

Close Calls with Nuclear Weapons

HIGHLIGHTS

Both the United States and Russia keep nuclear-armed missiles on high alert, ready to launch within minutes. This posture increases the risk of an accidental, erroneous, or unauthorized launch. The fact that such a launch has not occurred so far suggests that safety measures work well enough to make the chance of such an incident small. But it is not zero.

There have been numerous incidents in both countries in which accidents and errors have eroded safety measures and increased the risk of a nuclear launch. The more of these close calls that occur, the greater the chance that an accident or error will lead to disaster. Taking nuclear missiles off “hair-trigger” alert is one critical step toward reducing this risk.

Despite the most elaborate precautions, it is conceivable that technical malfunction or human failure, a misinterpreted incident or unauthorized action, could trigger a nuclear disaster or nuclear war.

— U.S. –Soviet Accident Measures Agreement,
September 1971

Since the beginning of the nuclear age, military and political leaders have faced the daunting challenge of controlling nuclear weapons. They want to ensure with high confidence that the weapons will detonate when their use is ordered, but that they will not do so by accident or without authorization.

Similarly, both the United States and Russia keep nuclear-armed missiles on high alert, primed for launch, to allow them to be launched within minutes on warning of an incoming attack. At the same time, they need to ensure that the missiles are not launched by mistake based on a false warning, without authorization, or by accident.

How secure are nuclear weapons against accidental, mistaken, and unauthorized nuclear explosions and missile launches?

Eroded Safety

The good news is that so far there have been no unintended nuclear explosions. The bad news is that there is a long list of past incidents when accidents and errors increased the risk of a nuclear explosion. In some of these incidents, the



U.S. Air Force/Staff Sgt. Jonathan Snyder

Numerous technical glitches and human errors have happened over the last few decades that could have led to a nuclear launch. With U.S. nuclear missiles on “hair-trigger” alert, military and political leaders have only a few minutes to make the critical decisions needed to identify these errors and call off retaliatory attacks.

high explosives surrounding the warhead's plutonium center detonated without triggering a nuclear chain reaction, but contaminated the surrounding area with radioactive material.

Nuclear weapons systems are designed so that several things would have to go wrong to result in an accidental or unauthorized missile launch or nuclear explosion. For most of the past incidents, only one or two things went wrong, so that in many cases the incident did not in itself pose a serious risk. However, these historical incidents show that system failures occur on a routine—even frequent—basis. Such system failures reduce the number of effective safety measures in the system. System failures also make it more likely that under the time pressure and confusion of a crisis, or under an unexpected confluence of circumstances, safety measures will be eroded to the point that an unintended detonation or launch can occur.

The fact that many dozens of incidents involving nuclear warheads are known to have occurred in the United States—and likely many more that have not been made public—indicates weaknesses exist in the chain of controls. There is presumably a similar list of Soviet and Russian incidents, only a few of which have been made public.

Moreover, there are some potential routes leading to a mistaken missile launch that require very few—or perhaps even a single—system failure to occur. For example, in 1983, Soviet early warning satellites were operating correctly but were fooled by sunlight reflected from clouds and sent data that erroneously reported an incoming attack by U.S. nuclear missiles. All the systems checked out in the short time available to make a decision. At that point, had the officer on duty followed procedures he would have recommended launching Soviet missiles. In this case the strongest, and one of the few, safety links in the chain was the judgment of the officer in command of the early warning center. Had a different officer been on duty, the situation could have ended very differently.

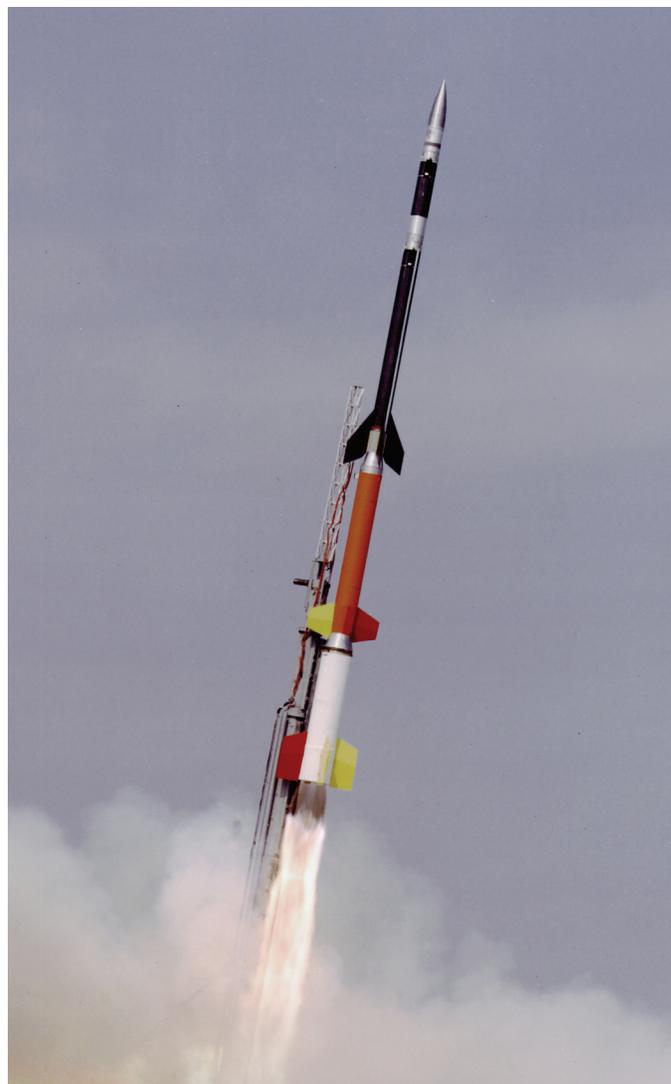
The fact that explosions of nuclear warheads have not occurred so far suggests that the safety measures put in place by the two countries work well enough that the probability of accidents and errors leading to a nuclear explosion is small.

But the probability is not zero. And the more of these incidents that occur, the greater is the chance that one of them will lead to a nuclear detonation.

Taking nuclear missiles off hair-trigger alert would be a significant additional safeguard that would reduce the dangers posed by unintentional launch.

Historical Examples

Below we discuss some of the incidents both in Russia and in the United States that have increased the risk of nuclear



Early warning sensors can give accurate but ambiguous data that suggest an attack, such as in 1995 when the launch of a Norwegian scientific rocket (similar to the one above) was interpreted by Russian radar as a U.S. submarine-launched ballistic missile.

disaster. They are part of a much longer list of incidents in both nations that illustrate the kinds of things that can and do go wrong (Schlosser 2013).

INCIDENTS WITH NUCLEAR BOMBERS

There is a long list of accidents involving nuclear-armed bombers. In the 1950s and 1960s, the United States kept bombers armed with nuclear weapons on “airborne alert.” Bombers were kept in the air 24 hours a day, every day, ready to respond to orders to fly to targets in the Soviet Union. Leaders feared that if the bombers were not already in the air when an attack came, they could be destroyed on the ground before they were able to take off, leaving the country with a reduced ability to retaliate.

During that period, there were numerous accidents involving nuclear-armed strategic aircraft. Bombs were dropped by mistake and planes crashed. Several close calls nearly resulted in nuclear explosions, but at least some of the safety systems worked and prevented a nuclear detonation. The United States ended its practice of airborne alert the day after a U.S. bomber carrying four nuclear bombs crashed near Thule, Greenland, in 1968, contaminating the surrounding area with plutonium. Instead, nuclear bombers were kept on high alert; they were kept armed and on runways ready to take off. In 1991, President George H.W. Bush finally removed U.S. strategic bombers from high alert. Their weapons were moved to storage; they are no longer ready to take off within 15 minutes, but can still take off within 24 hours.

INCIDENTS WITH BALLISTIC MISSILES

The United States and Russia continue to keep nuclear missiles on high alert, ready to be launched within minutes. Like bombers, missiles are also subject to accidents and errors. Unlike bombers, however, missiles cannot be called back or retargeted after they are launched. Nor do they carry self-destruct mechanisms to abort a mistaken launch. Once fired, the missiles will proceed to their targets. This fact, coupled with the pressure to launch vulnerable land-based missiles quickly after receiving warning, means that accidents, erroneous warning of attack, or other technical glitches could lead to nuclear war.

There are numerous examples of incidents involving nuclear missiles that could have led to catastrophe. Below are a few that illustrate the kinds of things that can go wrong. Relatively common are erroneous or ambiguous warnings from U.S. or Russian early warning sensors of an incoming nuclear attack. Unclear or inaccurate warnings are especially dangerous when coupled with policies that allow nuclear missiles to be launched quickly in response to warning of an attack, because officials have only minutes to determine if the warning is accurate and the attack is real.

Some incidents have involved early warning sensors giving accurate but ambiguous data that suggested an attack:

- **January 25, 1995.** A Russian early warning radar detected a missile launch off the coast of Norway with flight characteristics similar to those of a U.S. submarine-launched ballistic missile. Fearing that it could be the first move in a larger attack, Russian nuclear forces quickly went on full alert. Russian President Boris Yeltsin activated his “nuclear football” and retrieved launch codes, preparing for a retaliatory launch. Fortunately,

Erroneous or ambiguous warnings from U.S. or Russian early warning sensors of an incoming nuclear attack are relatively common.

Russian satellites monitoring U.S. missile fields did not show any additional launches, and Russian leaders declared the incident a false alarm. The event detected was actually the launch of a Norwegian scientific rocket on a mission to study the aurora borealis. Norway had notified countries, including Russia, in advance of the launch, but the information had failed to reach the correct Russian personnel (Schlosser 2013, p. 478).

- **March 15, 1980.** The Soviet Union launched four submarine-based missiles from near the Kuril Islands as part of a training exercise. Based on data from a U.S. early warning sensor, one of the launches appeared to have a trajectory aimed at the United States. This led the United States to convene officials for a threat assessment conference (Comptroller General of the United States 1981).

In some cases, early warning sensors were fooled by natural phenomena that appeared to have the signature of a missile attack:

- **September 26, 1983.** A Soviet early warning satellite showed that the United States had launched five land-based missiles at the Soviet Union. The alert came at a time of high tension between the two countries, due in part to the U.S. military buildup in the early 1980s and President Ronald Reagan’s anti-Soviet rhetoric. In addition, earlier in the month the Soviet Union shot down a Korean Airlines passenger plane that strayed into its airspace, killing almost 300 people. The Soviet officer on duty had only minutes to decide whether or not the satellite data were a false alarm. Since the satellite was found to be operating properly, following procedures would have led him to report an incoming attack. Going partly on gut instinct and believing the United States was unlikely to fire only five missiles, he told his commanders that it was a false alarm before he knew that to be true. Later investigations revealed that reflection of the sun on

“False alerts of this kind are not a rare occurrence.”

–Marshall Shulman,
U.S. State Department adviser

the tops of clouds had fooled the satellite into thinking it was detecting missile launches (Schlosser 2013, p. 447; Hoffman 1999).

- **October 5, 1960.** The U.S. early warning radar at Thule, Greenland, reported to the North American Air Defense (NORAD) Command headquarters in Colorado Springs that it had detected dozens of Soviet missiles launched against the United States. NORAD went to its maximum alert level. The United States later determined that the radar had been fooled by the moonrise over Norway and computers misinterpreted this as an all-out attack on the United States. Fortunately, the Soviet leader Nikita Khrushchev was in New York at the time, raising doubts that the attack was real (Schlosser 2013, pp. 253–254).

Some incidents of erroneous warning of attack resulted from human errors. Two examples are notable because the supposed Soviet attacks that were erroneously detected looked just like what the American operators expected to see from their training:

- **November 9, 1979.** Computers at NORAD headquarters indicated a large-scale Soviet attack on the United States. NORAD relayed the information to the Strategic Air Command (SAC) and other high-level command posts, and top leaders convened to assess the threat. Within minutes, U.S. intercontinental ballistic missile (ICBM) crews were put on highest alert, nuclear bombers prepared for takeoff, and the National Emergency Airborne Command Post—the plane designed to allow the U.S. president to maintain control in case of an attack—took off (but without President Jimmy Carter on board). After six minutes, satellite data had not confirmed the attack, leading officials to decide no immediate action was necessary. Investigations later discovered that the incident was caused by a technician who had mistakenly inserted a training tape containing a scenario for a large-scale nuclear attack into an operational computer.

In a comment about this incident in a letter designated Top Secret (since declassified), senior U.S. State Department adviser Marshall Shulman said that “false alerts of this kind are *not* a rare occurrence. There is a

complacency about handling them that disturbs me” (Shulman 1979, emphasis in original).

- **October 28, 1962.** Just before 9:00 am, radar operators at Moorestown, NJ, reported to NORAD headquarters that a nuclear attack was under way, with impact expected at 9:02 near Tampa, FL. Tensions were high since this event happened during the Cuban Missile Crisis. All of NORAD was alerted, but before any action was taken, NORAD learned that no detonations had occurred at the expected time. The New Jersey radar operators discovered that a test tape simulating a missile launch from Cuba was being run at the Moorestown facility, when an actual satellite had unexpectedly appeared over the horizon, confusing the operators. While there should have been overlapping radars to confirm the appearance of missiles, the additional radars were not operating at the time. Moreover, the radar operators had not been informed of the passage of the satellite as they should have been, because the facility that would normally provide that notice had been assigned to other work during the crisis (Sagan 1993, pp. 130–131).

Other cases of false warning were caused by technical problems with the early warning system:

- **June 3 and 6, 1980.** Warnings of Soviet missile attack by the U.S. early warning system on both June 3 and 6 triggered activities at SAC and the National Military Command Center designed to increase survivability of U.S. strategic forces and command and control systems in the face of an attack. For example, bomber and tanker crews were ordered to their stations and started their engines, and the National Emergency Airborne Command Post at Andrews Air Force Base taxied into position for a rapid takeoff. The alerts were suspended when warning systems showed no further signs of an attack. The U.S. Department of Defense later attributed the false alerts to a failed computer chip (Comptroller General of the United States 1981).

Technical problems with the warning and launch systems, and with the weapons themselves, can cause other kinds of problems. For example:

- **October 23, 2010.** A launch control center at Warren Air Force Base, WY, lost contact with the 50 Minuteman III ICBMs under its control for nearly an hour in what is known as a “launch facilities down” incident. The missiles were on high alert and carrying nuclear warheads. According to at least one report, there may have been



In 1961, two nuclear bombs fell to the ground in North Carolina when a bomber lost a wing. Neither bomb detonated, but multiple safety devices failed. According to Defense Secretary Robert McNamara, “By the slightest margin of chance, literally the failure of two wires to cross, a nuclear explosion was averted.”

previous communication problems at the site. A spokesperson said the site was still able to monitor the security of the missiles but “We’ve never had something as big as this happen . . . we’ve never lost complete command and control functionality of 50 ICBMs” (Ambinder 2010). The cause of the problem was later found to be a circuit card in one of the computers that had been improperly installed during routine maintenance.

While much of the discussion of this incident focused on whether it had affected U.S. readiness, Bruce Blair—an analyst and former ICBM launch officer—noted that “the more important concern should be that for the better part of an hour, the safeguards that protect against unauthorized launch of America’s missiles were compromised” since “the remote underground launch centers that control them lost their ability to detect and cancel any unauthorized launch attempts” (Blair 2010).

- **November 24, 1961.** SAC headquarters in Omaha lost contact with the early warning radar in Thule, Greenland. When an official at SAC tried to call NORAD headquarters in Colorado to find out what the problem was, the line was dead. The low probability of a simultaneous breakdown in communications with both locations led to concerns that an attack was taking place, so SAC’s entire alert force was ordered to prepare for takeoff. Fortunately, a U.S. bomber circling over Thule made contact with the early warning radar facility and the alert was called off. An investigation found that a single AT&T switch in Colorado had failed, with surprisingly far-reaching ramifications. In addition to shutting down communications between SAC and NORAD, including the hotline linking

the SAC commander to NORAD headquarters, it also shut down communication with the early warning radars. AT&T was supposed to provide redundant circuits for these communications, but had not done so, despite its assurance to the government that it had (Schlosser 2013, p. 286).

- **January 24, 1961.** Two nuclear bombs fell to the ground when a bomber lost a wing over Goldsboro, NC. The parachute on one bomb failed and the bomb broke apart on impact. The other bomb suffered little damage on impact, but five of the bomb’s six safety devices failed during the crash. Expressing his concern about the incident, Defense Secretary Robert McNamara said that “by the slightest margin of chance, literally the failure of two wires to cross, a nuclear explosion was averted” (Center for Defense Information 1981; McNamara et al. 1963, p. 2).

Dangerous situations may arise from people not following proper procedures or from a lack of training:

- **August 29–30, 2007.** Six nuclear-armed cruise missiles were mistakenly loaded onto a B-52 bomber at Minot Air Force Base in North Dakota. Although there were multiple instances when the crew should have verified that the cruise missiles were not armed, no one followed required protocol to check for live weapons. The plane sat overnight on the tarmac at Minot, unguarded. It then flew 1,500 miles to a base in Louisiana where it sat unguarded for another nine hours until a maintenance crew there realized that the weapons were live. In total, there were 36 hours during which no one in the Air Force realized that six live nuclear weapons were missing (Schlosser 2013, p. 473).

In response to the incident, retired Air Force General Eugene Habiger, commander of U.S. Strategic Command from 1996 to 1998, said, “I have been in the nuclear business since 1966 and am not aware of any incident more disturbing” (Warrick and Pincus 2007).

- **2003.** Half of U.S. Air Force units responsible for nuclear weapons failed their nuclear surety (safety and security) inspections despite the fact that they had advance warning of the inspections. An Air Force inspector general’s report found that the pass rate for these inspections, which take place every 18 months, had hit an all-time low. Lieutenant Colonel Lynn Scott, deputy director of inspections at that time, said that while there were some outside factors that may have contributed to the failures, the bottom line is that each [of these factors] offers a convenient excuse to avoid accepting responsibility for failure—and

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failure is not something that is acceptable when it comes to the safety, security, and reliability of our nuclear weapons” (Schlosser 2013, p. 472; Hoffman 2008).

Other types of human error can also lead to risks by compromising nuclear safety and security:

- August 1974.** In his last weeks in office during the Water-gate crisis, President Richard M. Nixon was clinically depressed, emotionally unstable, and drinking heavily. U.S. Secretary of Defense James R. Schlesinger instructed the Joint Chiefs of Staff to route “any emergency order coming from the president”—such as a nuclear launch order—through him first (Schlosser 2013, p. 360).

The bottom line is clear: Accidents happen. They shouldn’t lead to nuclear war. Taking missiles off hair-trigger alert would reduce the chance of an accidental, mistaken, or unauthorized launch.

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NATIONAL HEADQUARTERS

Two Brattle Square
Cambridge, MA 02138-3780
Phone: (617) 547-5552
Fax: (617) 864-9405

WASHINGTON, DC, OFFICE

1825 K St. NW, Suite 800
Washington, DC 20006-1232
Phone: (202) 223-6133
Fax: (202) 223-6162

WEST COAST OFFICE

500 12th St., Suite 340
Oakland, CA 94607-4087
Phone: (510) 843-1872
Fax: (510) 843-3785

MIDWEST OFFICE

One N. LaSalle St., Suite 1904
Chicago, IL 60602-4064
Phone: (312) 578-1750
Fax: (312) 578-1751