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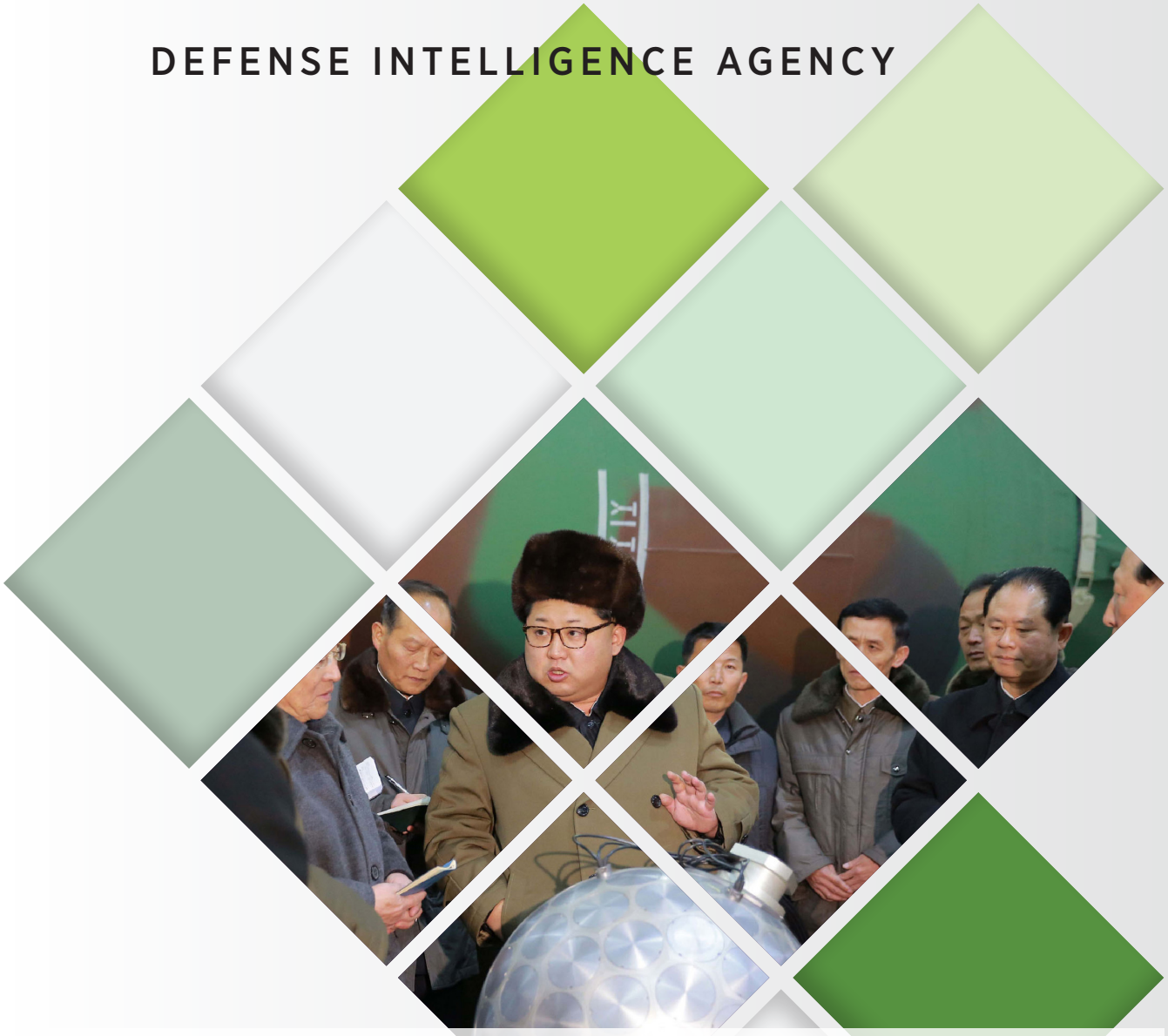

GLOBAL NUCLEAR LANDSCAPE 2018

Committed to Excellence in Defense of the Nation

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Cover image: Kim Jong Un inspecting an alleged mockup of a nuclear device.
Source: AFP PHOTO/KCNA VIA KNS

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Contents

Executive Summary

Scope Note

This DIA report was compiled from open source information in response to a request by the House Armed Services Committee to provide a document on selected foreign nuclear weapons-related capabilities, programs, infrastructure, and doctrine.

Since the end of the Cold War and related reductions of Russian and U.S. stockpiles, the number of nuclear states has increased; their stockpiles have grown; new weapons have been built and older weapons improved; and the threshold for use has potentially lowered. Nation-state efforts to develop or acquire weapons of mass destruction (WMD), their delivery systems, or their underlying technologies constitute a major threat to the security of the United States, its deployed troops, and its allies. Most nuclear-armed countries see nuclear weapons as a guarantor of sovereignty and are unlikely to eliminate their stockpiles. A future use of nuclear weapons probably would bring about significant geopolitical changes as some states would seek to establish or reinforce security alliances with existing nuclear powers and others would push for global nuclear disarmament.[1]

Five themes in foreign nuclear development and proliferation are:

1. Increasing numbers or capabilities of weapons in existing programs.
2. Enduring security threats to weapons and material.
3. Countries developing new delivery systems with increased capabilities.
4. Countries developing nuclear weapons with smaller yields, improved precision, and increased range for military or coercive use on the battlefield.
5. Countries developing new nuclear weapons without conducting large-scale nuclear tests.

Examples of these themes include:

- Russia, China, and North Korea are increasing stockpiles of nuclear weapons and enhancing delivery systems.
- Nuclear use doctrines, smaller nuclear weapons, growing stockpiles, and the movement of additional weapons and material increase opportunities for theft or diversion.[2]
- As multiple countries, particularly those with less established weapons programs, seek to build ever smaller and more sophisticated nuclear weapons, their technical ambitions may lead to compromises in safety which, taken with the increasing size of stockpiles, could make a weapons accident more likely.[3]
- North Korea is developing a wide variety of new delivery systems, and China is developing a mobile missile with multiple idependently targeted re-entry vehicles (MIRVs).[4,5]
- In order to counter missile defense, countries are developing new categories of weapon systems. China and Russia are developing hypersonic glide vehicles, and Russia is probably developing a nuclear-armed, nuclear-powered underwater vehicle.[6,7,8]
- Since the turn of the century, North Korea has been the only nation to have conducted large-scale nuclear tests, but other countries are also developing new nuclear weapons without conducting large-scale tests.[9,10,11]

Selected Nuclear Capable Delivery Systems

Class of Weapon	Inventory
RUSSIAN NUCLEAR MILITARY CAPABILITY	
Intercontinental Ballistic Missiles	●
Short-Range Ballistic Missiles	●
Close-Range Ballistic Missiles	●
Ground-Launched Cruise Missiles	●
Submarine-Launched Ballistic Missiles	●
Antiship Missiles	●
Torpedoes	●
Antisubmarine Missiles	●
Depth Charges	●
Nuclear-Armed, Nuclear-Powered Underwater Vehicle	○
Air-to-Surface Missiles	●
Antiaircraft Missiles	●
Antiballistic Missiles	●
Gravity Bombs	●
CHINESE NUCLEAR MILITARY CAPABILITY	
Intercontinental Ballistic Missiles	●
Intermediate-Range Ballistic Missiles	○
Medium-Range Ballistic Missiles	●
Submarine-Launched Ballistic Missiles	●
NORTH KOREAN BALLISTIC MISSILES DESIGNED FOR NUCLEAR DELIVERY	
Intercontinental Ballistic Missiles	○
Intermediate-Range Ballistic Missiles	○
Medium-Range Ballistic Missiles	●
Short-Range Ballistic Missiles	●
Submarine-Launched Ballistic Missiles	○

● Current Stockpile ○ Developmental

RUSSIA

Section One

Overview

Russia is committed to modernizing and adding new military capabilities to its nuclear forces. Land-based intercontinental ballistic missiles (ICBMs) are controlled by the Strategic Rocket Forces (SRF), and sea- and air-based strategic systems are managed by the Navy and Aerospace Force, respectively.[12] Russia plans to upgrade the capacity of its strategic nuclear triad by 2020.[13] In addition to its strategic nuclear weapons, Russia is adding new military capabilities to its large stockpile of nonstrategic nuclear weapons (NSNWs), including those employable by ships, aircraft, and ground forces.[14]

Image Source: Shutterstock

Tu-95 Bear Nuclear-Capable Strategic Bomber

- The SRF operates three older ICBM systems for more than one-half of its land-based nuclear delivery vehicles: the silo-based SS-18 and SS-19, which respectively carry 10 and 6 MIRVs, and the single-warhead SS-25. These systems will be withdrawn from service and replaced with newer, more modern road-mobile and silo-based ICBMs as they reach the end of their operational lives by 2021.[15,16]
- The second element of the nuclear triad is a fleet of at least 10 nuclear-powered ballistic missile submarines (SSBNs) under Naval High Command control.[17]
- The third element of Russia's nuclear triad is the Russian Aerospace Force's fleet of strategic bombers, which forms the core of the Long-Range Aviation (LRA) Command.[18,19]
- Russia currently has an active stockpile of up to 2,000 NSNWs.[20,21,22]

History

Russia's nuclear weapons program began during World War II, accelerated after the bombings of Hiroshima and Nagasaki, and by 1949 resulted in a successful test of a nuclear device. From 1949 until 1990, the Soviet Union was responsible for 715 of the world's 2,079 reported nuclear detonations. Of the 715, 219 occurred in the atmosphere, in space, or underwater. The remaining 496 detonations were performed underground. The majority of the testing occurred at two sites: 456 tests at Semipalatinsk in Kazakhstan and 140 tests on the Novaya Zemlya archipelago. The Soviet Union carried out the most powerful explosion conducted by any country on 30 October 1961, when it tested a 50-megaton thermonuclear bomb nicknamed "Tsar Bomb." Bolstered by the data gathered from these tests, the Soviet Union developed the largest foreign nuclear weapons program in the world, culminating in more than 40,000 nuclear warheads in its inventory by 1986.[23,24,25]

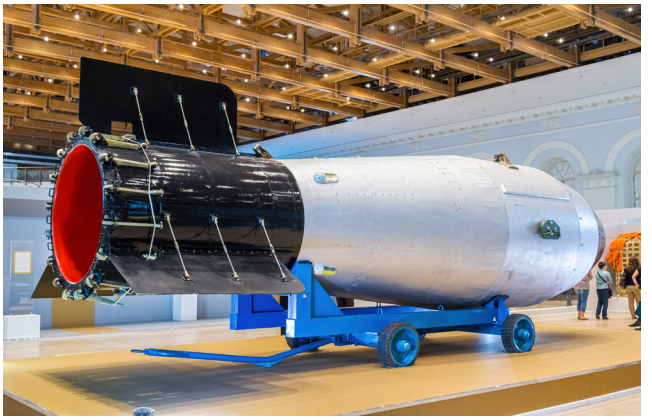

Image Source: Shutterstock

Model of Soviet 50-Megaton "Tsar Bomb"

Nuclear Arms Control

Several treaties have placed limitations on Russian nuclear explosive testing and weapon stockpiles. The Partial Test Ban Treaty, signed by the Soviet Union, the United States, and the United Kingdom in 1963, prohibited all nuclear explosions in the atmosphere, ocean, and outer space. Underground testing was subsequently limited to 150 kilotons by the Threshold Test Ban Treaty, signed in July 1974 and entered into force in December 1990. The Comprehensive Nuclear Test Ban Treaty, which Russia signed in 1996 and ratified in 2000, banned any nuclear explosion in any environment by all parties to the treaty upon its entry into force. The U.S.-Soviet Strategic Arms Reduction Treaty, known as START I, was signed in 1991 and was the first

The Intermediate-Range Nuclear Forces Treaty

The Intermediate-Range Nuclear Forces (INF) Treaty between the United States and the Soviet Union entered into force in June 1988 and eliminated all nuclear and conventional ground-launched ballistic and cruise missiles with ranges of 500 to 5,500 kilometers. Since 2014, the Russian Federation has been in violation of its obligations under the INF Treaty not to possess, produce, or flight-test a ground-launched cruise missile within these ranges, or to possess or produce launchers of such missiles.[26] Russia has developed a ground-launched cruise missile (GLCM) that the United States has declared is in violation of the INF Treaty. In 2013, a senior Russian administration official stated publicly that the world had changed since the INF Treaty was signed. In addition, Russian officials have made statements in the past complaining that the treaty prohibits Russia, but not some of its neighbors, from developing and possessing ground-launched missiles with ranges between 500 and 5,500 kilometers.[27]

treaty mandating deep reductions in both countries' deployed strategic nuclear delivery systems. Finally, the New START Treaty (NST) was signed by the United States and the Russian Federation on 8 April 2010, further limiting the number of strategic warheads each country can deploy and the number of active and inactive strategic delivery systems.[28,29,30,31,32]

Image Source: DIBMAC Report

SS-27 Road-Mobile ICBM

Doctrine

Russia relies on its strategic nuclear forces to deter foreign attacks and, should deterrence fail, to deliver crippling, responsive strikes. Russia reserves the right to use nuclear weapons first if its sovereignty or territorial integrity is threatened.[33] Because the responsive option imposes the most strain on the strategic forces, which must react even after a potentially disabling strike, strategic forces, weapons, and battle management systems are designed and built to be hardened, stealthy, redundant, and reliable even in a WMD-degraded environment.[34] Russia maintains the Perimetr system, which is designed to ensure that a responsive launch could be ordered when Russia is under nuclear attack.[35]

Russia plans to complete upgrading the capacity and capability of its strategic nuclear triad. Russia's nuclear force upgrade goals include replacing Soviet-legacy weapons with modern nuclear weapons, maintaining rough parity with the U.S. nuclear arsenal, improving the survivability and efficiency of its nuclear weapons, and maintaining prestige on the international stage. Russia's nuclear upgrades include both strategic and nonstrategic nuclear weapons.[36,37,38,39]

Russia fears that the speed, accuracy, and quantity of nonnuclear, strategic-range, precision-guided weapons can achieve strategic effects on par with nuclear weapons,[40] one of the primary reasons that, since at least 1993 (and most recently reflected in Russia's 2014 Military Doctrine), Russia has reserved the right to respond with a nuclear strike to a nonnuclear attack threatening the existence of the state.[41,42,43] Recent statements on Russia's evolving nuclear weapons doctrine lower the threshold for first use of nuclear weapons and blur the boundary between nuclear and conventional warfare. Very-low-yield nuclear weapons reportedly could be used to head off a major conflict and avoid full-scale nuclear war.[44,45]

Image Source: Shutterstock

Tu-160 Blackjack Nuclear-Capable Strategic Bomber

Nuclear Capability/Stockpile

The U.S.-Russia NST entered into force on 5 February 2011. This treaty specifies both sides must meet limits on strategic delivery systems and deployed warheads by February 2018 and maintain them

through February 2021, with the option for a single extension of 5 years. The aggregate limits of the NST restrict the United States and Russia to 1,550 deployed strategic warheads each. Warheads actually deployed on ICBMs and submarine- launched ballistic missiles (SLBMs) count toward this limit while each deployed heavy bomber equipped for nuclear armaments, whether with gravity bombs or air-launched cruise missiles (ALCMs), counts as one warhead. The NST includes an aggregate limit of 800 deployed and nondeployed ICBM launchers, SLBM launchers, and heavy bombers equipped for nuclear armaments. Within that limit, the number of deployed ICBMs, SLBMs, and heavy bombers cannot exceed 700.[46] According to New START Treaty statements on 5 February 2018, Russia declared 1,444 warheads on 527 deployed ICBMs, SLBMs, and heavy bombers.[47]

Nonstrategic nuclear weapons are any nuclear weapons not covered by NST. Russia currently has an active stockpile of up to 2,000 NSNWs. These include air-to-surface missiles, short-range ballistic missiles, land-attack cruise missiles, gravity bombs, and depth charges for medium-range bombers, tactical bombers, and naval aviation, as well as antiship, antisubmarine, and antiaircraft missiles and torpedoes for surface ships and submarines, and Russia's antiballistic missile system.[48,49,50,51]

Infrastructure

Rosatom is the state corporation in charge of Russia's nuclear complex. In addition to its civil nuclear power responsibilities, Rosatom develops, tests, manufactures, and dismantles nuclear munitions at the facilities depicted on the map. Rosatom is updating its warhead production complex and is producing what we assess to be hundreds of nuclear warheads each year.[52,53] In 2015, Russian President Putin claimed that more than 40 ICBMs/SLBMs would be produced that year.[54] Each missile can carry 6 warheads, indicating Russia probably produced more than 200 nuclear warheads in 2015.

Image Source: Shutterstock

Russian SS-18 Heavy ICBM Silo Cover

Russia Nuclear Weapon-Related Facilities

1703-12169 Russia's nuclear weapons program has been supported by a number of facilities that include production, processing, research and development, and testing.

Delivery Systems

Russia's strategic nuclear weapon triad consists of the SRF, SSBNs, and the LRA.

Strategic Rocket Forces

The SRF's missile inventories are split between road-mobile and silo-based ICBMs. Three Soviet-era ICBM systems account for over half of the SRF's land-based strategic missiles. The oldest ICBMs in the arsenal are the silo-based SS-18 (initial operational capability (IOC) 1988), and the SS-19 Mod 3 (IOC 1980). These missiles carry, respectively, 10 and 6 MIRVs. The single-warhead SS-25 (IOC 1988) was deployed as a road-mobile ICBM.[55] As these aging missiles approach the end of their operational lives, they are being replaced with more modern road-mobile and silo-based ICBMs. The first of these modern ICBMs is the single-warhead SS-27 Mod 1 (RS-12M1 and 2), fielded initially in silos and then as a road-mobile version in 2006.[56] Russia continues to field a MIRVed version, the SS-27 Mod 2 (RS-24, IOC 2010) ICBM.[57,58]

Nuclear-Powered Ballistic Missile Submarines

Russia's sea-based portion of the triad includes at least 10 SSBNs under operational control of the Naval High Command.[59] The current fleet consists of the SS-N-18 Mod 1 (IOC 1978) deployed on Delta III class submarines, the SS-N-23 (derivative Sineva missile deployed in 2007) deployed on Delta IV class submarines, and the new SS-N-32 (IOC 2014) deployed on Dolgorukiy class submarines. These

Image Source: DIBMAC Report

Field Deployed SS-27 Road-Mobile ICBM

Image Source: Wikimedia Commons

Dolgorukiy Class Nuclear-Powered Ballistic Missile Submarine

missiles carry three, four, and six MIRVs respectively. The Russian Navy is upgrading its strategic capabilities, mainly by building more reliable and quiet Dolgorukiy class SSBNs with the new SS-N-32 SLBMs. The Delta III SSBNs are likely to be retired in the next few years.[60,61]

Long-Range Aviation

Russia's fleet of strategic bombers constitutes the air element of its nuclear triad. The LRA's main strategic assets—Tu-95 Bear and Tu-160 Blackjack bombers—are being updated to continue operating beyond their original lifespan. Russia has announced that it will resume production of Tu-160 bombers and complete development of a new-generation bomber (Russian designation PAK-DA) within a decade; timelines for both programs may slip if financial difficulties arise.[62,63]

Efforts To Improve Capability

Russia has several development programs underway for its SRF. Russian officials claim a new class of hypersonic vehicle, probably called "Object 4202" and "Yu-71," is being developed to allow Russian strategic missiles to penetrate missile defense systems. A Russian media outlet claimed a successful test of this system from an SS-19 booster occurred in April 2016. Russian press reports indicate that Russia is developing a new, heavy, silo-based, liquid-propellant ICBM—called the Sarmat—to replace the SS-18. Russia is also preparing to field the new solid-propellant, mobile, Rubezh strategic ballistic missile, at Irkutsk possibly in 2018.[64,65]

According to a Russian state media report in November 2015, Russia may also be developing a unique delivery system known as Status-6. The platform is a nuclear-armed, nuclear-powered underwater vehicle. The Status-6 is allegedly a "robotic minisubmarine" capable of 100 knots with a range of 5,400 nautical miles, designed to "destroy important economic installations of the enemy in coastal areas and cause guaranteed devastating damage to the country's territory by creating wide areas of radioactive contamination, rendering them unusable for military, economic, or other activity for a long time."[66]

CHINA

Section Two

Overview

China continues to modernize and add new military capabilities to its nuclear forces by enhancing silo-based ICBMs and adding more survivable mobile delivery systems, including four Jin class ballistic missile submarines.[67,68,69] China has the most active and diverse ballistic missile development program in the world. Its ballistic missile force is expanding in both size and types of missiles, with China developing advanced new mobile, solid-propellant ICBMs.[70] The number of warheads on Chinese ICBMs capable of threatening the United States is likely to continue growing.[71]

Image Source: DIBMAC Report

CSS-10 Road-Mobile ICBM

In addition to strategic nuclear forces, China has long maintained theater nuclear forces and is in the process of improving delivery capabilities for these forces.[72]

History

China began its nuclear weapons program in the mid-1950s, successfully detonating its first device at the nuclear test site in Lop Nur in 1964. In total, the international community detected 45 large-scale nuclear explosive tests originating in China, the largest of which had an estimated yield on the order of multiple megatons.[73,74] China continues research, development, maintenance, and production of nuclear warheads.[75]

Nuclear Arms Control

China is party to the Nonproliferation Treaty, but is not party to any bilateral arms limitation treaties with the United States.[76]

Doctrine

China maintains a "no-first-use" (NFU) policy consisting of two stated commitments: China will never be the first to use nuclear weapons, and China will not use or threaten to use nuclear weapons against any non-nuclear-weapon state or in nuclear-weapon-free zones.[77,78] An NFU policy is consistent with a nuclear force that is modest, survivable, and can probably deliver a damaging, responsive nuclear strike.[79]

Although China has frequently reaffirmed its commitment to NFU, most recently with the 2015 release of "China's Military Strategy" by the Ministry of National Defense, China's nuclear program has consistently relied on opaqueness and uncertainty in its deterrence posture.[80,81,82] We cannot exclude the possibility of circumstances in which China would abandon its NFU doctrine, particularly if its nuclear forces—and, therefore, responsive capability—or political survival of the country were at risk.[83,84]

Nuclear Capability/Stockpile

China probably maintains an operational nuclear warhead stockpile in the low hundreds.[85,86] China's highly enriched uranium and plutonium are probably sufficient for a potential nuclear warhead stockpile in the high hundreds to low one-thousands.[87]

Infrastructure

China has the required industrial capacity to enrich uranium and produce plutonium for military needs. The China National Nuclear Corporation, the largest nuclear enterprise in China, operates several uranium enrichment facilities organized under three plants (plants 405, 504, and 814)[88] that primarily support the nation's burgeoning nuclear power industry, but China could devote some enrichment capacity to support military needs.[89] China's plutonium production reactors (plants 404 and 821) probably ceased operation in the 1980s;[90] however, China's reprocessing facilities at plant 404 can extract plutonium from spent reactor fuel if required.[91]

China's only nuclear weapon design and production organization—the China Academy of Engineering Physics—is key in developing and maintaining China's nuclear force.[92] It has tens of thousands of employees, and its scientists are capable of all aspects of nuclear weapon design research, including nuclear physics, materials science, electronics, explosives, and computer modeling.[93,94]

Delivery Systems

China has about 75 to 100 ICBMs with nuclear missions in its inventory, including the silo-based CSS-4 Mod 2 and Mod 3 (Chinese designator DF-5), the solid-fueled, road-mobile CSS-10 Mods 1 and 2 (DF-31 and DF-31A), and the shorter ranged CSS-3 (DF-4). The CSS-10 Mod 2, with a range in excess of 11,000 kilometers, can reach most locations within the continental United States. The remainder of China's nuclear force includes road-mobile, solid-fueled CSS-5 (DF-21) medium-range ballistic missiles (MRBMs) for regional missions.[95]

Image Source: Wikimedia Commons

The CSS-4 is a silo-based ICBM that can reach most locations in the United States.

China Nuclear Weapon-Related Facilities

1703-12168 China's nuclear weapons program has been supported by a number of facilities that include production, processing, research and development, and testing.

Efforts To Improve Capability

China is developing and producing nuclear weapons with new military capabilities to increase its survivability, reliability, and ability to penetrate missile defenses.[96] China is developing and testing offensive missiles, forming additional missile units, qualitatively upgrading missile systems, and developing methods to counter ballistic missile defenses. The Chinese nuclear ballistic missile force is expanding in both quantity and types of missiles, and the number of Chinese ICBM nuclear warheads capable of reaching the United States is likely to expand in the near future.[97] In addition, each of China's four Jin class SSBNs is capable of carrying 12 JL-2 SLBMs, whose estimated range could allow targeting of portions of the United States from operating areas near the Chinese coast.[98,99]

The People's Liberation Army (PLA) probably has multiple nuclear warhead designs that are decades old, and stockpiled weapons probably require ongoing observation, maintenance, or refurbishment to maintain confidence in their effectiveness.[100] China probably continues research, development, maintenance, and production of nuclear warheads given the development of new nuclear weapon delivery systems such as the DF-26 intermediate-range ballistic missile (IRBM), as well as the road-mobile DF-41 ICBM with MIRVs.[101,102,103,104,105,106] Nuclear weapon development includes launch platforms for new weapon systems, such as more-mobile transporter-erector-launcher systems, possible rail-launch platforms, and a next-generation SSBN, which will reportedly carry the JL-3 SLBM.[107,108] China tested a hypersonic glide vehicle in 2014, although official statements made no reference to its intended mission or its capability to carry a nuclear warhead.[109,110]In 2016, the PLA Air Force commander referred publicly to the military's efforts to produce an advanced long-range strategic bomber, a platform observers tied to nuclear weapons. Past PLA writings expressed the need to develop a "stealth strategic bomber," suggesting aspirations to field a strategic bomber with a nuclear delivery capability.[111]

Image Source: DIBMAC Report — DF-26 Road-Mobile IRBMs

Image Source: Wikimedia Commons — Jin Class Nuclear-Powered Ballistic Missile Submarine

NORTH KOREA

Section Three

Overview

North Korea's national security strategy revolves around two objectives: ensure the Kim regime's long-term security, which is defined as North Korea remaining a sovereign, independent country ruled by the Kim family, and retaining influence over the Korean Peninsula. Since the mid-2000s, North Korea's strategy has been to prioritize the development of nuclear weapons and ballistic missiles to deliver nuclear weapons to increasingly distant ranges while maintaining a conventional military capable of inflicting enormous damage to South Korea.[112] North Korea has demonstrated the capability to produce plutonium and highly enriched uranium, conducted nuclear tests, and organized a strategic force with units operating SRBMs, MRBMs, IRBMs, and ICBMs while developing SLBMs.[113,114,115,116]

Image Source: AFP PHOTO/KCNA VIA KNS

Previous North Korean Leaders Kim Il Sung and Kim Jong Il

North Korea seeks to achieve nuclear power status, thereby deterring any external attack, and use its nuclear and conventional military capabilities to compel South Korea and the United States into policy decisions ensuring regime survival.[117] This strategy's current priorities are reflected in several trends observed over the course of Kim Jong Un's leadership to date:

- Increasingly frequent ballistic missile flight tests and training launches, many of which impact in waters near Japan.[118]

- Increasingly frequent nuclear tests.[119]
- Public emphasis on the linkage between North Korea's nuclear weapons program and its ballistic missiles, along with rhetoric seeking to persuade international audiences that North Korea has the capability for nuclear-armed ballistic missile strikes against the United States and regional allies.[120]

History

The North Korean nuclear program began in the late 1950s with cooperation agreements with the Soviet Union on research. North Korea's first research reactor, supplied by the Soviet Union, began operating in 1967, and North Korea later built a nuclear reactor at Yongbyon with an electrical power rating of 5 megawatts electrical (MWe). This reactor began operating in 1986 and was capable of producing about 6 kilograms (kg) of plutonium per year. Later that year, high-explosives testing and a reprocessing plant to separate plutonium from the reactor's spent fuel were detected. Initial construction of additional reactors—a 50-MWe reactor at Yongbyon and a 200-MWe reactor at Taechon—provided additional indications of a larger-scale nuclear program.[121]

Image Source: Wikimedia Commons

Yongbyon 5-MWe Nuclear Reactor

Joint Declaration on the Denuclearization of the Korean Peninsula

In 1992, North Korea and South Korea signed a declaration which provided that:

1. South Korea and North Korea shall not test, manufacture, produce, receive, possess, store, deploy, or use nuclear weapons.
2. South Korea and North Korea shall use nuclear energy solely for peaceful purposes.
3. South Korea and North Korea shall not possess nuclear reprocessing and uranium enrichment facilities.

Both sides exchanged instruments to bring the declaration into force by 19 February 1992. Implementation actions ultimately became part of the Agreed Framework process, but North Korea overtly conducted nuclear reprocessing, uranium enrichment, and nuclear test activities inconsistent with the declaration after the breakdown of the Agreed Framework in 2002.[122]

Six-Party Talks and Leap Day Arrangement

Because of concerns about North Korea's covert enriched uranium program following the breakdown, Six-Party Talks were held from 2003 to 2007. The talks included North and South Korea, China, Russia, Japan, and the United States.[123] During the fifth round of talks, North Korea agreed to shut down its nuclear facilities in exchange for fuel aid and steps towards the normalization of relations with the United States and Japan.[124,125] However, in mid-2009, North Korea's failed satellite launch triggered condemnation from the UN Security Council and North Korea resumed its nuclear program.[126]

- Leap Day Arrangement: On 29 February 2012, the United States and North Korea announced a "leap day" arrangement that the United States would provide substantial food aid in return for North Korea agreeing to a moratorium on uranium enrichment and missile testing and a return of International Atomic Energy Agency (IAEA) inspectors to Yongbyon, leading to a resumption of the Six-Party Talks. On 6 April 2012, a North Korean satellite failed to enter into orbit, and the launch was declared a failure by the United States and South Korea. In addition, the launch was described as a provocative test of missile technology, and the United States subsequently announced the suspension of food aid to North Korea.[127,128]

Nuclear Arms Control

The Nonproliferation Treaty and Agreed Framework. North Korea joined the Nonproliferation Treaty (NPT) in 1985, but inspections only started 7 years later under the NPT's safeguards regime. This gap invited questions about North Korea's plutonium production. In 1994, North Korea pledged to freeze and eventually dismantle its plutonium programs under the Agreed Framework with the United States. At that time, a number of sources estimated that North Korea had separated enough plutonium for one or two nuclear weapons. North Korea complied with the framework, allowed the IAEA to place seals on spent fuel from the Yongbyon reactor, and allowed remote monitoring and onsite inspections at its nuclear facilities.[129] In January 2003, North Korea announced it was withdrawing from the NPT, and the withdrawal from the treaty was completed in April 2003.[130]

Breakdown of the Agreed Framework. In 2002, negotiators from the United States confronted North Korea with evidence of a clandestine uranium enrichment program, a claim that North Korean officials publicly denied. The conflict over whether North Korea had a uranium enrichment program led to the breakdown of the Agreed Framework. The United States reached an understanding with members of the Korean Economic Development Organization and stopped shipment of heavy fuel oil to North Korea, whose response was removing the international monitors and seals at the Yongbyon facility and restarting its plutonium production infrastructure.[131]

Doctrine

The steady development of road-mobile ICBMs, IRBMs, and SLBMs highlights North Korea's intention to develop a survivable nuclear weapon delivery capability.[132] This developing capability, along with high-level statements of nuclear usage at the first sign of a U.S. strike, suggests potential for usage at any stage of conflict when North Korea believes itself to be in regime-ending danger.[133,134,135]

Image Source: AFP PHOTO/KCNA VIA KNS

Hwasong-13 Road-Mobile ICBM displayed in a military parade

Nuclear Capability/Stockpile

North Korea established a Strategic Force (previously known as the Strategic Rocket Forces) in 2012 and has described this organization as a nuclear-armed ballistic missile force. The Strategic Force includes units operating SRBMs, MRBMs, IRBMs, and ICBMs, each of which North Korea has stated represents a nuclear-capable system class. In 2016, the North claimed a Scud class SRBM launch had tested nuclear weapon components in a mock attack against a South Korean port.[136]

Infrastructure

North Korea has demonstrated the capability to produce kilogram quantities of plutonium for nuclear weapons and has claimed to possess the ability to produce enriched uranium for nuclear weapons.[137,138] North Korea also admitted in August 2016 that it has been producing highly enriched uranium for nuclear weapons. This put into context North Korea's revelation in 2010 of an enrichment facility at Yongbyon and the subsequent expansion of the facility, and raised concerns about its ability and intention to produce uranium-based nuclear weapons.[139,140]

North Korea has conducted six nuclear tests, one each in 2006, 2009, and 2013, two in 2016, and one in 2017, according to seismic detections and public claims by North Korean media.[141,142] North Korea has exclusively used the underground nuclear test facility in the vicinity of Punggye for nuclear tests. Each successive test has demonstrated higher explosive yield, according to seismic data.[143]

Delivery Systems

North Korea is committed to developing a long-range, nuclear-armed missile that is capable of posing a direct threat to the United States. The 4 and 28 July 2017 Hwasong-14 launches were North Korea's first ICBM flight tests.[144] These events represent significant milestones in North Korea's ballistic missile development process—the first flight tests of a system capable of reaching the United States. Without additional flight tests, the ICBM's current reliability as a weapon system would be low. North Korea subsequently launched another new ICBM, Hwasong-15, in November 2017. North Korea also continues to develop the Taepo Dong 2 (TD-2), which could reach the continental United States if configured as an ICBM but has only been used as a space-launch vehicle (SLV). In April and December 2012 and again in February 2016, North Korea conducted launches of the TD-2 configured as an SLV, which used ballistic missile technology.[145,146]

North Korea has several hundred SRBMs and MRBMs available for use against targets on the Korean Peninsula and Japan. In the past 2 years, North Korea has diversified its ballistic missile force to include longer-range, solid-fueled systems. Solid-propellant missiles offer operational advantages over liquid-fueled systems, eliminating the time required to fuel a missile before firing it.[147] In 2017, North Korea test-launched a new solid-propellant MRBM from a tracked transporter-erector-launcher (TEL), describing this system as a land-based variant of its SLBM.[148] Following a successful flight test of its SLBM from a submerged submarine in September 2016,[149] and a second successful launch in May 2017, Kim approved deployment of the land-

North Korea Nuclear Weapon-Related Facilities

1703-12171 North Korea's Nuclear Infrastructure

Image Source: AFP PHOTO/KCNA VIA KNS

Kim Jong Un allegedly ordering his missile units to be ready to strike

Image Source: AFP PHOTO/KCNA VIA KNS

North Korean SLBM launched from an underwater test barge

based variant.[150] In 2016 and 2017, over 40 launches of short-, medium-, intermediate-, intercontinental-range, and submarine-launched systems were conducted.[151] In addition to two Hwasong-14 ICBM tests and a Hwasong-15 ICBM launch, these flight tests included intermediate-range missile tests over Japan in August and September.[152,153]

Efforts To Improve Capability

Kim's public emphasis on the missile force has continued, highlighted by an April 2017 military parade including four previously unseen missile systems and their equipment. Included were a modified Scud SRBM with a probable maneuvering reentry vehicle on a tracked TEL, a new liquid-propellant IRBM on a modified Musudan TEL, and launchers for two canister-launched probable solid-propellant systems.[154,155] One of the canister systems was mounted on a modified Hwasong-13 eight-axle TEL, and the other canister system was mounted on a semitrailer or mobile-erector-launcher with a three-axle prime mover.[156] Although airframes were not displayed, the canister systems can probably support IRBMs and ICBMs.[157]

Nuclear Proliferation

North Korea's demonstrated willingness to proliferate nuclear technology remains one of our gravest concerns.[158] North Korea provided Libya with uranium hexafluoride (UF_6),[159] the form of uranium used in the uranium enrichment process to produce fuel for nuclear reactors[160] and nuclear weapons[161], through the proliferation network of Pakistani nuclear scientist Abdul Qadeer Khan.[162] North Korea also provided Syria with nuclear reactor technology until 2007.[163,164]

ANNEX

21st Century Cases

Iran

Iran's overarching strategic goals of enhancing its security, prestige, and regional influence led it to pursue nuclear energy capabilities and technology goals and give it the ability to build missile-deliverable nuclear weapons, if it chooses to do so.[165,166]

Iran has no nuclear weapons and has agreed not to seek, develop, or acquire nuclear weapons. The Joint Comprehensive Plan of Action (JCPOA) limits Iran's uranium enrichment capabilities until at least 2026 and requires Iran to redesign its Arak reactor, making it more difficult to produce plutonium for weapons. Without a sufficient source of weapons-usable fissile material, Iran cannot produce a nuclear weapon.[167] Iran's interest in nuclear technology dates back to the 1950s, when it began receiving assistance through the U.S. Atoms for Peace program, which later included the Tehran Nuclear Research Center and a 5-megawatt-thermal research reactor. Iran signed the NPT as a nonweapons state and ratified the agreement in 1970. However, in what may have been an attempt to intimidate regional adversaries, the Shah told a French newspaper in February 1974 that "sooner than is believed," Iran would be "in possession of a nuclear bomb." The nuclear program continued, and in the mid-1970s, Iran unveiled ambitious plans to expand the nuclear power program. These plans, however, did not come to fruition because of the 1979 Revolution.[168]

In the late 1980s, Iran established an undeclared nuclear program, managed through the Physics Research Center (PHRC) and overseen through a scientific committee by the Defense Industries Education Research Institute. The PHRC was subordinate to the Ministry of Defense and Armed Forces Logistics.[169] In the late 1990s, the PHRC was consolidated under the "Amad Plan," Iran's effort to develop a nuclear weapon. Iran's Project 111 was an attempt to integrate a spherical payload into a Shahab 3 missile reentry vehicle. However, Iran halted its nuclear weapons program in 2003 and subsequently announced the suspension of its declared uranium enrichment program.

Iran also signed an Additional Protocol to its IAEA Safeguards Agreement in 2003. The halt was primarily in response to increasing international scrutiny resulting from the exposure of Iran's previously undeclared nuclear work.[170] After this halt, and in line with its history of poor transparency, Iran continued its efforts to develop uranium enrichment technology with gas centrifuges and constructed an undeclared uranium enrichment plant near Qom, where it began producing near-20-percent enriched uranium in mid-2011.[171,172] In late 2011, a Department of State compliance report found Iran to be in violation of obligations under the NPT because Iran's past nuclear activities and its failure to report ongoing activities were contrary to its Safeguards Agreement. That same year, the IAEA began an effort to clarify issues surrounding Iran's lack of transparency dating back to 2002, noting that by failing to declare some nuclear activities, including the construction at Qom, Iran was not implementing the Additional Protocol.[173,174] In 2015, the IAEA concluded that it had no further indications of undeclared work.[175,176]

In April 2015, a framework was announced to limit Iran's nuclear program that built on the interim Joint Plan of Action.[177] Under the deal, Iran would commit that under no circumstances would it seek, develop, or acquire nuclear weapons, and it would limit its enrichment program and redesign a heavy-water reactor near Arak; in exchange, all nuclear-related sanctions against Iran would be suspended.[178] On 14 July 2015, Iran and the P5+1 (the five permanent members of the UN Security Council plus Germany) finalized the JCPOA, whereby Iran agreed to curtail its nuclear program significantly in exchange for sanctions relief. On 16 January 2016, the IAEA reported that Iran had taken the technical steps required to meet its Implementation Day obligation. As long as Iran adheres to the agreement, the JCPOA limits the pathways to a nuclear weapon and hampers Iran's ability to conduct activities that could contribute to nuclear explosive device design and development.[179]

Until 2031, Iran must maintain a total enriched uranium stockpile of no more than 300 kilograms of up to 3.67 percent enriched UF_6 or its equivalent in other chemical forms. Under the JCPOA, Iran also reduced its low-enriched uranium stockpile of about 8,500 kilograms to below 300 kilograms by shipping the material to Russia and downblending the remaining scrap to natural uranium.[180,181]

Libya

In 2003, Libya negotiated an understanding with the United States and the United Kingdom calling for complete dismantlement of its nuclear and chemical weapon programs. As part of this understanding, Libyan officials turned over a collection of nuclear-related equipment to the United States, most of which was supplied to the Libyan nuclear weapon program by the A.Q. Khan network.[182]

- According to the IAEA, from the early 1980s until late 2003, Libya pursued a clandestine nuclear weapons program with major assistance from Pakistani nuclear expert A.Q. Khan's illicit supplier network. By late 2003, the program had achieved only early-stage research and development but had acquired extensive technical data and equipment from the Khan network. Central to the program was an early-stage uranium enrichment effort based on gas centrifuge technology, established with components, technical data, and UF_6 centrifuge feed material acquired through the Khan network. According to press reports, IAEA inspectors discovered evidence that North Korea may have secretly provided Libya in early 2001 with nearly two tons of UF_6, which could be used in a uranium enrichment program.[183]
- In addition, the Khan network provided Libya with nuclear weapon design documentation and related data. Tripoli's nuclear weapons ambitions underwent a radical shift during 2003-04 as a result of the government's engagement with the United States and United King-

dom. The Libyans claimed to have halted their previously undisclosed nuclear weapons program and revealed details of the program's status, scope, and suppliers. Libyan disclosures and investigations by U.S.-UK technical teams during 2003-04 indicated that Libya had not made major progress in assembling a functioning uranium enrichment plant or in developing a nuclear weapon capability, and Libya claimed that it had never conducted any nuclear weaponization work. After making these claims and revelations, Libya took significant steps to terminate its nuclear weapons program:[184]

- During early 2004, Libya allowed the United States and the United Kingdom to remove all disclosed key elements of the nuclear weapons program, including gas centrifuge components and key related equipment, UF_6 feed material, and uranium conversion facility equipment.[185]
- Libya signed an Additional Protocol to its IAEA Safeguards Agreement in 2004 and allowed IAEA experts to interview Libyan nuclear officials and visit many nuclear, missile, industrial, and academic sites, in parallel with visits and interviews by U.S. and UK investigators.[186]

Since 2004, Libya's civilian nuclear program has focused on basic nuclear research. Libya's Tajura Nuclear Research Center houses a 10-megawatt research reactor, which originally was designed to use highly enriched uranium but was converted to operate on low-enriched uranium. With help from the IAEA, Libya began removal of its highly enriched uranium in 2004, a task it completed in 2009. According to the IAEA, Libya stores 2,263 tons of yellowcake at a facility in Sabha.[187,188,189]

Syria

The most compelling evidence of a Syrian nuclear weapon program pursuit was the construction of a covert nuclear reactor with North Korean assistance known as Al Kibar (aka Dair Alzour) at a remote location in eastern Syria. Syria was building a North Korean-designed gas-cooled, graphite-moderated reactor, which neared operational capability in August 2007. The reactor was destroyed in September 2007 before it was loaded with nuclear fuel or operated. The reactor would have been capable of producing plutonium for nuclear weapons; it was not configured to produce electricity and was ill-suited for research. Environmental samples taken during an IAEA visit to the reactor site in June 2008 contained particles of anthropogenic natural uranium, graphite, and stainless steel, consistent with the materials in this type of reactor.[190,191]

- Based on IAEA analysis of commercial imagery from 2001 to 2007, the dimensions of the building are similar to the 5-MWe gas-cooled graphite- moderated reactor at Yongbyon.[192]
- Three other locations in Syria were functionally related to the reactor site.[193]
- According to the IAEA, by the end of October 2007, large-scale clearing and leveling operations had taken place at the site which had removed or obscured the remains of the destroyed building.[194]
- Syria has not been transparent with the IAEA in its investigation of the undeclared reactor.[195]

Currently Syria operates a small nuclear research reactor, a light-water-cooled Miniature Neutron Source Reactor outside Damascus. A pilot plant for the purification of phosphoric acid was constructed and commissioned in 1997 at Homs, Syria, with the support of the UN Development Program and the IAEA. Yellowcake was also produced as a result of the acid purification process. During a July 2004 visit to the Homs phosphoric acid purification plant, IAEA inspectors observed hundreds of kilograms of yellowcake.[196]

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References

[1] 2008, Global Trends 2025: A Transformed World, National Intelligence Council, pages 67-68.

[2] 5 Jan 2016; Office of the Secretary of Defense; Military and Security Developments Involving the Democratic People's Republic of Korea

[3] <https://www.ispr.gov.pk/front/main.asp?o=t-press_release&id=3211>; 24 February 2016; Inter-Services Public Relations; Press release by ISPR on the 24 Feb National Command Authority Meeting

[4] 5 Jan 2016; Office of the Secretary of Defense; Military and Security Developments Involving the Democratic People's Republic of Korea

[5] 1 Aug 2014; The Age Online; Australia: China Confirms New Generation Nuclear-Capable ICBM that can target US

[6] Olga Bozhyeva; 21 Apr 2016; Moscow MK Online; Sources: Russia Successfully Tested New Missile Superweapon: Developers Called Launch of Sarmat ICBM Warhead a 'Fantastic Success

[7] Sam LaGrone; <https://news.usni.org/2015/11/12/analyst-doomsday-nuclear-torpedo-leak-gives-insight-to-russian-strategic-mindset-ballistic-missile-defense-anxiety>; 22 Mar 2017; Nov 2015; USNI News; Analyst: Doomsday Nuclear Torpedo Leak Gives Insight to Russian Strategic Mindset Ballistic Missile Defense Anxiety

[8] <http://www.scmp.com/news/china/diplomacy-defence/article/1982950/chinas-successful-new-rocket-launch-signals)>; 29 Jun 2016; Hong Kong South China Morning Post; China's successful new rocket launch signals breakthroughs in nation's space weaponry

[9] <http://carnegieendowment.org/files/12-chinanucleararsenal-240315wintro-formatted.pdf>; Accessed 13 Jun 2017; 24 Mar 2015; Carnegie Endowment for International Peace; Why is China Modernizing its Nuclear Arsenal?

[10] Olga Bozhyeva; 21 Apr 2016; Moscow MK Online; Sources: Russia Successfully Tested New Missile Superweapon: Developers Called Launch of Sarmat ICBM Warhead a 'Fantastic Success

[11] 9 Sep 2016; Pyongyang Korean Central Broadcasting Station; DPRK Succeeds in Nuclear Warhead Explosion Test

[12] 2017; DIA; Russia Military Power; page 29

[13] 2017; DIA; Russia Military Power; page 30

[14] 21 Feb 2017; CRS; 7-5700; Nonstrategic Nuclear Weapons; Page 24

[15] Podvig, Pavel, et al. "Russian Strategic Nuclear Forces." Center for Arms Control, Energy and Environmental Studies at the Moscow Institute of Physics and Technology, English language edition supported by the Security Studies Program at the Massachusetts Institute of Technology, MIT Press, 2001. pp. 133

[16] 2017; DIA; Russia Military Power page 30

[17] 2017; DIA; Russia Military Power; page 30

[18] 2017; DIA; Russia Military Power; page 30

[19] Anna Yudina; <http://tass.ru/armiya-i-opk/4827520>; 22 Dec 2017; TASS; Secrets of the PAC-DA and the TU-160 M2 will be winged shield of Tussia

[20] Igor Sutyagin; Nov 2012; Royal United Services Institute Occasional Paper; Atomic Accounting: A New Estimate of Russia's Non-Strategic Nuclear Forces. Page3

[21] Alexei Arbatov; <www.nti.org/media/pdfs/NTI_Framework_Chpt8b.pdf%3F_%3D1322702907+&cd=5&hl=en&ct=clnk&gl=us>; Nuclear Threat Initiative; A Russian Perspective on the Challenge of U.S., NATO, and Russian Non-Strategic Nuclear Weapons; page 160

[22] 21 Feb 2017; CRS; 7-5700; Nonstrategic Nuclear Weapons; Page 24

[23] 2007; Russia's Arms and Technologies, The XXI Century Encyclopedia (Volume 14); Page 250-254

[24] Matthew Bodner; 4 Oct 2014; The Moscow Times; (U) Russia Overtakes U.S. In Nuclear Warhead Deployment

[25] <http://www.nti.org/learn/countries/russia/nuclear>; Accessed 17 Mar 2017; Nuclear Threat Initiative, Russia

[26] <http://www.state.gov/t/avc/rls/rpt/2017/index.htm>; Apr 2017, Adhenence to And Compliance With Arms Control, Nonproliferation, And Disarmament Agreements And Comments

[27] <https://www.rt.com/politics/official-word/180136-inf-treaty-antonov-nuclear/>; Accessed 15 Dec 2017; RT US nuke accusations 'part of infowar set to discredit Russia' over Ukraine crisis

[28] <http://www.nti.org/learn/treaties-and-regimes/treaty-banning-nuclear-test-atmosphere-outer-space-and-under-water-partial-test-ban-treaty-ptbt>; Accessed 17 Mar 2017; Nuclear Threat Initiative; Partial Test Ban Treaty

[29] <https://www.state.gov/t/isn/5204.htm>; Accessed 4 Apr 2017; U.S. Department of State; Threshold Test Ban Treaty

[30] <http://www.nti.org/learn/treaties-and-regimes/comprehensive-nuclear-test-ban-treaty-ctbt>; Accessed 17 Mar 2017; Nuclear Threat Initiative; Comprehensive Nuclear Test Ban Treaty

[31] <http://www.nti.org/learn/treaties-and-regimes/treaties-between-united-states-america-and-union-soviet-socialist-republics-strategic-offensive-reductions-start-i-start-ii/>; Accessed 17 Mar 2017; Nuclear Threat Initiative; U.S.-Soviet Strategic Arms Reduction Treaty

[32] <http://www.nti.org/learn/treaties-and-regimes/treaty-between-the-united-states-of-america-and-the-russian-federation-on-measures-for-the-further-reduction-and-limitation-of-strategic-offensive-arms/>; Accessed 17 Mar 2017; Nuclear Threat Initiative; Measures for the Further Reduction and Limitation of Strategic Offensive Arms

[33] <http://kremlin.ru/>; 16 Feb 2010; Moscow President of Russia; The Military Doctrine of the Russian Federation

[34] Podvig, Pavel, et al. "Russian Strategic Nuclear Forces." Center for Arms Control, Energy and Environmental Studies at the Moscow Institute of Physics and Technology, English language edition supported by the Security Studies Program at the Massachusetts Institute of Technology, MIT Press, 2001. pp. 50–51.

[35] 2017; DIA; Russia Military Power; Page 27

[36] 2017; DIA; Russia Military Power; Page 29

[37] Andreyev, Oleg; < http://www.ng.ru/> Accessed 19 May 2016; 18 May 2016; Nezavisimaya Gazetal; RVSN Given Six Years to Rearm; Moscow Adjusts Plans to Enhance Combat Readiness of the Armed Forces

[38] <http://lenta.ru/>; 5 Sep 2016; Accessed 15 Sep 2016; Moscow Lenta.ru; Source Names Timeframe for Troops to Get New Sarmat Missile

[39] Bodner, Matthew; < http://www.themoscowtimes.com>; 23 Sep 2015; Moscow Times Online in English; Kremlin Threatens Response to U.S. Nuclear Bomb Deployment in Germany

[40] Gerasimov, Valery; Military-Industrial Courier; 27 Feb 2013; The Value of Science is in Foresight: New Challenges Demand Rethinking of the Forms and Methods of Conducting Combat Actions (ЦЕННОСТЬ НАУКИ В ПРЕДВИДЕНИИ НОВЫЕ ВЫЗОВЫ ТРЕБУЮТ ПЕРЕОСМЫСЛИТЬ ФОРМЫ И СПОСОБЫ ВЕДЕНИЯ БОЕВЫХ ДЕЙСТВИЙ)

[41] <http://kremlin.ru/>; 16 Feb 2010; Moscow President of Russia; The Military Doctrine of the Russian Federation

[42] Military Thought; 1 Dec 2002; On the Question of Nuclear Deterrence (К ВОПРОСУ О ЯДЕРНОМ СДЕРЖИВАНИИ)

[43] Pavel Felgengauer; 14 Feb 1997; Moscow Segodnya; Rybkin's Preventive Strike

[44] <http://www.militarynews.ru>; 5 Sep 2014; Moscow Interfax-AVN Online; Russia Classifies Information on Pre-Emptive Nuclear Strikes

[45] 01 May 1999; Military Thought; On Employing Nuclear Weapons to De-Escalate Military Operations

[46] <http://www.nti.org/learn/treaties-and-regimes/treaty-between-the-united-states-of-america-and-the-russian-federation-on-measures-for-the-further-reduction-and-limitation-of-strategic-offensive-arms/>; Accessed 17 Mar 2017; Nuclear Threat Initiative; Measures for the Further Reduction and Limitation of Strategic Offensive Arms

[47] 22 Feb 2018; New START Treaty Aggregate Numbers of Strategic Offensive Arms

[48] Igor Sutyagin; Nov 2012; Royal United Services Institute Occasional Paper; Atomic Accounting: A New Estimate of Russia's Non-Strategic Nuclear Forces. Page3

[49] Alexei Arbatov; < www.nti.org/media/pdfs/NTI_Framework_Chpt8b.pdf%3F_%3D1322702907+&cd=5&hl=en&ct=clnk&gl=us>; Nuclear Threat Initiative; A Russian Perspective on the Challenge of U.S., NATO, and Russian Non-Strategic Nuclear Weapons; page 160

[50] 21 Feb 2017; CRS; 7-5700 Nonstrategic Nuclear Weapons; Page 24

[51] Aleksandr Shcherbak; < http://tass.ru/politika/2512286>; 9 Dec 2015; TACC; Lavrov: There is no need to use nuclear weapons against terrorists

[52] <http://www.atomic-energy.ru/>; 2 Sep 2013; Summary of Priority Security And Protection Upgrades To Russian Nuclear Weapons Complex Facilities

[53] <http://www.strana-rosatom.ru/>; 23 Apr 2012; The Nuclear Weapons Complex Looks Forward to a Stable Future

[54] Vladimir Putin; 16 Jun 2015; Speech at ceremony opening ARMY-2015 International Military-Technical Forum

[55] Podvig, Pavel, et al; Russian Strategic Nuclear Forces; Center for Arms Control, Energy and Environmental Studies at the Moscow Institute of Physics and Technology, English language edition supported by the Security Studies Program at the Massachusetts Institute of Technology, MIT Press, 2001; pp. 133

[56] <russianforces.org/missiles>; 22 Jul 2017: Accessed 19 January 2018; Russian Strategic Nuclear Forces;

[57] <http://vzglyad.ru/>; 12 May 2016; Moscow Vzglyad Online; The Acceptance in the Inventory of the RS-26 'Yars-M' Missile Complex Is Planned in 2017

[58] <russianforces.org/missiles>; 22 Jul 2017: Accessed 19 January 2018; Russian Strategic Nuclear Forces;

[59] Podvig, Pavel, et al; Russian Strategic Nuclear Forces; Center for Arms Control, Energy and Environmental Studies at the Moscow Institute of Physics and Technology, English language edition supported by the Security Studies Program at the Massachusetts Institute of Technology, MIT Press, 2001; pp. 245

[60] <russianforces.org/missiles>; 20 Jun 2017: Accessed 19 January 2018; Russian Strategic Navy;

[61] 2017; DIA; Russia Military Power; Page 30

[62] <russianforces.org/missiles>; 20 Jun 2017: Accessed 19 January 2018; Russian Strategic Aviation;

[63] Anna Yudina; <http://tass.ru/armiya-i-opk/4827520>; 22 Dec 2017; TASS; Secrets of the PAC-DA and the TU-160 M2 will be winged shield of Tussia

[64] Olga Bozhyeva; 21 Apr 2016; Moscow MK Online; Sources: Russia Successfully Tested New Missile Superweapon: Developers Called Launch of Sarmat ICBM Warhead a 'Fantastic Success

[65] 2017; DIA; Russia Military Power; page 76

[66] Sam LaGrone; <https://news.usni.org/2015/11/12/analyst-doomsday-nuclear-torpedo-leak-gives-insight-to-russian-strategic-mindset-ballistic-missile-defense-anxiety>; 22 Mar 2017; Nov 2015; USNI News; Analyst: Doomsday Nuclear Torpedo Leak Gives Insight to Russian Strategic Mindset Ballistic Missile Defense Anxiety

[67] Carnegie Endowment for International Peace; <http://carnegieendowment.org/files/12-chinanucleararsenal240315wintro-formatted.pdf>; 24 Mar 2015; Why is China Modernizing its Nuclear Arsenal?

[68] 30 Jun 2017, NASIC; <http://www.nasic.af.mil/About-Us/Fact-Sheets/Article/1235024/2017-ballistic-and-cruise-missile-threat-report/>; 2017 Ballistic and Cruise Missile Threat

[69] Chinese Military Review; <https://www.chinesemilitaryreview.blogspot.com/2011/10/chinese-jl-2-submarine-launched.html>; 19 Oct 2011; Chinese JL-2 Submarine Launched Ballistic Missile (SLBM)

[70] Jun 2017, 2017 Ballistic and Cruise Missile Threat Report, by the Defense Intelligence Ballistic Missile Analysis Committee, pages 3 and 29

[71] 30 Jun 2017, NASIC; <http://www.nasic.af.mil/About-Us/Fact-Sheets/Article/1235024/2017-ballistic-and-cruise-missile-threat-report/>; 2017 Ballistic and Cruise Missile Threat

[72] Carnegie Endowment for International Peace; <http://carnegieendowment.org/files/12-chinanucleararsenal240315wintro-formatted.pdf>; 24 Mar 2015; Why is China Modernizing its Nuclear Arsenal?

[73] John W. Lewis and Xue Litai; 1988; Stanford University Press; China Builds the Bomb

[74] Arms Control Association <https://www.armscontrol.org/factsheets/nucleartesttally>, Accessed 7 Nov 2017; The Nuclear Testing Tally

[75] China Academy of Engineering Physics; <www.caep.ac.cn/rlzy/bsh/21443.shtml>; 10 Jun 2015; 2015 Chinese Academy of Engineering Physics Postdoctoral Careers

[76] Arms Control Association; <https://www.armscontrol.org/factsheets/chinaprofile#nw>; Accessed 15 Dec 2017; Arms Control and Proliferation Profile: China

[77] Nuclear Age Peace Foundation; <https://www.nuclearfiles.org/menu/key-issues/nuclear-weapons/issues/policies/no-first-use_1995_04_05.htm#>; 5 Apr 1995; No First Use Policy of Declared Nuclear Weapons States

[78] Ministry of National Defense of the People's Republic of China; <http://www.mod.gov.cn>; 20 Jan 2008; Defense White Paper: China's National Defense in 2008

[79] National Academy of Science; 2002; The National Academies Press; Technical Issues Related to the Comprehensive Test Ban Treaty

[80] Ministry of National Defense of the People's Republic of China; <http://www.mod.gov.cn>; 20 Jan 2008; Defense White Paper: China's National Defense in 2008

[81] Ministry of National Defense of the People's Republic of China; <http://www.mod.gov.cn/affair/2013-04/16/content_4442839.htm>; 16 Apr 2013; Defense White Paper: Diversification of China's Armed Forces

[82] Rachel Oswald; <http://www.nti.org/gsn/article/chinas-new-defense-paper-causes-stir-over-questions-no-first-use-policy>; 26 Apr 2013; Nuclear Threat Initiative; China's New Defense Paper Causes Stir over No First Use Policy

[83] Yao Yunzhu; <http://chinausfocus.com/peace-security/china-will-not-change-its-no-first-use-policy/>; 22 Apr 2013; China US Focus; China will not Change its Nuclear Policy

[84] 15 May 2017, Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2017, page 60

[85] International Panel on Fissile Materials; <http://fissilmaterials.org/countries/china.html>; 2016; Countries: China

[86] 26 Apr 16, Office of the Secretary of Defense; Annual Report on Military and Security Developments Involving the People's Republic of China 2016

[87] International Panel on Fissile Materials; <http://fissilmaterials.org/countries/china.html>; 2016; Countries: China

[88] Science & Global Security; ISSN: 0892-9882; 23 Oct 2015; China's Uranium Enrichment Complex

[89] Bulletin of the Atomic Scientists; <http://thebulletin.org/china%E2%80%99s-rapidly-expanding-centrifuge-enrichment-capacity8934>; 7 Dec 2015; China's rapidly expanding centrifuge enrichment capacity

[90] Harvard University; China's Stockpile of Military Plutonium: a New Estimate

[91] Video, Beijing CCTV News in English; China's Spent Nuclear Fuel Breakthrough

[92] Yang Rui, Wang Xinxin; <http://www.cyd.com.cn>; 20 May 2013; Zhongguo Qingnian Bao Online; At China's Only Nuclear Weapons Development and Production Unit, More than 7,300 Technical Personnel Act as the Right Hand Men of Scientific Research Personnel They Turn Scientists' Ideas into Reality

[93] Yang Rui, Wang Xinxin; <http://www.cyd.com.cn>; 20 May 2013; Zhongguo Qingnian Bao Online; At China's Only Nuclear Weapons Development and Production Unit, More than 7,300 Technical Personnel Act as the Right Hand Men of Scientific Research Personnel They Turn Scientists' Ideas into Reality

[94] China Academy of Engineering Physics; <www.caep.ac.cn/rlzy/bsh/21443.shtml>; 10 Jun 2015; 2015 Chinese Academy of Engineering Physics Postdoctoral Careers

[95] 26 Apr 2016, Office of the Secretary of Defense; Annual Report on Military and Security Developments Involving the People's Republic of China 2016

[96] Carnegie Endowment for International Peace; <http://carnegieendowment.org/files/12-chinanucleararsenal240315wintro-formatted.pdf>; 24 Mar 2015; Why is China Modernizing its Nuclear Arsenal?

[97] 30 Jun 2017, NASIC; <http://www.nasic.af.mil/About-Us/Fact-Sheets/Article/1235024/2017-ballistic-and-cruise-missile-threat-report/>; 2017 Ballistic and Cruise Missile Threat

[98] Chinese Military Review; <https://www.chinesemilitaryreview.blogspot.com/2011/10/chinese-jl-2-submarine-launched.html>; 19 Oct 2011; Chinese JL-2 Submarine Launched Ballistic Missile (SLBM)

[99] 15 May 2017, Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2017, page 24

[100] SinoDefense; <www.sinodefense.com/rocketry/df4>; Dong Feng-4 (CSS-3)

[101] China Academy of Engineering Physics; <www.caep.ac.cn/rlzy/bsh/21443.shtml>; 10 Jun 2015; 2015 Chinese Academy of Engineering Physics Postdoctoral Careers

[102] Online Newspaper, The Age; < http://www.theage.com.au/>; 1 Aug 2014; China Confirms New Generation Nuclear-Capable ICBM That Can Target US

[103] Online Newspaper, Want China Times in English; <https://www.wantchiantimes.com/>; 31 Aug 2015; PLA's DF-26 IRBM is without peer, says Sina Military

[104] Hong Kong South China Morning Post; < http://www.scmp.com/news/china/diplomacy-defence/article/1982950/chinas-successful-new-rocket-launch-signals>; 29 Jun 2016; China's successful new rocket launch signals breakthroughs in nation's space weaponry

[105] China Military Online; <http://english.chinamil.com.cn>; Sep 2016; Expert: Three Solutions for China's New-Generation Long-range Strategic Bomber

[106] 26 Apr 2016, Office of the Secretary of Defense; Annual Report on Military and Security Developments Involving the People's Republic of China 2016

[107] Franz-Stefan Gady; <http://thediplomat.com/2015/08/china-tests-new-missile-capable-of-hitting-entire-united-states/>; 19 Aug 2015

[108] 15 May 2017, Office of the Secretary of Defense; Annual Report on Military and Security Developments Involving the People's Republic of China 2017

[109] South China Morning Post Online; < http://www.scmp.com/news/china>; 14 Jan 2014; China Hails First Test Of Hypersonic Nuclear Missile Carrier

[110] Song Zhongping; < http://www.xinhuanet.com/herald/>; 7 Feb 2014; Hypersonic Missiles Can Break Through the US Anti-missile System

[111] 15 May 2017, Office of the Secretary of Defense; Annual Report on Military and Security Developments Involving the People's Republic of China 2017

[112] 5 Jan 2016; Office of the Secretary of Defense, Military and Security Developments Involving the Democratic People's Republic of Korea; pp. 9-14

[113] 3 Apr 2013; Congressional Resource Service; CRS 7-5700; North Korea's Nuclear Weapons: Technical Issues

[114] 5 Jan 2016; Office of the Secretary of Defense; Military and Security Developments Involving the Democratic People's Republic of Korea

[115] <http://english.yonhapnews.co.kr/news/2017/02/24/26/0200000000AEN20170224000251315F.html.>; 24 Feb 2017; Accessed 8 Sep 2017; Yonhap; N. Korea Moving Solidly Toward Second Nuclear Strike Capability

[116] Yu, Yong-weon;< http://english.chosun.com/site/data/html_dir/2016/07/21/2016072100780.html>; 21 Jul 2016; Accessed 1 Aug 2017; Chosun Ilbo ; N. Korean Missile Launch 'Practiced Pre-emptive Nuke Strike

[117] 5 Jan 2016; Office of the Secretary of Defense, Military and Security Developments Involving the Democratic People's Republic of Korea; p. 5

[118] 5 Jan 2016; Office of the Secretary of Defense; Military and Security Developments Involving the Democratic People's Republic of Korea

[119] 5 Jan 2016; Office of the Secretary of Defense; Military and Security Developments Involving the Democratic People's Republic of Korea

[120] 5 Jan 2016; Office of the Secretary of Defense; Military and Security Developments Involving the Democratic People's Republic of Korea

[121] 3 Apr 2013; Congressional Resource Service; CRS 7-5700; North Korea's Nuclear Weapons: Technical Issues

[122] Oct 2011; Nuclear Threat Initiative; Joint Declaration of South And North Korea On The Denuclearization Of The Korean Peninsula

[123] Jack Kim and Chris Buckley; Reuters World News; North Korea Agrees to Nuclear Disarmament Steps

[124] Jayshree Bajoria and Beina Xu; 20 Sep 2013; <ForeignAffairs.com>; Council on Foreign Relations; The Six Party Talks on North Korea's Nuclear Program;

[125] 13 Feb 2007; World Nuclear News; North Korea Agrees To Nuclear Disarmament

[126] Robert Longley; 2 May 2017; Thoughtco; North Korea and Nuclear Weapons: A Long History of Failed Diplomacy;

[127] <http://www.economist.com/blogs/banyan/2012/03/north-korean-nuclear-progress>; 1 Mar 2012. Accessed 17 Mar 2012; The Economist online. North Korean nuclear progress: Leap of faith

[128] Choe Sang-hun and Steven Lee Myers; <https://www.nytimes.com/2012/03/17/world/asia/north-korea-satellite-launch-missile-test.html?pagewanted=all >;16 Mar 2012; The New York Times; North Korea Says It Will Launch Satellite Into Orbit

[129] 3 April 2013; Congressional Resource Service; CRS 7-5700; North Korea's Nuclear Weapons: Technical Issues

[130] <https://www.armscontrol.org/factsheets/dprkchron#2016>; Accessed 15 Dec 2017; Arms Control Association; Chronology of U.S.-North Korean Nuclear and Missile Diplomacy; pg 11

[131] 3 Apr 2013; Congressional Resource Service; CRS 7-5700; North Korea's Nuclear Weapons: Technical Issues

[132] 5 Jan2016; Office of the Secretary of Defense; Military and Security Developments Involving the Democratic People's Republic of Korea

[133] 23 Feb 2016; KCNA; Crucial Statement of KPA Supreme Command approved by OSC for public release as per email 170921121716

[134] 6 Mar 2016; KCBS; DPRK National Defence Commission Warns of Military Counter-action for Preemptive Attack

[135] 21 Aug 2016; KCNA; Spokesman for KPA General Staff Clarifies Principled Stand on Nuclear War Drill against DPRK

[136] Yu, Yong-weon; <http://english.chosun.com/site/data/html_dir/2016/07/21/2016072100780.html>; 21 July 2016; Accessed 1 Aug 2017; Chosun Ilbo; N. Korean Missile Launch 'Practiced Pre-emptive Nuke Strike

[137] 3 Apr 2013; Congressional Resource Service; CRS 7-5700; North Korea's Nuclear Weapons: Technical Issues

[138] 5 Jan 2016; Office of the Secretary of Defense; Military and Security Developments Involving the Democratic People's Republic of Korea

[139] <https://www.washingtonpost.com/national/world-digest-aug-17-2016/2016/08/17/c6f0a626-6484-11e6-96c0-37533479f3f5_story.html?utm_term=.b1c9e3efe277>; Accessed 15 Dec 2017; Washington Post; World Digest: 17 Aug 2016

[140] <https://www.armscontrol.org/factsheets/dprkchron#2016>; Accessed 15 Dec 2017; Arms Control Association; Chronology of U.S.-North Korean Nuclear and Missile Diplomacy; pg 11.

[141] 9 Sep 2016; Pyongyang Korean Central Broadcasting Station; DPRK Succeeds in Nuclear Warhead Explosion Test

[142] 6 Jan 2016; KCNA; DPRK Proves Successful in H-bomb Test

[143] 3 Apr 2013; Congressional Resource Service; CRS 7-5700; North Korea's Nuclear Weapons: Technical Issues

[144] 5 Jul 2017; KCTV; Report of the Democratic People's Republic of Korea on the "successful" test-fire of the intercontinental ballistic rocket Hwaso'ng-14 type on 4 July

[145] 5 Jan 2016; Office of the Secretary of Defense; Military and Security Developments Involving the Democratic People's Republic of Korea

[146] 11 Feb 2016; KCTV; Korean documentary: Successful Launch of Earth Observation Satellite 'Kwangmyo'ngso'ng-4' Under Guidance of Respected and Beloved Comrade Kim Jong Un.

[147] Michael Elleman; <http://www.38north.org/2017/05/pukguksong2_052517/>; 25 May 2017; Accessed 10 Aug 2017; 38 North. org, U.S.-Korea Institute, Johns Hopkins University; The Pukguksong-2: Lowering the Bar on Combat Readiness

[148] <http://english.yonhapnews.co.kr/news/2017/02/24/26/0200000000AEN20170224000251315F.html>; 24 Feb 2017; Accessed 8 Sep 2017; Yonhap ; N. Korea Moving Solidly Toward Second Nuclear Strike Capability

[149] Stephen Evans; <http://www.bbc.com/news/world-asia-37353956>; 14 September 2017; Accessed 8 September 2017; BBC News ; The Alarming Progress of a Nuclear North Korea

[150] <http://english.yonhapnews.co.kr/news/2017/05/21/0200000000AEN20170521003552315.htm>; 21 May 2017; Accessed 8 Sep 2017; Yonhap ; N.K. Says its Leader Oks Deployment of New Missiles for Action

[151] <https://missilethreat.csis.org/country/dprk/>; Accessed Jan 2018; CSIS; Missiles of North Korea

[152] <https://usun.state.gov/remarks/7924> ; Accessed 8 Sep 2017; United Nations; Fact Sheet: Resolution 2371

[153] Heavy, Susan and Kim, Jack; <https://www.reuters.com/article/us-northkorea-missiles/message-from-north-korean-missile-over-japan-loud-and-clear-trump-idUSKCN1B8283>; 28 Aug 2017; Accessed 8 Sep 2017; Reuters; Message from North Korean Missile over Japan 'Loud and Clear': Trump

[154] Schilling, John; https://www.38north.org/2017/05/jschilling052417/>; Accessed 8 Sep 2017; May 24, 2017; The Pukguksong-2 Approaches Initial Operational Capability

[155] <http://www.scmp.com/news/china/diplomacy-defence/article/2089839/opinion-north-koreas-huge-military-parade-shows-its-prepared-to-wage-nuclear-war>; 23 Apr 2017; Accessed 8 Sep 2017; South China Morning Post; Opinion: North Korea's Huge Military Parade Shows its Prepared to Wage Nuclear War

[156] <http://english.yonhapnews.co.kr/news/2017/04/15/0200000000AEN20170415003154315.html>; 15 Apr 2017; Accessed 8 September 2017; Yonhap; N. Korea Unveils New ICBM At Military Parade

[157] Brad Lendon; <http://www.cnn.com/2017/04/15/asia/north-korea-missiles-parade/>; Date of access 17 April 2017; CNN news online; North Korea surprises with display of new missiles

[158] Mary Beth Nikitin; http://fpc.state.gov/documents/organization/207428.pdf>; Date of access: 18 March 2014; Date of publication: 3 Apr 2013; Congressional Research Service; North Korea's Nuclear Weapons: Technical Issues; p.28-29

[159] <http://www.nti.org/learn/countries/libya/nuclear/>; February 2011; Nuclear Threat Initiative; Country Profiles: Libya Nuclear Overview

[160] Mary Beth Nikitin; <http://fpc.state.gov/documents/organization/158477.pdf>; Date of access: 18 Mar 2014; Date of publication: 2 March 2011; "Congressional Research Service"; Managing the Nuclear Fuel Cycle: Policy Implications of Expanding Global Access to Nuclear Power; p.10

[161] Mary Beth Nikitin; http://fpc.state.gov/documents/organization/207428.pdf>; Date of access: 18 Mar 2014; Date of publication: 3 April 2013; Congressional Research Service; North Korea's Nuclear Weapons: Technical Issues; p.10

[162] Mary Beth Nikitin; http://fpc.state.gov/documents/organization/207428.pdf>; Date of access: 18 Mar 2014; Date of publication: 3 April 2013; Congressional Research Service; North Korea's Nuclear Weapons: Technical Issues; p.9

[163] Emma Chanlett-Avery and Ian E. Rinehart; <http://fpc.state.gov/documents/organization/221261.pdf>; Date of access: 18 March 2014; Date of publication: 15 Jan 2014; "Congressional Research Service"; North Korea: U.S. Relations, Nuclear Diplomacy, and Internal Situation; p.5

[164] Mary Beth Nikitin; http://fpc.state.gov/documents/organization/207428.pdf>; Date of access: 18 Mar 2014; Date of publication: 3 April 2013; Congressional Research Service; North Korea's Nuclear Weapons: Technical Issues; p.28

[165] 8 Nov 2011; IAEA; GOV/2011/65; Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran; Annex p 1, para 3-5 and 18-24

[166] 9 Feb 2016, James R. Clapper; ODNI; Statement for the Record Worldwide Threat Assessment of the US Intelligence Community; pg. 8

[167] 31 Jul 2015; IAEA; INFCIRC/887; Communication dated 24 July received from China, France, Germany, the Russian Federation, the United Kingdom, the United States of America (E3/EU+3) and the Islamic Republic of Iran concerning the text of the Joint Comprehensive Plan of Action (JCPOA)

[168] ISIS; Iran's Nuclear History from the 1950s to 2005

[169] 8 Nov 2011; IAEA, GOV/2011/65; Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran; Annex p 1, para 3-5 and 18-24

[170] Nov 2007; Director of National Intelligence; National Intelligence Estimate: Iran: Nuclear Intentions and Capabilities

[171] 16 Nov 2009; IAEA, GOV/2009/74; Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006), 1747 (2007), 1803 (2008) and 1835 (2008) in the Islamic Republic of Iran; Paragraph 7

[172] 8 Nov 2011; IAEA, GOV/2011/65; Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran; Paragraph 20

[173] 8 Nov 2011; IAEA, GOV/2011/65; Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran; Section K, para 52

[174] Aug 2011; Department of State; Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments; page 20

[175] 2 Dec 2015; IAEA, GOV/2015/68; Final Assessment on Past and Present Outstanding Issues regarding Iran's Nuclear Programme; Section F, para 77

[176] 16 Jan 2016; IAEA; GOV/INF/2016/1; Verification and Monitoring in the Islamic Republic of Iran in light of United Nations Security Council Resolution 2231 (2015); sections 15.9-11

[177] 31 Jul 15; IAEA; INFCIRC/887; Communication dated 24 July received from China, France, Germany, the Russian Federation, the United Kingdom, the United States of America (E3/EU+3) and the Islamic Republic of Iran concerning the text of the Joint Comprehensive Plan of Action (JCPOA)

[178] 31 Jul 15; IAEA; INFCIRC/887; Communication dated 24 July received from China, France, Germany, the Russian Federation, the United Kingdom, the United States of America (E3/EU+3) and the Islamic Republic of Iran concerning the text of the Joint Comprehensive Plan of Action (JCPOA)

[179] 31 Aug 2017; IAEA; GOV/2017/35; Verification and monitoring in the Islamic Republic of Iran in light of United Nations Security Council resolution 2231 (2015)

[180] 31 Jul 15; IAEA; INFCIRC/887; Communication dated 24 July received from China, France, Germany, the Russian Federation, the United Kingdom, the United States of America (E3/EU+3) and the Islamic Republic of Iran concerning the text of the Joint Comprehensive Plan of Action (JCPOA)

[181] 16 Jan 2016; IAEA; GOV/INF/2016/1; Verification and Monitoring in the Islamic Republic of Iran in light of United Nations Security Council Resolution 2231 (2015)

[182] <http://www.nti.org/learn/countries/libya/nuclear/>; Feb 2011; Nuclear Threat Initiative; Country Profiles: Libya Nuclear Overview

[183] David E. Sanger and William J. Broad; 31 Mar 2005; New York Times; Using Clues From Libya To Study A Nuclear Mystery

[184] 12 Sep 2008; International Atomic Energy Agency (IAEA); IAEA Board of Governors Report: Implementation of the NPT Safeguards Agreement of the Socialist People's Libyan Arab Jamahiriya GOV/2008/39

[185] Adam Entous; 15 Mar 2004; Reuters; U.S. displays components of Libyan nuclear program

[186] 12 Sep 2008; International Atomic Energy Agency (IAEA); IAEA Board of Governors Report: Implementation of the NPT Safeguards Agreement of the Socialist People's Libyan Arab Jamahiriya GOV/2008/39

[187] 30 Aug 2004; International Atomic Energy Agency (IAEA); IAEA Board of Governors Report: Implementation of the NPT Safeguards Agreement of the Socialist People's Libyan Arab Jamahiriya GOV/2004/59

[188] 8 Mar 2004; International Atomic Energy Agency (IAEA); Staff Report: Removal of High-Enriched Uranium in Libyan Arab Jamahiriya

[189] <http://www.nti.org/learn/countries/libya/nuclear/>; Feb 2011; Nuclear Threat Initiative; Country Profiles: Libya Nuclear Overview

[190] 24 May 2011; International Atomic Energy Agency (IAEA); IAEA Board of Governors Report: Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic GOV/2011/30

[191] <http://www.nti.org/learn/countries/syria/nuclear/>; Aug 2014; Nuclear Threat Initiative; Country Profiles: Syria Nuclear Overview

[192] 24 May 2011; International Atomic Energy Agency (IAEA); IAEA Board of Governors Report: Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic GOV/2011/30

[193] 24 May 2011; International Atomic Energy Agency (IAEA); IAEA Board of Governors Report: Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic GOV/2011/30

[194] 24 May 2011; International Atomic Energy Agency (IAEA); IAEA Board of Governors Report: Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic GOV/2011/30

[195] 24 May 2011; International Atomic Energy Agency (IAEA); IAEA Board of Governors Report: Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic GOV/2011/30

[196] 24 May 2011; International Atomic Energy Agency (IAEA); IAEA Board of Governors Report: Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic GOV/2011/30

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