allies. This would still be the case if none of the SSBNs were on alert.

Indeed, we find that even if all US and Russian nuclear forces were de-alerted and one side secretly re-alerted, the aggressor could not be confident in carrying out a disarming first strike because a sufficient number of highly capable forces would survive to provide a devastating retaliation.

A DOD report obtained under the Freedom of Information Act appears to confirm this conclusion by determining that even a Russian “decapitating” first strike with force levels significantly above the limits of the New START Treaty could not deny the United States the assured ability to retaliate against a significant number of Russian high-value targets, primarily because of the secured retaliatory capability deployed at sea on SSBNs.<sup>131</sup> Retaining that retaliatory capability, we assert, does not require that the SSBNs are on alert, only that a sufficient number are at sea and secure. And as long as the secure retaliatory capability at sea is intact, ICBMs do not need to be on alert either. Consequently, we conclude that it is possible to de-alert nuclear forces, as long as it is done carefully, and still retain the basic deterrence framework that underpins strategic stability.



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Moreover, the argument that re-alerting could create an incentive for an adversary to strike first assumes that the aggressor would somehow have significant numbers of warheads on alert to carry out such a strike. But the de-alerting proposals we have seen all require reciprocal and verifiable reductions of alert forces, and it seems highly unlikely that there is any plausible scenario where a state could hope to avoid detection and secretly build up a unilateral alert force sizeable enough to conduct a decapitating first strike against another state.

In contrast with the objections to de-alerting we found in the many studies reviewed for this report, we find it noteworthy that two recent Commanders of US Strategic Command both support de-alerting of nuclear weapons. General James Cartwright, who was STRATCOM Commander in 2004–2007 and later served as Vice Chairman of the Joint Chiefs of Staff, has as a member of the Global Zero US Nuclear Policy Commission recommended de-alerting nuclear forces.<sup>132</sup> And General Eugene Habiger, who was STRATCOM Commander in 1996–1998, has stated that it is “time for multilateral action to be taken by policy makers as we are significantly reducing our operational nuclear stockpiles to take aggressive de-alerting actions”.<sup>133</sup>

Both the United States and the Russian Federation have de-alerted or reduced warhead loadings on significant numbers of their strategic nuclear weapons in the past and have de-alerted all of their non-strategic nuclear weapons. Future arms control agreements are expected to reduce the numbers of alert forces further. To that end it is interesting that both the Russian Federation and the United States have been willing to completely de-alert their non-strategic nuclear weapons but retained strategic forces on high alert; after all, if the concern were crisis stability, it would presumably be better to not have to resort to strategic nuclear use right away in a crisis but try to limit use of strategic weapons.

Although proposals for de-alerting principally are motivated by concerns among many about the risk of accidental or mistaken launch and the horrific consequences that would follow, it is important to also address the issue in the context of efforts to reduce the number and role of nuclear weapons. The nuclear weapons alert level is linked in important ways to nuclear reductions because many of the warheads that are currently on alert are likely to be reduced by arms control treaties in the foreseeable future. Nuclear alert is the glue that keeps the United States and the Russian Federation—and to some extent the United Kingdom and France—tied to the Cold War in planning and in mindset.

Indeed, we find that nuclear alert forces are incompatible with the stated goals of reducing the numbers and role of nuclear weapons and taking concrete steps towards the eventual elimination of nuclear weapons.

Alert nuclear forces strongly shape international affairs and nuclear postures by tying relations down in unnecessary and outdated worst-case threat scenario planning that fuels excessive and expensive nuclear force requirements and modernizations. The Russian Federation's nuclear posture is dominated by the requirement to keep forces secure from a hypothetical US first strike, and the United States' nuclear posture keeps large numbers of weapons on high alert to avoid a Russian first strike. Both these postures shape decisions made by China about its nuclear forces; indeed, China's decision to develop the mobile ICBMs it is currently deploying came after Chinese leaders became concerned that their silo-based ICBMs would be vulnerable to a first strike by US Trident SLBMs deployed in the Pacific.<sup>134</sup>

It is important that reductions of alert levels not only follow but also surpass numerical reductions. Deep cuts are going to be difficult to achieve if the remaining forces and the strike plans they serve are based on worst-case assumptions about first strikes because a significant portion of the remaining forces are on alert. This dilemma may become even more urgent as improved missile defence systems are deployed.

A critical issue in moving de-alerting forward is the prospect of persuading the Russian Federation to agree to reduce its alert posture. The Soviet Union at various times in the 1970s and 1980s adopted no-first-use policies that would, if implemented, have narrowed the mission of alert nuclear forces.<sup>135</sup> The no-first-use policy was reaffirmed by President Mikhail Gorbachev. The West viewed such initiatives with scepticism, and President Boris Yeltsin's military doctrine adopted in 1993 was widely interpreted as abandoning the no-first-use policy.<sup>136</sup> But we find it hard to imagine that the Russian Federation would not prefer to have fewer US nuclear weapons poised on alert against Russian targets. Since China is not believed to have nuclear forces on alert, it is reasonable to assume that the Russian Federation would follow the United States in a series of de-alerting initiatives that would save the Kremlin billions of roubles. A serious effort to discuss de-alerting initiatives that take into account Russian security interests seems necessary (for a proposed outline, see annex).

Reducing the operational readiness of nuclear forces will require political leadership and caution. Our analysis suggests that the risks of reducing the

alert rates and the fear of de-alerting triggering a destabilizing re-alerting race in a crisis are significantly overblown. Current nuclear strategies of the United States and the Russian Federation both include plans for increasing alert rates and generating nuclear forces in a serious crisis situation, which would almost certainly trigger the same re-alerting race that opponents of de-alerting argue would be so dangerous if operational readiness were significantly reduced.

The fiftieth anniversary of the Cuban missile crisis is a stark reminder of the risks posed by current alert nuclear postures. Although nuclear forces were already on alert before the crisis, the Soviet deployment of missiles in Cuba triggered US generation of additional nuclear alert forces, surge deployment of submarines, dispersal of bombers, deployment of nuclear armed warships, and significantly shortened the time national leaders had to make decisions in circumstances that were inherently prone to overreaction and misunderstanding.

But while there are risks with both alerted and de-alerted postures, a re-alerting race that takes three months under a de-alerted posture is much preferable to a re-alerting race that takes only three hours under the current highly alerted posture. A de-alerted nuclear posture would allow the national leaders to think carefully about their decisions, rather than being forced by time constraints to choose from a list of pre-designed responses with catastrophic consequences. It would also demonstrate that the world's leading nuclear-weapon states had finally departed from one of the most emphatic symbols of the Cold War and put an end to this particularly dangerous remnant of Cold War thinking.

## ANNEX: A PHASED APPROACH TO DE-ALERTING

In exploring options for the United States and the Russian Federation to proceed with de-alerting of their strategic nuclear forces, the diplomatic and negotiated framework should be considered, as well as initial steps that do not involve verification and monitoring. While dramatic advances towards de-alerting would be preferred, perhaps a phased approach would yield greater progress in the long term. This study proposes that de-alerting could initially be an executive branch programme that would not be negotiated into treaty format until incremental achievements had been made.

**Phase 1:** US–Russian de-alerting negotiations—a joint assessment of the combat readiness of deployed nuclear forces, an analysis of the current system for executive consultation in a crisis situation, and discussions on the impact of missile defences on nuclear postures; negotiation towards presidential statements on de-alerting and confidence-building measures that could lead to initial implementation of de-alerting; negotiation of a US executive statement that missile defences are not targeted at Russian strategic nuclear forces.

**Phase 2:** Implementation—executive statements on the mutual benefits and goals of de-alerting nuclear forces; implementation of confidence-building measures, for example further exchanges of military observers, particularly during activities pertinent to de-alerting, such as SSBN and road-mobile deployments; lab-to-lab programmes on technical aspects of verification and monitoring of de-alerted forces.

**Phase 3:** US–Russian de-alerting negotiations—negotiate what subsets of strategic weapons systems could be initially de-alerted without severe disruption of current postures and at the same time are good candidates for verification and monitoring; establish joint de-alerting timetable, technical data exchanges, inspection protocols, monitoring and data exchange centres; adopt as executive orders not in a treaty framework.

**Phase 4:** Implementation—gain experience with verification and monitoring, increase buy-in from military and legislative branch through stabilizing, constructive consultation and engagement—at this point de-alert only a portion of strategic forces currently on alert in a way that does not induce risk (meaning that other forces on alert would provide assured retaliation).

**Phase 5:** US–Russian de-alerting negotiations—proceed to taking all strategic forces to a reduced level of combat readiness, building on the trust, good will, verification and monitoring infrastructure and experiences from phase 4; formulate as a treaty.

## Notes

- <sup>1</sup> The nuclear forces of the other states in possession of nuclear weapons—China, the Democratic People’s Republic of Korea, India, Israel and Pakistan—are not thought to be deployed on a launch-ready status; rather warheads are stored separately from delivery vehicles.
- <sup>2</sup> For analysis of environmental consequences of nuclear weapons use, see Alan Robock, “Climatic consequences of nuclear conflict”, Rutgers University, <<http://climate.envsci.rutgers.edu/nuclear/>>; Ira Helfand, *Nuclear Famine: A Billion People at Risk*, International Physicians for the Prevention of Nuclear War/Physicians for Social Responsibility, May 2012, <[www.psr.org/nuclear-weapons/nuclear-famine-report.pdf](http://www.psr.org/nuclear-weapons/nuclear-famine-report.pdf)>; and Steve Starr, “Nuclear darkness, global climate change & nuclear famine: the deadly consequences of nuclear war”, <[www.nucleardarkness.org/index2.php](http://www.nucleardarkness.org/index2.php)>.
- <sup>3</sup> Examples of important international recommendations on reducing the operational readiness of nuclear forces include the “thirteen practical steps” adopted by the 2000 Review Conference of the Nuclear Non-Proliferation Treaty, and United Nations General Assembly resolutions adopted in 2007, 2008 and 2010.
- <sup>4</sup> “A 21st century military for America: Barack Obama on defense issues”, *BarackObama.com*, 2008, p. 8.
- <sup>5</sup> US Department of Defense, Office of the Secretary of Defense, *Nuclear Posture Review Report*, April 2010, pp. 25, 26.
- <sup>6</sup> *Ibid.*, pp. x, 25–27.
- <sup>7</sup> Thomas Donilon, National Security Advisor, keynote address to the 2011 Carnegie International Nuclear Policy Conference, 29 March 2011, p. 5.
- <sup>8</sup> James Miller, Principal Deputy Under Secretary of Defense for Policy, written response to questions from Representative Michael Turner, Strategic Forces Subcommittee, House Armed Services Committee, 2 November 2011, p. 136, <[www.fas.org/irp/congress/2011\\_hr/nw-qfr.pdf](http://www.fas.org/irp/congress/2011_hr/nw-qfr.pdf)>.
- <sup>9</sup> International Security Advisory Board, US State Department, *Report on Mutual Assured Stability: Essential Components and Near Term Action*, 14 August 2012, <[www.state.gov/documents/organization/196789.pdf](http://www.state.gov/documents/organization/196789.pdf)>.
- <sup>10</sup> For analysis of the US strategic nuclear war plan, see Hans M. Kristensen, *Obama and the Nuclear War Plan*, Federation of American Scientists, February 2010, <[www.fas.org/programs/ssp/nukes/publications1/WarPlanIssueBrief2010.pdf](http://www.fas.org/programs/ssp/nukes/publications1/WarPlanIssueBrief2010.pdf)>.
- <sup>11</sup> US Joint Chiefs of Staff, “JP 3-12 comment matrix combined sorted 21 Dec 04”, pp. 5–6, <[www.wslfweb.org/docs/doctrine/cc312fc.pdf](http://www.wslfweb.org/docs/doctrine/cc312fc.pdf)>. An update

to NUWEP-04 was published in 2008 as annex B to the Guidance for the Employment of the Force issued in May 2008.

- 12 Madelyn Creedon, Assistant Secretary of Defense for Global Strategic Affairs, joint statement for the record on the Fiscal Year 2013 National Defense Authorization Budget Request for the Department of Defense Nuclear Forces Programs before the Strategic Forces Subcommittee, Committee on Armed Services, US Senate, 28 March 2012, p. 8.
- 13 For a proposed stable posture, see Bruce Blair et al., “Smaller and safer: a new plan for nuclear postures”, *Foreign Affairs*, vol. 89, no. 5, 2010, <[http://carnegieendowment.org/static/npp/pdf/Smaller\\_and\\_Safer.pdf](http://carnegieendowment.org/static/npp/pdf/Smaller_and_Safer.pdf)>; the technical appendix to the article is available at <[www.globalzero.org/files/FA\\_appendix.pdf](http://www.globalzero.org/files/FA_appendix.pdf)>.
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- 15 US Department of Defense, Office of the Secretary of Defense, *Report on the Strategic Nuclear Forces of the Russian Federation Pursuant to Section 1240 of the National Defense Authorization Act for Fiscal Year 2012*, 1 May 2012, pp. 6, 7. Partially declassified and released under the Freedom of Information Act.
- 16 General (ret.) James E. Cartwright and Ambassador Thomas R. Pickering, *Global Zero Nuclear Policy Commission: Modernizing U.S. Nuclear Strategy, Forces and Posture for the 21st Century*, prepared testimony to the United States Senate Committee on Appropriations Subcommittee on Energy and Water Development, 25 July 2012, p. 4.
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- 18 For overviews of the nuclear postures of these states, see the Nuclear Notebook of the *Bulletin of the Atomic Scientists*, available at <<http://bos.sagepub.com/cgi/collection/nuclearnotebook>>.
- 19 For an estimate of the US nuclear force posture, see Hans M. Kristensen and Robert S. Norris, “U.S. nuclear forces, 2012”, Nuclear Notebook, *Bulletin of the Atomic Scientists*, May/June 2012, <<http://bos.sagepub.com/cgi/reprint/68/3/84>>.

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- <sup>20</sup> US Department of Defense, Office of the Secretary of Defense, *Nuclear Posture Review Report*, April 2010, p. 23.
- <sup>21</sup> The US SSBN posture is derived from this source: Hans M. Kristensen and Robert S. Norris, "U.S. nuclear forces, 2012", Nuclear Notebook, *Bulletin of the Atomic Scientists*, May/June 2012, <<http://bos.sagepub.com/cgi/reprint/68/3/84>>.
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- <sup>30</sup> "A 21st century military for America: Barack Obama on defense issues", *BarackObama.com*, 2008.
- <sup>31</sup> US Department of Defense, Office of the Secretary of Defense, *Nuclear Posture Review Report*, April 2010, p. x.
- <sup>32</sup> The White House, "Foreign policy", <[www.whitehouse.gov/issues/foreign-policy](http://www.whitehouse.gov/issues/foreign-policy)>.



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- <sup>45</sup> Russian Federation Ministry of Defence, “During winter instruction period RVSN will conduct over 100 tactical exercises and drills involving missile regiments”, 30 December 2011 (translation by US Open Source Center via World News Connection).

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- <sup>47</sup> “Russian strategic missile army commander’s TV interview: new ICBMs, other info”, *Rossiya 24*, 9 June 2012; Russian Federation Ministry of Defence, “More than 200 tactical exercises and drills planned in RVSN for summer training period”, 1 June 2012 (translation by Open Source Center via World News Connection).
- <sup>48</sup> “Box 1: U.S. and Russian strategic nuclear alert postures”, in Thomas H. Karas, *De-alerting and De-activating Strategic Nuclear Weapons*, Sandia National Laboratories, April 2001, p. 11.
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- <sup>91</sup> “Chirac: Russia no longer targeted”, *Moscow Times*, 27 September 1997, <[www.themoscowtimes.com/news/article/chirac-russia-no-longer-targeted/299924.html](http://www.themoscowtimes.com/news/article/chirac-russia-no-longer-targeted/299924.html)>; “Chirac addresses new Russia”, September 1997, <[www.fas.org/news/france/971600-eve.htm](http://www.fas.org/news/france/971600-eve.htm)>.

- <sup>92</sup> “Speech by Nicolas Sarkozy, President of the French Republic, presentation of ‘Le Terrible’ submarine in Cherbourg, on March 21, 2008”, <[www.diplomatie.gouv.fr/en/IMG/pdf/Speech\\_by\\_Nicolas\\_Sarkozy\\_\\_presentation\\_of\\_Le\\_Terrible\\_submarine.pdf](http://www.diplomatie.gouv.fr/en/IMG/pdf/Speech_by_Nicolas_Sarkozy__presentation_of_Le_Terrible_submarine.pdf)>.
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- <sup>94</sup> Statement by the delegations of France, the People’s Republic of China, the Russian Federation, the United Kingdom of Great Britain and Northern Ireland and the United States of America, document NPT/CONF.2000/21, 1 May 2000, <<http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N00/411/96/PDF/N0041196.pdf?OpenElement>>.
- <sup>95</sup> “Joint statement to the 2010 Non-Proliferation Treaty Review Conference by the five Permanent Members of the United Nations Security Council”, 5 May 2010, <[www.state.gov/r/pa/prs/ps/2010/05/141547.htm](http://www.state.gov/r/pa/prs/ps/2010/05/141547.htm)>.
- <sup>96</sup> US Strategic Command, *History of the United States Strategic Command, June 1, 1992—October 1, 2002*, January 2004, p. 28. For an analysis of the risks of alert nuclear forces that preceded the de-alerting agreement, see Bruce G. Blair, *The Logic of Accidental Nuclear War*, Brookings Institute, 1993.
- <sup>97</sup> Tim Miller and Rebecca Davis, “De-alerting nuclear forces”, Science Applications International Corporation, May 2009, p. 1, <[www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA536263](http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA536263)>. A request to the US government under the Freedom of Information Act for declassification of this study resulted in a “no document” response.
- <sup>98</sup> STRATCOM Strategic Advisory Group, “Nuclear forces; post 1994”, 12 July 1994, <[www.nukestrat.com/us/stratcom/sagpost94.htm](http://www.nukestrat.com/us/stratcom/sagpost94.htm)>. Admiral Chiles forwarded the white paper to Chairman of the Joint Chiefs of Staff General John Shalikashvili, who used the paper to develop the Joint Staff’s conclusions and recommendations for the NPR. “In particular”, Shalikashvili said, “I appreciate your perspective on hedging against future uncertainty while we grapple with near-term resource management”. Admiral Chiles subsequently told the Strategic Advisory Group that the paper had been “particularly effective” in preparing the NPR, which formally adopted a “lead and hedge strategy”. For copies of these and other documents relating to the 1994 NPR, see Hans M. Kristensen, “The 1994 Nuclear Posture Review”, [nukestrat.com](http://nukestrat.com), 8 July 2005, <[www.nukestrat.com/us/reviews/npr1994.htm](http://www.nukestrat.com/us/reviews/npr1994.htm)>.
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- <sup>100</sup> Defense Special Weapons Agency, *Assessment of De-alert Options for US Nuclear Force Structures*, final report, 30 April 1998, as referenced in Tim Miller and Rebecca Davis, “De-alerting nuclear forces”, Science Applications International Corporation, May 2009, pp. 1–3, <[www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA536263](http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA536263)>.
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- <sup>102</sup> US Department of Defense, Office of the Under Secretary of Defense for Acquisition and Technology, *Report of the Defense Science Board Task Force on Nuclear Deterrence*, October 1998, pp. 15, 61.
- <sup>103</sup> Michael W. Edenburn et al., *De-alerting Strategic Ballistic Missiles*, Sandia National Laboratories, March 1999, <[www.cmc.sandia.gov/cmc-papers/sand98-05059.pdf](http://www.cmc.sandia.gov/cmc-papers/sand98-05059.pdf)>.
- <sup>104</sup> Edward L. Warner, III, Assistant Secretary of Defense for Strategy and Threat Reduction, statement before the Senate Armed Services Subcommittee on Strategic Forces Hearing on Nuclear Deterrence, 14 April 1999, p. 8, <<http://armed-services.senate.gov/statemnt/1999/990414ew.pdf>>.
- <sup>105</sup> UK Ministry of Defence, *Strategic Defence Review*, July 1998, p. 117, <[www.mod.uk/NR/rdonlyres/65F3D7AC-4340-4119-93A2-20825848E50E/0/sdr1998\\_complete.pdf](http://www.mod.uk/NR/rdonlyres/65F3D7AC-4340-4119-93A2-20825848E50E/0/sdr1998_complete.pdf)>. For a later discussion of British reasons for rejecting de-alerting, see Tim Hare, Commodore, Royal Navy (ret.), “A part-time deterrent? The case for continuous-at-sea deterrence (CASD)”, discussion paper presented to Bradford University workshop “Stepping Down the Nuclear Ladder: Options for UK Nuclear Weapons Policy”, 17–18 September 2009, <[www.brad.ac.uk/acad/bdrc/nuclear/trident/workshop/Hare.pdf](http://www.brad.ac.uk/acad/bdrc/nuclear/trident/workshop/Hare.pdf)>.
- <sup>106</sup> US Department of Defense, Office of the Secretary of Defense, *Nuclear Posture Review Report*, 8 January 2002 (submitted to Congress on 31 December 2001), p. 17.
- <sup>107</sup> Thomas H. Karas, *De-alerting and De-activating Strategic Nuclear Weapons*, Sandia National Laboratories, April 2001, <<http://prod.sandia.gov/techlib/access-control.cgi/2001/010835.pdf>>.
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- <sup>109</sup> US Department of Defense, “Special briefing on the Nuclear Posture Review”, news transcript, 9 January 2002.

- <sup>110</sup> William J. Perry and James R. Schlesinger, *America's Strategic Posture: The Final Report of the Congressional Commission of the Strategic Posture of the United States*, US Institute for Peace, May 2009, p. 69.
- <sup>111</sup> US Department of Defense, Office of the Secretary of Defense, *Nuclear Posture Review Report*, April 2010, p. x.
- <sup>112</sup> *Ibid.*, p. 26.
- <sup>113</sup> US Department of Defense, Office of the Secretary of Defense, *Nuclear Posture Review Report*, 2001, p. 17.
- <sup>114</sup> US Department of Defense, Office of the Secretary of Defense, *Nuclear Posture Review Report*, April 2010, p. 25.
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- <sup>116</sup> Thomas Donilon, National Security Advisor, keynote address to the 2011 Carnegie International Nuclear Policy Conference, 29 March 2011, p. 5, <[http://carnegieendowment.org/files/Thomas\\_Donilon.pdf](http://carnegieendowment.org/files/Thomas_Donilon.pdf)>.
- <sup>117</sup> James Miller, Principal Deputy Under Secretary of Defense for Policy, written response to questions from Representative Michael Turner, Strategic Forces Subcommittee, House Armed Services Committee, 2 November 2011, p. 136, <[www.fas.org/irp/congress/2011\\_hr/nw-qfr.pdf](http://www.fas.org/irp/congress/2011_hr/nw-qfr.pdf)>.
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- <sup>120</sup> General (ret.) James E. Cartwright and Ambassador Thomas R. Pickering, "Global Zero Nuclear Policy Commission: modernizing U.S. nuclear strategy, forces and posture for the 21st century", prepared testimony to the US Senate Committee on Appropriations Subcommittee on Energy and Water Development, 25 July 2012, p. 4.
- <sup>121</sup> *Modernizing U.S. Nuclear Strategy, Force Structure and Posture*, Global Zero, May 2012, p. 5.
- <sup>122</sup> US Department of Defense, Office of the Secretary of Defense, *Report on the Strategic Nuclear Forces of the Russian Federation Pursuant to Section 1240 of the National Defense Authorization Act for Fiscal Year 2012*, 1 May 2012, pp. 6, 7. Partially declassified and released under the Freedom of Information Act.
- <sup>123</sup> *Ibid.*



- <sup>124</sup> A “2-on-1 strike” in this context refers to the aggregate effects of an attack on one target by two successive nuclear detonations—in this case strategic warheads attacking a missile silo target. If the two attacking nuclear warheads have identical properties (e.g., yield, accuracy, reliability and height of burst), and if the probability of the target surviving one strike is estimated as  $P_s$ , then the probability of the target surviving a 2-on-1 strike, or of surviving both successive attacks, would be calculated to be  $P_s \times P_s$  or  $P_s^2$ . For example, if the probability of a missile silo surviving a nuclear strike by one warhead is 0.2 (20%), then the probability of the missile silo surviving a 2-on-1 strike would be  $0.2 \times 0.2$  or  $0.2^2$  or 0.04 (4%).
- <sup>125</sup> Bruce Blair et al., “One hundred nuclear wars: stable deterrence between the United States and Russia at reduced nuclear force levels off alert in the presence of limited missile defenses”, *Science & Global Security*, vol. 19, no. 3, 2011.  
For additional analysis, see Pavel Podvig, “The window of vulnerability that wasn’t: Soviet military buildup in the 1970s”, *International Security*, vol. 33, no. 1, 2008, <[http://russianforces.org/podvig/2008/06/the\\_window\\_of\\_vulnerability\\_that\\_wasnt.shtml](http://russianforces.org/podvig/2008/06/the_window_of_vulnerability_that_wasnt.shtml)>; the original papers can be found at the Hoover Institution at Stanford University, <<http://findingaids.stanford.edu/xtf/view?docId=ead/hoover/2002C48.xml;query=;brand=default>>.
- <sup>126</sup> The figures on alert warheads and weapons are derived from the summary data in table 1 based on information and analysis of alert levels stated in the accompanying state-specific discussions in the first chapter. For example, in deriving the figure of 890 alert Russian warheads, we assumed, based on available data discussed and cited in the first chapter, that the alert levels of the following Russian strategic weapon systems are: for SS-18 96% of warheads on alert, for SS-19 67%, for SS-27 (silo-based) 90%, for SS-25 15%, for SS-27 (mobile) 20%, for SSBN 20%, and for bombers 0%. These fractions of specific weapons systems on alert were multiplied by the corresponding total numbers of specific weapon systems and warheads and summed to derive the aggregate numbers of alert weapons for both the United States and Russia.
- <sup>127</sup> Hazard Prediction and Assessment Capability (HPAC) is a software tool that predicts the effects of hazardous material releases into the atmosphere and its effects on populations. HPAC estimates the nuclear, biological and chemical hazards associated with such releases from either facilities or weapons, including nuclear weapons explosions. HPAC is authored by the Science Applications International Corporation (SAIC) under contract to the US DOD Defense Threat Reduction Agency (DTRA).
- <sup>128</sup> The 2009 paper by Miller and Davis describes a collaborative study conducted by US Strategic Command, the US Air Force and the US Navy at the end of the Cold War of approximately 100 de-alerting ideas. A request for the study submitted to the US government under the Freedom of Information

Act resulted in a “no document” response. The study is referenced in Tim Miller and Rebecca Davis, “De-alerting nuclear forces”, Science Applications International Corporation, May 2009, p. 1, <[www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA536263](http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA536263)>.

- <sup>129</sup> James Miller, Principal Deputy Under Secretary of Defense for Policy, written response to questions from Representative Michael Turner, Strategic Forces Subcommittee, House Armed Services Committee, 2 November 2011, p. 135, <[www.fas.org/irp/congress/2011\\_hr/nw-qfr.pdf](http://www.fas.org/irp/congress/2011_hr/nw-qfr.pdf)>.
- <sup>130</sup> General Kevin Chilton, Commander, US Strategic Command, and Greg Weaver, Senior Advisor for Strategy and Plans, US Strategic Command, J5, “Waging deterrence in the twenty-first century”, *Strategic Studies Quarterly*, vol. 3, no. 1, 2009, p. 41.
- <sup>131</sup> US Department of Defense, Office of the Secretary of Defense, *Report on the Strategic Nuclear Forces of the Russian Federation Pursuant to Section 1240 of the National Defense Authorization Act for Fiscal Year 2012*, 1 May 2012, pp. 6, 7. Partially declassified and released under the Freedom of Information Act.
- <sup>132</sup> See *Modernizing U.S. Nuclear Strategy, Force Structure and Posture*, Global Zero, May 2012.
- <sup>133</sup> Eugene Habiger, General, US Air Force (ret.), “De-alerting of nuclear forces: a political imperative”, presentation at the seminar “Re-framing De-alert: Decreasing the Operational Readiness of Nuclear Weapons Systems in the U.S.–Russia Context”, Yverdon-les-Bains, Switzerland, 21–23 June 2009.
- <sup>134</sup> Robert D. Walpole, Strategic and Nuclear Programs, National Intelligence Council, Central Intelligence Agency, testimony before the International Security, Proliferation and Federal Services Subcommittee of the Senate Governmental Affairs Committee hearing on CIA National Intelligence Estimate of Foreign Missile Developments and the Ballistic Missile Threat Through 2015, 11 March 2002, p. 26.
- <sup>135</sup> For a description of the Soviet no-first-use policy, see Robert B. Bathurst, “Soviet military doctrine: form and content”, in Willard C. Frank, Jr. and Philip S. Gillette (eds.), *Soviet Military Doctrine From Lenin to Gorbachev, 1915–1991*, 1992, p. 198.
- <sup>136</sup> The no-first-use policy does not appear to have been abandoned to enhance the readiness of alert forces in general, but to enable Russian nuclear forces to compensate for declining conventional capabilities and allow missions against chemical and biological weapons attacks.

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## ABBREVIATIONS

DCA	dual-capable aircraft
DOD	US Department of Defense
ICBM	intercontinental ballistic missile
MIRV	multiple independently targetable re-entry vehicle (multiple warhead)
NATO	North Atlantic Treaty Organization
NPR	US Nuclear Posture Review
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
PNI	Presidential Nuclear Initiative
SAIC	Science Applications International Corporation
SLBM	submarine-launched ballistic missile
SRF	Russian Strategic Rocket Forces
SSBN	nuclear-powered ballistic missile submarine
STRATCOM	US Strategic Command
TLAM/N	Tomahawk land-attack sea-launched cruise missile