

Defense Review 2022



International Relations Insights & Analysis

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Overview

The year 2022 can be defined as a turning point for global security and the geopolitical landscape. It was a significant year for the global defense industry as 2022 witnessed an immense increase in demand for weapons largely due to a global wave of military modernization. New technological advances were achieved while older technologies were upgraded. From next-generation bombers and aircraft to basic handheld rocket launchers, the IRIA Defense Review 2022 provides a concise and comprehensive overview of the weapon technologies of 2022 and their use in modern warfare.

The first quarter of the year 2022 saw the beginning of Russia's war on Ukraine and changed the course for the rest of the year. Although the actual military campaign started only in February 2022, the military buildup had been forging grounds since late 2021. Updates related to the Russia-Ukraine war have been making headlines to date as it seems far from over. The Russia-Ukraine war is a significant development because it is one of the largest military conflicts in Europe since World War II. This year's edition of Defense Review extensively focuses on events related to the Russia-Ukraine war.

NATO claims not to be an actor in the Russia-Ukraine war, however, members of the NATO alliance are most vulnerable to a security threat if the war spreads beyond Ukrainian borders. In the wake of this threat, NATO and its allies have revitalized their arsenal and defense capabilities. NATO has conducted a large number of military exercises while the alliance members are ramping up efforts to deter a possible war in Europe. All this has led to an immense increase in the demand for weapons most prominently, fighter jets and air defense systems. U.S.-made F-35 Lightning II fighter jets and Korean-made FA-50 Golden Eagle saw a substantial increase in demand while U.S.-made HIMARS became the most extensively used air defense system against Russian aerial attacks. This year's Defense Review puts a special emphasis on these and other defensive weapons technologies that gained prominence as a result of the Russia-Ukraine war.

The year 2022 also saw a substantial improvement in the drone industry as global militaries are shifting towards cheaper yet more reliable drones to carry out surveillance and reconnaissance as well as light combat missions. Turkey became the frontrunner

Overview

in the global drone industry with its military drones gaining significant fame during the Russia-Ukraine war. On the other hand, Iranian drones also gained a fair share of publicity after being used by the Russian military for carrying out attacks in Ukraine. Defense Review 2022 gives particular attention to the role of drones in modern warfare and its future implications.

As Europe was facing a threat of aggression, a lot happened in the Indo-Pacific region as well. The year 2022 saw an unprecedented increase in weapons testing and missile launches by North Korea. From the start of 2022 until the end, North Korean leadership kept its regional rivals on the edge of their seats by carrying out consecutive missile tests, including one of the largest Intercontinental Ballistic Missile (ICBM) tests to date.

Not too far away from North Korea, tensions were rising between China and the U.S. on issues related to Taiwan. The ongoing tension reached its climax in August 2022 when an unannounced trip by the U.S. House Speaker to the self-governed island angered Beijing to a point that China's People's Liberation Army (PLA) conducted the largest-ever live-fire drills around Taiwan. The IRIA Defense Review 2022 provides an analysis of the weapons and military capabilities that China showed off during the live-fire drills.

Militaries all around the world advanced their ambitions of modernization. Several countries added new fighter jets, naval ships, and attack missiles to their fleets while many others unveiled similar plans for the future. The most significant additions are the U.S. Air Force's B-21 Bomber Jet, Indian Navy's INS Vikrant Aircraft Carrier, and Russian Navy's Oscar II-class Belgorod K-329 Submarine. These cutting-edge upgrades to the largest military arsenals of the world indicate the ambitions of the states and the continually evolving global and regional security landscape.

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Revitalized NATO: Expansion and Capability Enhancement in 2022

Not long ago, in November 2019, French President Emmanuel Macron famously described NATO (North Atlantic Treaty Organization) as a 'brain-dead' alliance. He was not happy about U.S.'s withdrawal from Northern Syria without NATO's consultation. Little did he know that the importance of NATO would be redefined in a few years ahead.¹

The predominantly European military alliance was created in the 1940s to provide collective security against Soviet Union's increasing influence in Europe and beyond. Since the collapse of the Soviet Union, NATO had been dubbed as a 'Cold War relic' without a purpose. Former U.S. President Donald Trump often referred to it as an 'obsolete' entity throughout his term and election campaigns.²

Mocked by the critics and ridiculed by the leaders of its member states, the NATO alliance was in a dire need of a post-Cold War purpose. NATO got involved in the Middle East, but it was not as intense as it would be if it was a threat directed at Europe. The time finally came for NATO to become more relevant as Russia started its invasion of Ukraine in February of 2022. Through Russian President Putin's decision to carry out a "special military operation" in Ukraine, NATO not only found an opportunity to revive itself but also to expand its membership and gain access further into Europe.

In wake of the Russian invasion of Ukraine in February 2022, NATO General Secretary Jens Stoltenberg ordered an immediate deployment of NATO's Rapid Action Force, consisting of 4,000 troops, to protect the alliance's European borders. Although NATO remains uninvolved in the military actions that are taking place in Ukraine, its forces are currently on high alert while keeping a close eye on Russia's advancements toward the west.

NATO's expansion

Russia's attack on Ukraine recommenced the rusted communication channels between the NATO member states and brought Europe and its Western partners back into frequent



U.S., Romanian and British soldiers finish Bull Run II at the training area in Bemowo Piskie, Poland. (Image Credit: U.S. Army/Capt. John W. Strickland)

1. Economist, Emmanuel Macron warns Europe: NATO is becoming brain-dead, The Economist, November 07, 2019. <https://www.economist.com/europe/2019/11/07/emmanuel-macron-warns-europe-nato-is-becoming-brain-dead>

2. Cyra Master, Trump tells German paper: NATO is 'obsolete', The Hill, January 15, 2017. <https://www.thehill.com/homenews/administration/314432-trump-nato-is-obsolete/amp/>

communications regarding European security. Several European countries started to line up to increase cooperation with NATO. These countries include Sweden, Finland, Ireland, Serbia, Georgia, and Moldova.

So far, Finland and Sweden are well on track to become NATO members. In January 2022, NATO's Secretary General Stoltenberg hinted at Sweden and Finland's accession to the alliance by stating that "Finland and Sweden are NATO's closest partners. We share the same values. And we face the same challenges, in the Baltic Sea region and beyond. Our forces have trained and exercised together for many years. We continue to share information and situational awareness. And both Finland and Sweden have contributed to NATO missions and operations, from the Western Balkans to Iraq."³

In April 2022, leaders of Finland and Sweden met to discuss the possibilities of joining the NATO alliance and agreed upon initiating a joint accession request. Apart from fulfilling the formal protocols, all joining nations require unilateral approval from all existing NATO member states to formally join the alliance.⁴ Turkey was the only country to oppose the accession of the two Nordic states into the alliance citing its reservations over their support for terrorism. Turkey accused the two countries of harboring terrorists as several individuals associated with the Kurdistan Worker's Party (PKK) have taken asylum in Sweden and Finland. Turkey deems PKK a terrorist organization.

Turkish President Recep Tayyip Erdogan has openly expressed on several occasions that Turkey is "not in favor" of letting the two states into the NATO alliance. He compared their application to the time when NATO added, Turkey's regional rival, Greece into the alliance. The Turkish president pointed out that NATO's decision to accept Greece as a member in 1952 was a "mistake."⁵ Turkey holds a significant say in NATO's decision-making as it is one of the founding members of the alliance with a significantly large share of troops. Turkey joined the NATO alliance in 1952 and holds the second-largest military contribution after the United States in the 30-member alliance.

In a breakthrough development during NATO's Madrid Summit in June 2022, Turkey agreed to lift its opposition against Sweden and Finland. In a meeting moderated by NATO Secretary General Jens Stoltenberg, Turkey and the two Scandinavian states agreed on the following points.

- Establishing a joint, structured dialogue and cooperation mechanism at all levels of government, including between law enforcement and intelligence agencies, to enhance cooperation on counter-terrorism, organized crime, and other common challenges.
- Sweden and Finland will conduct the fight against terrorism with determination, resolve, and in accordance with the provisions of the relevant NATO documents and policies.
- Finland and Sweden will address Turkey's pending deportation or extradition requests of terror

3. IRIA, Finland and Sweden sign the Accession Protocols for NATO membership, IRIA News, July 6, 2022. <https://www.ir-ia.com/news/finland-and-sweden-sign-the-accession-protocols-for-nato-membership>

4. IRIA, Finland, Sweden leaders meet to discuss Russia-Ukraine war, express willingness to join NATO, IRIA News, April 15, 2022. <https://www.ir-ia.com/news/finland-sweden-leaders-meet-to-discuss-russia-ukraine-war-express-willingness-to-join-nato>

5. IRIA, Turkey does not support Finland and Sweden's bid to join NATO: Erdogan, IRIA News, May 15, 2022. <https://www.ir-ia.com/news/turkey-does-not-support-finland-and-swedens-bid-to-join-nato-erdogan>

suspects, taking into account information, evidence, and intelligence provided by Turkey, and establish necessary bilateral legal frameworks to facilitate extradition and security cooperation with Turkey in accordance with the European Convention on Extradition.

- Finland and Sweden agreed to investigate and interdict any financing and recruitment activities of the PKK and all other terrorist organizations and their extensions, as well as affiliates or inspired groups.
- Turkey, Finland, and Sweden commit to fighting the disinformation and prevent their domestic laws from being abused for the benefit or promotion of terrorist organizations, including through activities that incite violence against Turkey.
- Sweden and Finland agreed to ensure that their respective national regulatory frameworks for arms exports enable new commitments to Allies and reflects their status as NATO members.
- Finland and Sweden commit to supporting the fullest possible involvement of Turkey and other non-EU Allies in the existing and prospective initiatives of the European Union's Common Security and Defence Policy.⁶

Following the major development during the Madrid Summit, Finnish Foreign Minister Pekka Haavisto and his Swedish counterpart Ann Linde visited the NATO headquarters in Brussels to hold a joint meeting with the ambassadors of all 30 NATO countries as they signed the Accession Protocols at the North Atlantic Council in July 2022.⁷



Polish soldiers assigned to the 3rd Air Defense Rocket Brigade, and U.S. Soldiers assigned to the 5th Battalion, 4th Air Defense Artillery Regiment, hold closing ceremonies for the Poland phase of exercise Saber Strike 22 at BPTA, Poland on February 26, 2022. (Image Credit: U.S. Army/Staff Sgt. Clinton Thompson)

Military exercises and forward deployment strategy

One of the most significant tasks for NATO was to prepare its forces and forge their capabilities to address the looming threat of Russia's continued invasion of Ukraine. This came in the form

6. Trilateral Memorandum, Trilateral Agreement between Turkey, Finland, and Sweden, NATO, June 2022. https://www.nato.int/nato_static_fl2014/assets/pdf/2022/6/pdf/220628-trilat-memo.pdf

7. Ibid 3.

of updating the military equipment and expanding the scope of NATO military exercises.

NATO announced several new military exercises focusing on military training while bolstering capabilities in all aspects including land, aerial, naval as well as cyber warfare. As part of NATO's revived spirit, the allies and partners started conducting a series of planned military exercises spread across Europe.

NATO claims that all its exercises are defensive, transparent, and in line with international commitments. In 2020 and 2021, many of NATO's pre-planned annual exercises were postponed due to the Covid-19 pandemic, however, as soon as the Russian invasion of Ukraine started, around 35,000 soldiers from NATO countries took part in one of the largest NATO exercises called the Cold Response 2022, in Norway. During the exercise, NATO partners conducted live-fire drills to ensure that the allies' armed forces are prepared to respond to emerging threats or crises.

NATO's highest priority in the wake of Russia's invasion of Ukraine was to contain the threat by strengthening its eastern flank. This came in the form of organizing military exercises and wargames as well as deploying weapons and troops on the eastern flank. NATO's eastern flank spans Hungary, Bulgaria, Romania, Slovakia, Estonia, Latvia, Lithuania, and Poland. The eastern flank is managed by NATO's command stationed at the Multinational Corps Northeast Headquarters in Szczecin, Poland.

NATO currently has eight battle groups stationed at its eastern flank totaling 10,232 troops. Details of these battle groups are as follows.⁸



Battlegroup of Kabile in Bulgaria - The battlegroup of Kabile consists of 945 troops and it is managed by Italian command while Bulgaria, Greece, and the United States are contributing states.

Battlegroup of Tapa in Estonia - The battlegroup of Tapa consists of 1,373 troops. It is managed by the United Kingdom while Denmark, France, and Iceland are also contributors.

Battlegroup of Tata in Hungary - The battlegroup of Tata has 1,054 active troops. It is managed by the Hungarian command while Italy, Croatia, and the United States are contributors.

Battlegroup of Adazi in Latvia - The battlegroup of Adazi is one of the largest battlegroups in NATO's eastern flank. It consists of 1,840 troops. Canadian command is in charge of the battlegroup while Albania, Czech Republic, Iceland, Italy, Montenegro, North Macedonia, Poland, Slovakia, Slovenia, and Spain are contributor NATO states.

8. New NATO Force Model, NATO's forward deployment, NATO, August 2022.

https://www.nato.int/nato_static_fl2014/assets/pdf/2022/6/pdf/220629-infographic-new-nato-force-model.pdf

Battlegroup of Rukla in Lithuania - The battlegroup of Rukla is the second-largest NATO battlegroup in the eastern flank. It consists of 1,805 troops managed by the German command. Belgium, the Czech Republic, Luxembourg, the Netherlands, and Norway are the contributing states.

Battlegroups of Orzysz in Poland - The battlegroup of Orzysz consists of 1,033 troops and it is managed by the United States command. Croatia, Romania, and the United Kingdom are contributors to the battlegroup.

Battlegroup of Cincu in Romania - The battlegroup of Cincu consists of 574 troops stationed by the NATO command managed by France and Netherlands. Romania is also home to 1,126 additional soldiers stationed under NATO's supreme Allied Commander Europe by Poland, Portugal, and the United States, however, these troops are not integrated into the battlegroup of Cincu.

Battlegroup of Lest in Slovakia - The battlegroup of Lest consists of 1,056 troops managed by the Czech Republic. Germany, Slovakia, and Slovenia are contributors to the battlegroup.

During the 2022 NATO Summit in Madrid, Allies agreed to implement a new NATO Force Model. The new model represents a broader expansion of high-readiness forces potentially available to NATO where and when required. The details of the NATO Force Model, including its precise scale and composition, continue to be developed. The transition to the new model is planned to be completed in 2023.

According to the new Force Model, NATO allies also agreed to boost the collective ability to reinforce its forces in the eastern flank by 1) Deploying more pre-positioned equipment and weapon stockpiles in the eastern flank. 2) Enhancing forward-deployment capabilities, including integrated air and missile defense systems. 3) Strengthening command and control. 4) Upgrading



Troops with the Gotland regiment of the Swedish Army reload their machine guns during target practice on Gotland Island, Sweden, on May 11, 2022. (Image Credit: Sergey Ponomarev/The New York Times)

defense plans, with specific forces pre-assigned to the defense of specific allies in the region.⁹

In the wake of Russian aggression, the alliance has put particular focus on strengthening counterattack capabilities. This came in the form of elaborated and well-planned military exercises. Some of the major NATO exercises of 2022 are highlighted below.¹⁰

Defender Europe 2022

Defender Europe is an annual large-scale U.S.-led multinational joint military exercise that is not only confined to the NATO partner states but also includes non-NATO European allies. Defender Europe has been designed to focus on the readiness of troops and interoperability of the U.S. and NATO military. The Defender Europe 2022 has become more significant due to the ongoing Ukraine war and increased security threat in Europe.

Exercise Dates: May 3, 2022 - June 2022

Participants: 8,730 security personnel from 11 different countries participated in Defender Europe 22. The participant countries included the United States, Denmark, Estonia, Germany, France, Latvia, Lithuania Netherlands, Poland, Slovakia, Sweden, and the United Kingdom.

Venue: Defense Europe 22 exercise took place across 9 different countries throughout Europe. The exercise venues were based in Denmark, Lithuania, Germany, Greece, Latvia, Netherlands, Poland Slovakia, and Estonia.

Swift Response 2022

Swift Response is a large-scale U.S.-led multinational military exercise focusing on enhancing airborne interoperability. The exercise took place in Eastern Europe, Arctic High North, and the Baltic and Balkan regions. The objectives of Swift Response 2022 were to prepare combat-

credible Army forces in Europe while particularly focusing on building airborne interoperability with allies and partners and the integration of joint service partnerships.

Exercise Dates: May 2 - May 20, 2022

Participants: More than 9000 troops from 15 NATO and non-NATO allied countries took part in the exercises including forces from the U.S., UK, France, Italy, Montenegro, Albania, North Macedonia, Czech Republic, Germany, Latvia, Lithuania, Netherlands, Norway, Estonia, and Georgia.



U.S. Marines take part in Cold Response 2022 exercises in Evenes, Norway, on March 22, 2022. (Image Credit: Yves Herman/Reuters)

9. NATO, NATO's military presence in the Eastern side of the Alliance, North Atlantic Treaty Organization, December 21, 2022. https://www.nato.int/cps/en/natohq/topics_136388.htm

10. IRIA Report, NATO's ongoing and upcoming Military Exercises, IRIA, May 22, 2022. <https://www.ir-ia.com/NATO-Military-Exercises-2022.html>

Venue: Swift Response 2022 was conducted at several different venues throughout eastern Europe, the North Pole, Baltic, and Balkan regions as well as in Alaska in the U.S.

Hedgehog 2022

Hedgehog 2022 is a NATO-led military exercise that started at the Estonia-Latvia border. Hedgehog military exercise is Estonia's largest multinational military exercise, which takes place every three or four years. The exercise tests combat readiness and the ability to respond to different threat scenarios in an international framework. Different military units from infantry brigade, air force, navy, cyber command, special operations command, support command, military police, and territorial defense forces from NATO member states participated in the exercise, together with other allies and partner nations.

Exercise Dates: May 16 - May 30, 2022

Participants: More than 16,000 troops from 11 different NATO and non-NATO countries participated in the exercises including the United States, United Kingdom, Estonia, Latvia, Lithuania, Finland, Sweden Ukraine, Georgia, France, and Germany.

Venue: The Hedgehog 2022 took place in Estonia near the Estonia-Latvia border. Since the Russian invasion of Ukraine, NATO has increased its military presence in Estonia.

Steadfast Cobalt 2022 (STCO22)

Steadfast Cobalt 2022 or STCO22 is designed to establish and test the networks and systems needed for the NATO Response Force (NRF) to connect with each other and conduct missions together. The exercise validated and enhanced the interoperability under a federated environment of the deployed NATO Command Structure (NCS) forces, NATO Force Structure (NFS) forces, and partners for the C4ISR (Command, Control, Communication, Computer, Intelligence, Surveillance, and Reconnaissance).

Exercise Dates: April 25 – June 10, 2022

Participants: Representatives from all 30 NATO member countries participated in STCO22. 19 different NATO Command Structures and 14 NATO Forces Structure units took part in the exercise directly while around 9 countries obtained observer status for STCO22 after having approval from the North Atlantic Council (NAC).

Venue: STCO22 was conducted simultaneously in the U.S. European Command (USEUCOM) headquarters in Stuttgart, Germany, and the NATO Response Force headquarters in Brunssum, Netherlands.

Ramstein Legacy 2022

Ramstein Legacy was this year's largest ground-based Integrated Air and Missile Defense (IAMD) exercise in the world, bringing together NATO IAMD allies and partners to build theater-wide procedural interoperability.

Exercise Dates: June 5 - June 16, 2022

Participants: The complete list of participants for the Ramstein Legacy 2022 includes 25 different countries mostly from the NATO alliance with Sweden being the only non-NATO country.

Venue: Operations for the Ramstein Legacy 2022 include live fire and missile defense system



Airmen from 4th Fighter Wing, Seymour Johnson Air Force Base and the 48th Fighter Wing, RAF Lakenheath arrive at Amari Air Base, Estonia on Jan. 24, 2022. (Image Credit: USAF/Staff Sgt. Megan Beatty)

exercises. These events took place at four different locations in Estonia, Lithuania, Latvia, and Poland.

Dynamic Mongoose 2022

Dynamic Mongoose is a NATO-led annual military exercise held in the High North every summer. It is hosted consecutively by Norway and Iceland each year. The exercise focuses on the interoperability of surface ships, submarines, as well as aircraft, and personnel converges for anti-submarine warfare and training to conduct sea control or sea denial-related naval tasks in preparation for future collective defense and crisis response operations.

Exercise Dates: June 12 - July 8, 2022

Participants: The exercise Dynamic Mongoose 2022 involved units, sailors, and airmen along with submarines, surface ships, and maritime patrol aircraft from seven NATO nations (Canada, Denmark, France, Germany, Norway, the United Kingdom, and the United States).

Venue: According to the schedule of annual rotation between Iceland and Norway, the Dynamic Mongoose 2022 took place in the Arctic Circle of Norway.

Dynamic Guard 2022 (II)

Dynamic Guard is NATO's five-day-long biannual multi-national maritime electronic warfare exercise series designed to provide tactical training and help build and maintain proficiency in maritime electronic warfare and anti-ship missile defense for the NATO Response Force and NATO national units.

Exercise Dates: September 4 – September 8, 2022.

Participant Countries: The participants of the Dynamic Guard exercise are limited only to the NATO member states. 5 to 10 different naval fleets participate in each exercise with rotation.

Venue: The Dynamic Guard 2022 (I) was conducted in February 2022 along the coast of Norway. Dynamic Guard 2022 (II) took place in the Mediterranean Sea.

Apart from these major military exercises, several short-level military training programs were also conducted by NATO partners to prepare the member states and allies for war readiness.

Although some countries such as Sweden and Finland are prepared to join the NATO alliance in the backdrop of Russian aggression toward the west, it would take months before their applications are accepted and approved by all 30 NATO member states. To address the short-term security concerns in Europe, many NATO member countries are signing military pacts, and defense deals with non-NATO members are making security pacts and defense agreements as well as providing each other with weapons and equipment to strengthen their collective defense against Russia. The most recent security pact was made between the United Kingdom, Sweden, and Finland.

Weapons and Aircraft used in the Russia-Ukraine War

“I do not know with what weapons World War III will be fought, but World War IV will be fought with sticks and stones”. - *Albert Einstein*

Weapon technology and warfare techniques have come a long way to see unprecedented growth in the modern era. It has been more than seven decades since World War II ended but the reminiscence of the technological leap in the defense and weapons industry that started during WWII is still evident in modern warfare.

It was the morning of February 24, 2022, when some major European cities heard the sound of echoing war sirens as Russia started its ‘special military operation’ in the eastern part of Ukraine quickly spreading it into a full-fledged invasion. Excessive use of heavy weapons is causing major military and civilian infrastructure on both sides while claiming several lives.

The Ukrainian military is mainly relying on its surface-to-surface and surface-to-air defense system as well as missile-equipped drones, while Russian forces are majorly relying on its artillery and tanks and substantial aerial support.

Use of illegal weapons against civilian targets:

Western countries have repeatedly accused Russia of using illegal weapons against civilians such as cluster bombs and Thermobaric weapons, however, no proof has been put forward to support such claims yet. When the Russian Ministry of Defense confirmed the use of the TOS-1 Multiple Launch Rocket System (MLRS) against Ukraine, the British Ministry of Defense released a statement suspecting Russia of using Thermobaric warheads with its TOS-1 MLRS.¹



A BM-1 launcher from a TOS-1A system of the Russian 1st Mobile NBC Protection Brigade at the Shikhany proving ground.
(Image Credit: Yevgeny Kel/Russian Ministry of Defense)

Thermobaric weapons are also known as Vacuum Bombs. Thermobaric bomb explodes in two phases. In the first stage, the shell of the projectile explodes,

1. BBC, What is a thermobaric or vacuum bomb?, The British Broadcasting Corporation, March 10, 2022. <https://www.bbc.com/news/business-60571395>

releasing toxic gasses and chemicals in the air that can quickly spread into the surroundings, and even penetrate bomb shelters through ventilation. In the second stage, a larger bomb detonates to ignite the chemicals, creating a huge shock wave. The intensity of the shock wave can easily vaporize an unprotected human body. The chemicals also burn out all the oxygen in its surrounding that creates an immense vacuum that can rupture human lungs.

A Thermobaric warhead can vary in size depending on the usage. These warheads can be deployed via MLRS artillery system as well as handheld rocket launcher systems. Larger variants can be deployed through aerial attacks. International law strictly prohibits the use of Thermobaric weapons against civilian targets; however, it can be used against military targets. U.S., Russia, China, and India are among the few countries that can deploy Thermobaric weapons.

This is not the first time that Russia has been accused of using Thermobaric weapons against civilian targets, similar claims were made in 2016 during the Russian military operations in Aleppo, Syria.

Another internationally banned weapons system that Russia is being accused of deploying in Ukraine is Cluster Bomb. As the name suggests, a cluster bomb is made up of several mini-bombs. A projectile missile carrying several of these bombs explodes in mid-air releasing the mini-bombs to spread the destruction over a large area.²

A cluster bomb can be launched from the air as well as the surface. Once these mini-bombs are released, there is no way for the attacker to control the path of each projectile, hence these mini-bombs can fall indiscriminately over an area as big as a football field.

Cluster bombs lack precision and reliability. There have been many instances where a large number of mini-bombs did not explode at the time of contact, resulting in ticking time bombs for unsuspecting civilians.



The lack of control and unpredictability of a cluster bomb is the reason why this form of weapon has been banned by more than 100 countries under the Conventions on Cluster Munition. However, both Russia and Ukraine are not part of the convention.

2. Richard Connor, Report: Russia uses cluster bombs 'extensively', Deutsche Welle, August 25, 2022. <https://www.dw.com/en/russia-uses-cluster-bombs-extensively-in-ukraine-report-says/a-62927491>



Russia's conventional weapons:

The satellite images of the Russian military settlement near the Ukrainian border revealed that a wide array of cruise missiles and precision short-range ballistic missiles were being used. It is estimated that Russia fired at least 100 surface-to-surface missiles during the initial stage of the invasion.

There are not many details released by Russian officials that confirm the types of weapons used by the Russian military against Ukraine. Based on Russia's previous choice of arsenal in Syria and Afghanistan as well as through experts' opinions based on the ground situation, the following weapons are being suspected to be deployed by Russia for its invasion of Ukraine.

9K720 Iskander - Russia most likely used the 9K720 Iskander, a Short-Range Ballistic Missile (SRBM), for its initial attack on Ukraine. Iskander is a heavily upgraded variant of the Soviet-era's infamous OTR21-Tochka tactical ballistic missile. 9K720 Iskander is 700 kilograms and 7.5 meters long SRBM that can hit a target in the range of 400-500 kilometers with a precision of 4-5 meters. The Iskander launcher has a completely armored outlook and secure cabin while its carrier can mount 2 such missiles at the same time driving off-road at a speed of 70 km/h.

3M14 Kalibr - Kalibr is the Russian army's flagship Land Attack Cruise Missile (LACM). The 6.2 meters long missile has a range of 1500-2500 km depending on the launching conditions. The missile can be launched from both, air and sea carriers. Due to the limited approach from the sea, the Russian military is using 3M14 Kalibr missiles for its aerial attack. It is suspected that the same missile was used to target most of the buildings in Kharkiv and other cities including the Regional State Administration Building in Kharkiv.

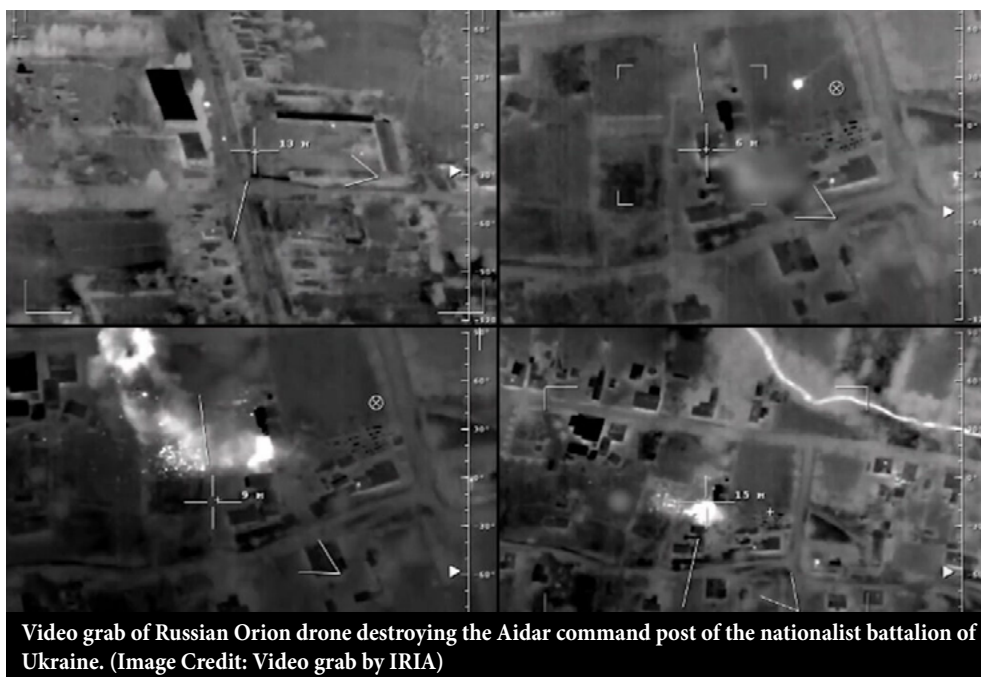
Drone, Fighter Jets, and Aircraft:

According to some reports, at one point during its invasion, the Russian Air Force was flying more than 200 sorties a day into Ukrainian airspace. However, most of the aerial missile firing was carried out from beyond the Ukrainian borders. The most prominent and frequently spotted Russian aircraft are Sukhoi SU-30 and SU-25 Russian Fighter Jets. The Sukhoi SU-30 is the Russian Air Force's superior twin-engine multi-role fighter jet. The Russian military is also using Ilyushin Il-76 multi-purpose planes as well as Ka-52 helicopters mainly to drop its paratrooper beyond Ukrainian borders and to carry out logistic missions.

In August 2022, Iran provided Russia with much-needed attack drones to be used in its war against Ukraine. According to some reports, Iran delivered hundreds of advanced combat drones to Russia. The drone from Tehran included Shahid 129/191 and Mohajer-6 drones.³

Shahed-129 – This is a multirole drone capable of carrying out reconnaissance missions and precision air-to-ground strikes with small guided munitions. Iran has reportedly used this drone for both external and internal missions since unveiling the drone in September 2012. The development of Shahed-129 is based on MQ-1 Predator (US) and Hermes 450 (Israel). The UAV has a maximum range reaches 1,700 km with a flight endurance of about 24 hours.

Mohajer-6 – Mohajer was Iran's first drone to enter series production in the 1980s. First unveiled in 2017, Mohajer-6 officially entered serial production in February 2018 and was designed to carry out both reconnaissance and attack operations for the Iranian military. Mohajer-6 “is an Intelligence, Surveillance, Target Acquisition, and Reconnaissance (ISTAR) UAV capable of carrying a multispectral surveillance payload and/or up to two precision-guided munitions” according to the U.S. Army's Training and Doctrine Command (TRADOC) report.



Russia is also using its locally manufactured Orlan-10 UAV Drones to mainly keep a track of its military movement and to provide aerial protection to its military convoys. Ukrainian official sources have claimed to shoot down dozens of the Russian jets, helicopters, and aircraft, however, Russian officials have not released any number regarding the damage.

3. IRIA, Iran to acquire Russian-made Su-35 fighter jets after selling drones to Moscow, IRIA News, September 06, 2022. <https://www.ir-ia.com/news/iran-to-acquire-russian-made-su-35-fighter-jets-after-selling-drones-to-moscow>

Ukraine's weapons of choice:

Ukrainian forces are keeping a defensive stance to counter the Russian invasion by using close contact ambush and urban warfare techniques. As Russia was piling up its military across the border, Ukraine was looking towards its western allies for weapons and military support, which turned out to be, too little too late. Eventually, when the invasion started on February 24, Ukraine had to face the initial blow with an outdated arsenal.

OTR-21 Tochka - Ukraine has a limited supply of Soviet-era OTR-21 Tochka ballistic missiles. Ukrainian military somehow managed to use its missiles precisely to sustain itself against much more advanced Russian Kalibr and Iskander missiles. According to reports, Ukraine used only one of its Tochka missiles on the first day to target an airbase inside the Russian border.

S-300v - S-300v is one of the oldest variants of the S-300 family of anti-aircraft missiles. It is also a Soviet-era missile system that was later integrated with anti-ballistic missile capabilities by Ukraine. Ukrainian military relied heavily upon the S-300v to take down Russia's Kalibr cruise missiles with a substantial success rate.

TOS-1 Buratino - TOS-1 Buratino is also a Soviet-era heavy flame thrower system that can be mounted on a tank or a carrier vehicle. The Ukrainian military is using TOS-1 Buratino for launching its OTR-21 Tochka as well as other ballistic missiles and rockets. It is an unguided missile launching system that relies heavily on input information to seek the target.

Fighter Jets and Drones - Ukraine has a small fleet of Soviet-era fighter jets that consists of MiG-29, SU-24, SU-25, and SU-27 attack aircraft, and fighter jets. Ukraine was heavily relying upon its Eastern European allies to provide aerial protection from Russia, however, due to NATO's reluctance to join the conflict, many of Ukraine's Eastern European allies including its neighbor Poland and maritime neighbor Bulgaria did not send reinforcements in time. This left Ukraine relying upon its fleet of Soviet-era aircraft.

One of the most successful aerial defense systems that Ukraine has deployed against Russia is its Turkish-made Drones Bayraktar TB2. The drone is paired with MAM-L Smart Micro Munition air-to-surface laser-guided missiles. Ukraine used these missiles to take out Russia's military convoys advancing toward Kyiv.⁴

Multiple-Launch Rocket Systems:

Ukraine has been receiving a large number and variety of multiple-launch rocket systems from its western partners. UK supplied M270 multiple-launch rocket systems (MLRS) and M31A1 munitions to Ukraine to help Ukraine defend against Russia's heavy artillery. M270 can strike targets up to 80km away with pinpoint accuracy and offered a significant boost in capability boost to Ukrainian forces. Spain provided Ukraine with several anti-aircraft missiles and German-made A4 Leopard battle tanks stepping up its military support to the country. About 40 tanks were repaired and delivered to the Ukrainian army. Spain and Germany also plan to manufacture the Leopard tanks and export them to Ukraine.⁵

4. IRIA Report, Review of Turkish Defense Improvements in 2021, IRIA, December 29, 2021. <https://www.ir-ia.com/Turkish-defense-improvements-in-2021.html>

5. IRIA News, Ukraine to receive MLRS rocket system from UK and anti-aircraft missiles from Spain, IRIA, June 08, 2022. <https://www.ir-ia.com/news/ukraine-to-receive-mlrs-rocket-system-from-uk-and-anti-aircraft-missiles-from-spain>



The Multi Launch Rocket System (MLRS) firing on the ranges at Otterburn Village in England.
(Image Credit: Cpl Jamie Peters RLC/UK MOD)

The U.S. has been one of the largest donors of weapons for Ukraine. U.S.'s High Mobility Artillery Rocket System (HIMARS) has been playing a vital role in maintaining Ukraine's air defense. In May 2022, the U.S. announced that it would be supplying HIMARS to Ukraine to be paired with the M13 Guided Multiple Launch Rocket System (GMLRS). So far U.S. has sent more than 20 units of HIMARS to Ukraine. The HIMARS supplied to Ukraine are the modified variants and they cannot fire tactical warheads. Such modifications are used to prevent Ukraine from acquiring tactical warheads from third

countries such as Bahrain, Greece, Poland, Qatar, Romania, South Korea, Turkey, and the United Arab Emirates.

Urbane Warfare Techniques: Ukraine has been calling on its ordinary citizens to join the forces to defend the cities from the Russian military. The Ukrainian military has been setting up camps to train citizens with urban and guerrilla warfare techniques. Ukrainian citizens have been making Molotov Cocktails, blocking roads and welding barricades to stop the Russian advances toward their cities.

The Ukrainian military on the other hand is using ambush techniques to attack the military convoys by utilizing NLAW and Javelin antitank missile systems. The NLAW antitank missile was jointly developed by UK and Sweden. It is a lightweight disposable launching setup that launches a 1.2-meter-long missile capable of damaging a tank's armor.⁶

FGM-148 Javelin on the other hand provides the attacker with a longer range. The U.S.-made Javelin missile has a range of up to 4 kilometers and comes with a reusable launching set-up. Ukraine is also using Soviet-era lightweight Grad Shelling rockets and BM-21 rockets to carry out shelling operations on the Russian bases and convoys. These rockets are unguided and highly unpredictable; hence the Ukrainian military is using MLRS to launch more than 72 rockets in a single volley for maximum damage.

The ongoing war between Ukraine and Russia is attracting overwhelming attention from all over the world. With the flow of information being easier than ever, hundreds of formal and informal media outlets are reporting every minute from the ground. Due to this, both sides seem very cautious of the collateral damage.

It is evident by comparison that Russia has a strategic and technological advantage in the ongoing war by a huge margin. However, with the help of its allies and partners, Ukraine is pushing Russian forces back with significant success.

6. Bloomberg, Ukraine's Javelin and NLAW tank-killer missiles could see Russia shift war tactics, South China Morning Post, March 16, 2022. <https://www.scmp.com/news/world/europe/article/3170632/ukraines-javelin-and-nlaw-tank-killer-missiles-could-see-russia>

The B-21 Raider: U.S. Air Force's most advanced stealth strategic bomber

On December 2, 2022, the U.S. Air Force unveiled the most advanced strategic bomber in the world, the B-21 Raider stealth aircraft, at the Air Force's Plant 42 facility in Palmdale, California. The B-21 Raider bomber development program is led by the U.S. Department of the Air Force Rapid Capabilities Office. In 2015, defense giant Northrop Grumman was awarded the B-21 Raider engineering and manufacturing development contract by the U.S. Air Force.

The B-21 Raider is the first strategic bomber in more than three decades and has been under development in the cloak of secrecy for a long time. It is a high-tech stealth bomber that will replace the U.S. Air Force's aging B-1 Lancer and B-2 Spirit bomber fleet. The stealth aircraft has long-range, highly survivable capabilities and is capable of carrying both conventional and nuclear weapons.

The strategic stealth bomber has been designed as the lead component of a larger family of systems that will deliver intelligence and conduct surveillance and reconnaissance operations, electronic attacks, and multi-domain networking capabilities.



The B-21 Raider was unveiled to the public at a ceremony on December 2, 2022, in Palmdale, California. The B-21 will play a critical role in ensuring America's enduring airpower capability. (Image Credit: U.S. Air Force photo)

U.S. Secretary of Defense Lloyd J. Austin, who was present at the unveiling ceremony of the aircraft said, "This isn't just another airplane... It's the embodiment of America's determination to defend the republic that we all love. It's a testament to our strategy of deterrence — with the capabilities to back it up, every time and everywhere."¹

1. Todd Lopez, World Gets First Look at B-21 Raider, U.S. Department of Defense News, December 3, 2022. <https://defense.gov/News/News-Stories/Article/Article/3235326/world-gets-first-look-at-b-21-raider>

According to Austin, the stealth bomber has been built on almost “50 years of advances in low-observable technology”.² The latest stealth technologies used in the B-21 bomber make it difficult for “even the most sophisticated air-defense systems” to detect the bomber in the skies. Austin added that U.S. defense is rooted in deterrence, and the development of the B-21 again serves as a symbol.

Development of the B-21 Raider bomber is part of the Pentagon’s efforts to modernize all three legs of its nuclear triad, which also includes the development of land-based nuclear ballistic missiles and submarine-launched warheads, as the Pentagon tries to catch up with China’s rapid military modernization.³ China is on track to develop at least 1500 nuclear warheads by 2035, as it also gains the upper hand in hypersonic weapons and cyber warfare capabilities.

There are six B-21 bombers in various stages of final assembly in the Palmdale facility in

	
B-21 Raider	B-2 Spirit
Wingspan: 150 ft	Wingspan: 172 ft
Units (expected): 100	Units (operated): 21
Unit Cost: \$639 million	Unit Cost: \$2 billion
Payload: 1360 kgs	Payload: 1800 kgs

California and the first flight is projected for 2023. The U.S. Air Force selected the Ellsworth Air Force Base in South Dakota as the main operating base and location of the Formal Training Unit for the B-21 bomber. Whiteman Air Force Base in Missouri and Dyess Air Force Base in Texas would be the preferred locations for the remaining bases.

U.S. Air Force Chief of Staff General CQ Brown, Jr., said that the B-21 aircraft will be “the backbone of our bomber fleet”. A defense budget expert and managing director of Metrea

Strategic Insights told Defense News that the B-21 stealth bomber will be one of the top two biggest aircraft acquisitions in U.S. military history, rivaled only by the F-35.⁴

Northrop Grumman Aeronautics Systems president Tom Jones claimed that “With the B-21, the U.S. Air Force will be able to deter or defeat threats anywhere in the world.” Northrop Grumman’s statement highlighted that the new stealth bomber is “capable of networking across the battlespace to multiple systems, and into all domains.”

The B-21 Raider can “quickly evolve through rapid technology upgrades that provide new capabilities to outpace future threats” and it would be supported by a “digital ecosystem throughout its lifecycle”.⁵

2. IRIA, US Air Force unveils B-21 stealth nuclear bomber, IRIA News, December 04, 2022. <https://www.ir-ia.com/news/us-air-force-unveils-b-21-stealth-bomber>

3. IRIA Report, Hypersonic and Directed-Energy Weapons – A New Arms Race, International Relations Insights & Analysis, October 31, 2021. <https://www.ir-ia.com/reports/Hypersonic-DEW-Weapons-Arms-Race.pdf>

4. Stephen Losey, ‘Deterrence the American way’: The new B-21 bomber debuts, Defense News, Dec 03, 2022. <https://www.defensenews.com/air/2022/12/03/deterrence-the-american-way-the-new-b-21-bomber-debuts>

5. Northrop Grumman, Northrop Grumman and the US Air Force Introduce the B-21 Raider, the World’s First Sixth-Generation Aircraft, Northrop Grumman Newsroom, December 02, 2022. <https://news.northropgrumman.com/news/releases/northrop-grumman-and-the-us-air-force-introduce-the-b-21-raider-the-worlds-first-sixth-generation-aircraft>

Highlights of B-21 Raider Aircraft

Sixth-generation strategic bomber - The B-21 Raider is a sixth-generation strategic bomber, which has been developed based on more than three decades of strike and stealth technology of the U.S. Air Force. The aircraft contains next-generation stealth technology, advanced networking capabilities, and an open systems architecture. The technology used in the latest U.S. aircraft has been improved to counter future threats and conduct operations in highly contested environments.

B-21 can defeat adversaries' systems - U.S. defense manufacturer Northrop Grumman has employed new manufacturing techniques and advanced technology as well as materials to ensure that the B-21 aircraft can effectively counter adversaries' anti-access, area-denial systems. The stealth bomber would be used by the U.S. Air Force in its most complex missions.

The Aircraft can deliver conventional and nuclear payloads - The B-21 Raider would serve as the strength of U.S. air power and support the future missions of the fleet. The aircraft would deliver a new era of capability and flexibility through the advanced integration of data, sensors, and weapons, Northrop Grumman claims. With the capabilities of carrying both conventional and nuclear warheads and the ability to use a mix of stand-off and direct attack munitions, the B-21 is set to be one of the most effective aircraft in the U.S. Air Force fleet.

B-21 a digital bomber - Northrop Grumman termed its latest stealth aircraft a "digital bomber". The company used "agile software development, advanced manufacturing techniques, and digital engineering tools" to reduce production risks involved in the B-21 program and enable modern sustainment practices.⁶

Cloud-based digital infrastructure - U.S. Air Force and Northrop Grumman have demonstrated the transfer of B-21 aircraft's ground systems data to a cloud environment.⁷ During the demonstration, the Air Force conducted the development, deployment, and data testing of B-21 aircraft, as well as the digital twin of the bomber, that will support the operations and sustainment of the B-21. According to Northrop Grumman's statement, the "robust cloud-based digital infrastructure will result in a more maintainable and sustainable aircraft with lower-cost infrastructure."



Artist rendering of a B-21 Raider in a hangar at Ellsworth Air Force Base, South Dakota. (Image Credit: U.S. Air Force/Northrop Grumman/Alan Radecki)

6. Northrop Grumman, 10 Facts About Northrop Grumman's B-21 Raider, Northrop Grumman Newsroom, November 29, 2022. <https://news.northropgrumman.com/news/features/10-facts-about-northrop-grumman-s-b-21-raider>

7. Northrop Grumman, Northrop Grumman B-21 Raider Delivers Data Sharing and Cloud Firsts, Northrop Grumman Newsroom, September 21, 2022. <https://news.northropgrumman.com/news/features/northrop-grumman-b-21-raider-delivers-data-sharing-and-cloud-firsts>

Open architecture and rapid upgradeability - The B-21 stealth bomber has been designed for rapid upgradeability to meet the evolving threat environment. With its agile software upgrade capabilities and built-in hardware flexibility, the B-21 can incorporate new technology, capabilities, and weapons, without undergoing block upgrades, like previous generation aircraft. The open architecture would allow the B-21 Raider to seamlessly meet the evolving threat for decades to come.

Sustainment affordability - U.S. Air Force has prioritized sustainment affordability and capabilities of conducting long-term operations in the B-21 program. The Air Force and Northrop Grumman teams have made maintainability as important of an objective as achieving stealth performance. The affordability, predictable operations, and sustainment outcomes are some of the main features of the B-21 program.

Supporting Strategic Deterrence - The B-21 Raider will be pivotal to supporting the United States' strategic deterrence strategy. The bomber possesses advanced long-range precision strike capabilities that would benefit the U.S. future missions and allow combatant commanders to hit targets, anywhere in the world. According to Northrop Grumman, the B-21 stealth bomber will provide the "flexibility and deterrence" critical to the security of the United States and its allies in a dynamic global security environment.



8. Northrop Grumman, 10 Facts About Northrop Grumman's B-21 Raider, Northrop Grumman Newsroom, November 29, 2022. <https://news.northropgrumman.com/news/features/10-facts-about-northrop-grummans-b-21-raider>

9. Northrop Grumman, Northrop Grumman and the US Air Force Introduce the B-21 Raider, the World's First Sixth-Generation Aircraft, Northrop Grumman Newsroom, December 02, 2022. <https://news.northropgrumman.com/news/releases/northrop-grumman-and-the-us-air-force-introduce-the-b-21-raider-the-worlds-first-sixth-generation-aircraft>

Drones and the Future of Warfare

The war between Russia and Ukraine has made it evident that the future of modern warfare lies with advancements. On October 29, a Russian fleet on the Black Sea near Sevastopol was attacked. The attack involved 16 drones, Nine aerial drones, and seven in the water. It is still unclear how much damage these drones brought to Russian vessels in the Black Sea, but the videos of the attacking drones showed that the vessels were unable to avoid being hit. In response to that, Russia has retaliated with scores of missiles and Iranian-built Shahed-136 drones aimed at electrical and water systems throughout Ukraine.¹ Both sides are committed to using the least of their aerial fleets and rely more on drones and UAVs for orchestrating attacks. The Russia-Ukraine war has changed the conventional wisdom on the use of drone technology in modern warfare.

For a long time, drones were deemed expensive, complicated, and unreliable to be deployed in an active warzone. Defense and aerospace industries spend a lot of resources and time to make their drones more reliable and accurate and even then, militaries would only deploy drones to carry out special tactical operations. However, a different approach was adopted by drone manufacturers in recent times. Instead of making expensive and complicated drones, some manufacturers started making cheaper and somewhat disposable drones. This approach came out as a game-changer for a thriving drone industry in countries like Turkey and Iran.

Turkish-made drones played a pivotal role in repelling Russia's initial wave of attack on Kyiv.



A Bayraktar drone is seen during a rehearsal for the Independence Day military parade in central Kyiv, Ukraine on August 18, 2021.
Image Credit: Reuters/Gleb Garanich)

Some experts believe that if drones were taken out of Ukraine's defense against Russia equation, Kyiv would have fallen during the first few days of the invasion. In one of his interviews, Ukrainian Vice Prime Minister Mykhailo Fedorov said, "we have been convinced once again the wars of the future will be about maximum drones and minimal humans."²

For years, military strategists have anticipated the arrival of the so-called drone swarm, a large cluster of small flying machines that will herald a new era of intelligent warfare. Thousands of robotic spreading out into an invisible formation, yet capable of instantly coalescing into a swirling

1. Andrew E. Kramer and Marc Santora, Russia Launches a Wave of Iranian-Made Drones at Kyiv, The New York Times, December 14, 2022. <https://www.nytimes.com/2022/12/14/world/europe/ukraine-russia-iranian-drones.html>

2. The Odessa Journal, Mykhailo Fedorov: The development of military tech is our priority for the coming years, Odessa Journal, September 01, 2022. <https://odessa-journal.com/mykhailo-fedorov-the-development-of-military-tech-is-our-priority-for-the-coming-years>

dark cloud, like a murmuration. Once such technology is within reach, it would change the course of warfare, defense, and security forever.³

Transformation of the Turkish drone industry

Turkey has made a tremendous stride in developing indigenous drones and UAVs paired with smart and technologically advanced munition systems. The Turkish military had been using its locally manufactured drones frequently in Syria during Operation Spring Field, however, It was not until February 2020, that Turkish drones gained a global spotlight. The operational success of Turkish drones in Syria was followed by substantial success in Libya and Nagorno-Karabakh, which provided the Turkish drone industry with a prestigious reputation in the global market that it had been striving to attain while the substantial success of Turkish drones in the Russia-Ukraine war has attested those reputations.

Based on this cemented reputation in 2022, Turkish drone manufacturers managed to capture the attention of the international market. In October 2022, Malaysian King Al-Sultan Abdullah visited Turkish drone manufacturing facilities in Ankara and announced a memorandum of understanding that Malaysia would not only buy Turkish-made drones but also integrate its defense industry with Turkey's. In July 2022, European multinational aerospace giant Airbus also awarded three contracts to a Turkish aerospace company. The contracts were related to Airbus A350F Barrier Wall, Airbus A320, and A220 Center Mid Lower Fuselage Panels. According to Turkish Aerospace, the company has been tasked to design, build and supply the Barrier Wall for Airbus' latest large widebody freighter, A350F. Under the contract, Turkish Aerospace will also supply Barrier Wall for A350F as the sole source throughout the entire program lifetime starting in 2024.⁴

Despite the proven capabilities in complex security environments, Turkish drones are not free from vulnerabilities, especially when operating in non-permissive airspace. To establish airspace for drone operations, the threats from the enemy's combat aircraft, surface-to-air missiles (SAM), and electronic warfare systems need immense improvements. Turkish-made drones only operate at an optimum operational capability if the military units have achieved dominance in the conflict zone. Some of the major Turkish drone manufacturers and their most successful models are enlisted below:

Ukraine's military received Bayraktar TB2 drones and more than 420 additional materiel items in March 2019. (Image Credit: Ukraine Ministry of Defense)



3. David Hambling, U.S. Army's New Drone Swarm May Be A Weapon Of Mass Destruction, Forbes, June 01, 2020. <https://www.forbes.com/sites/davidhambling/2020/06/01/why-new-us-armys-tank-killing-drone-swarm-may-be-a-weapon-of-mass-destruction/?sh=42993275ece8>

4. IRIA, Airbus awards three contracts to Turkish Aerospace, IRIA News, July 21, 2022. <https://www.ir-ia.com/news/airbus-awards-three-contracts-to-turkish-aerospace>

Baykar Technologies: Baykar is a privately owned Turkish defense company that specializes in attack and surveillance UAVs. The company has been in existence since 1984 and started as a mechanical parts-producing subcontractor for Turkish defense. In the early 2000s, Baykar started taking steps towards building unmanned aerial vehicles. In 2007, the Baykar Mini UAV was the first-ever drone produced entirely with domestic capital in Turkey. Later, Baykar moved on to produce high-precision attack and surveillance drones that are considered the best options in economical combat drones in Turkey and beyond. Some of its more famous models are:

Bayraktar TB2: Bayraktar TB2 drone is arguably one of the most iconic pieces of defense equipment from the Russia-Ukraine war. Bayraktar TB2 drone is a medium altitude long endurance UAV that can launch remote attacks on stationary and moving targets. The Turkish military is the largest operator of Bayraktar TB2 drones, however, it has been extensively used by the Ukrainian military to counter Russian invasion in the initial stages. Azerbaijan military and the Ethiopian National Defense Force are also among the top users of Bayraktar TB2 drones. Bayraktar TB2 can operate in altitudes of 18000 feet with 27 hours of flying endurance. It has an inverted V-tail body structure with a propeller configuration. The propeller is mounted at the tail. It can carry Turkish-made MAM missiles and BOZOK laser-guided bombs and launch them with precision. Baykar also makes export variants of these drones that can be integrated with foreign-made missile systems.

Bayraktar Akinci: Akinci is longer and wider than the Bayraktar TB2 and can perform strategic tasks. It has a 65-foot-wide wingspan with its unique twisted-wing structure and is equipped with fully automatic flight control and a triple-redundant autopilot system. The high-altitude long-endurance Unmanned Combat Aerial Vehicle is widely used by the Turkish Air Forces since August 2021, however, due to its higher cost, Akinci has not been acquired by international militaries.

Bayraktar Akinci Attack Drone is seen during Turkey's largest technology and aerospace event TEKNOFEST Istanbul, at Ataturk Airport, Istanbul, Turkey on September 17, 2019. (Image Credit: Muhammed Enes Yildirim/Anadolu Agency)



Turkish Aerospace: Turkish Aerospace (TAI) own one of the largest production plans in Turkey. Its Ankara-based production plant covers an area of 5 million square meters with an industrial

facility of 150,000 square meters under its roof. The company has a modern aircraft facility furnished with high-technology machinery and equipment that provide extensive manufacturing capabilities ranging from parts manufacturing to aircraft assembly, flight tests, and delivery. Apart from producing its UAVs, TAI has been involved in various aerospace projects with Airbus, Boeing, Lockheed Martin, Northrop Grumman, Sikorsky, and numerous other defense giants from around the world.

Anka: Anka is TAI's flagship drone. Envisioned in the early 2000s for aerial surveillance and reconnaissance missions, Anka has evolved into a combat, surveillance, precise attack, and satellite communication drone. The basic version, Anka-A, was classified as a medium-altitude long-endurance unmanned aerial vehicle for reconnaissance missions. Higher-tier versions of this drone include Anka-B, which is a weaponized platform equipped with electro-optical/infrared sensors. Anka-S is equipped with a SATCOM antenna and a national flight control computer which gives it more precision control.⁵

Iranian drone industry

In May 2022, an Iranian state-owned media outlet aired video footage from an underground drone base in Zagros mountains. The video showed 100s of combat drones including Iran's most advanced and newly built Ababil-5 drone which is equipped with a Qaem-9 missile system. Ababil-5 is the Iranian version of the U.S. Hellfire air-to-surface attack drone.⁶

A report published by Conflict Armament Research (CAR) suggests that Iranian drones are not only copying designs from western drones but they are also using western-built semiconductors despite economic sanctions. The remains of three models of advanced Iranian drones, the Shahed-131, and the Shahed-136, were analyzed by CAR. The drones have been designed to crash into their target and explode on impact. Another model, the Mohajer-6 armed surveillance drone, was also analyzed. The analysis showed that all these models used western-

built semiconductors. It is still unclear how is Iran sourcing these semiconductors despite severe economic sanctions.⁷

The Iranian drone industry is largely made up of government-owned initiatives that are producing cheap combat drones to be used by its military. However, in the wake of the Russia-Ukraine war, the heavily sanctioned Iranian defense industry made unofficial deals with Russian counterparts to supply Russian forces with many cheap drones to be used against Ukrainian targets.⁸



6. IRIA, Iran shows off underground drone base without revealing its location, IRIA News, May 31, 2022. <https://www.ir-ia.com/news/iran-shows-off-underground-drone-base-without-revealing-its-location>

7. John Ismay, Iranian Weapons Built With Western Semiconductors Despite Sanctions, The New York Times, November 22, 2022. <https://www.nytimes.com/2022/11/22/us/drones-russia-iran.html>




8. Joby Warrick, Souad Mekhennet, and Ellen Nakashima, Iran will help Russia build drones for Ukraine war, Western officials say, The Washington Post, November 19, 2022. <https://www.washingtonpost.com/national-security/2022/11/19/russia-iran-drones-secret-deal/>

Russia struck Ukraine’s key civilian infrastructure on October 10, destroying power plants and substations, plunging half the country into darkness just before winter arrives. Despite official denials from both sides, it is evident that Russia has imported hundreds of Iranian Shahed-136 kamikaze drones to deadly effect and over 1,000 more are on their way from Tehran, according to reports. In return for its drones, Iran plans to acquire Russian-made Su-35 fighter jets. There is very limited information about Iran’s drone production facilities and capabilities. Some of the most profoundly used Iranian drones by Russia are highlighted below.

Shahed-129: Shahed 129 is one of the largest and most advanced attack drones from Iran’s Shahed series. It can carry up to eight bombs. It can also be paired with Iranian-made Sadid missiles. Shahed 129 is a single-engine medium-altitude and long-endurance drone. It is capable of flying for almost 24 hours. The UAV has been used for airstrikes in the Syrian Civil War and for border patrol on Iran’s eastern border. The Shahed 129 is the backbone of Iran’s high-end UAV fleet.

Shahed 131 and Shahed 136: Three-and-a-half-meter-long Shahed 131 and Shahed 136 drones are designed to act as kamikaze attack drones. The aircraft has a cropped delta-wing shape, with a central fuselage blending into the wings and stabilizing rudders at the tips. The drones can carry warheads in their nose section estimated to weigh 30–50 kilograms. In October 2022, Russia used suicide drones bearing the name Geran-2 against Ukraine. These Geran-2 drones are considered by Ukraine and its Western allies to be redesignated Iranian-made Shahed-136 drones, however, both Iran and Russia deny the claims about such cooperation.

Mohajer-6: Mohajer was Iran’s first drone to enter series production in the 1980s. First unveiled in 2017, Mohajer-6 officially entered serial production in February 2018 and was designed to carry out both reconnaissance and attack operations for the Iranian military. Mohajer-6 “is an Intelligence, Surveillance, Target Acquisition, and Reconnaissance (ISTAR) UAV capable of carrying a multispectral surveillance payload and/or up to two precision-guided munitions” according to the U.S. Army’s Training and Doctrine Command (TRADOC) report.

Mohajer-6 Qods Aviation Industry	Shahed-161 Shahed Aviation Industry	Shahed-129 Shahed Aviation Industry
		
Dimensions Length: 5.6 meters Wingspan: 10 meters Gross weight: 600 kilograms Payload Capacity: 100 kilograms	Dimensions Length: 2.7 meters Wingspan: 7.3 meters Gross weight: 500 kilograms Payload Capacity: 100 kilograms	Dimensions Length: 8 meters Wingspan: 16 meters Gross weight: Unknown Payload Capacity: 400 kilograms
Performance Maximum speed: 200 km/h Range: 1,800 kilometers Endurance: 12 hours Service ceiling: 18,000 feet	Performance Maximum speed: 350 km/h Range: 1,500 kilometers Endurance: 4.5 hours Service ceiling: 25,000 feet	Performance Maximum speed: 150 km/h Range: 1,700 kilometers Endurance: 24 hours Service ceiling: 7,300 feet
Armament and Sensors 4 Qaem TV/IR-guided missiles Laser Range Finder Multispectral IR Sensor	Armament and Sensors 2 Sadid 1 Missiles <small>* Design of Shahed-161 drone is largely based on Lockheed Martin's RQ-170</small>	Armament and Sensors 4 Sadid-345 PGM Oghab-6 optical IR sensor Laser range finder

China's Military Drills around Taiwan

China has held its biggest-ever show of military force in and around Taiwan in the wake of a controversial visit to the island by U.S. House Speaker Nancy Pelosi. The drills displayed the country's missiles, air force, and naval capabilities. Beyond the live-firing of ballistic missiles, Chinese warships, fighter jets, and drones around the island asserted Beijing not just as a regional power but a global power.

On August 8, China's military announced that it is continuing large-scale military drills around Taiwan after the end of live-fire exercises as part of a series of drills, signaling that Beijing wanted to keep up pressure on the island. Chinese media reports suggested that such military exercises "will not stop and are expected to become routine" to push forward the reunification process.¹

During the heightened tensions over the island in 2021, China's President Xi Jinping said that "reunification" with Taiwan "must be fulfilled" and did not rule out the possible use of force to achieve this. Taiwan deems itself a sovereign state, while China views it as a breakaway province. Taiwan is an island, roughly 100 miles from the coast of southeast China. Taiwan is home to 23 million people and has its own democratically elected government. Regional analysts believe that the recent show of military power is a demonstration of China's growing military strength, which has significantly boosted its arsenal and naval force. The live-fire drills and simulation of an attack on the island of Taiwan assert Beijing's increased willingness to counter the threats in and around its territory and waters.

What weapons were put on display?

On August 4, 2022, China's People's Liberation Army (PLA) started conducting live-fire drills around Taiwan to initiate its large-scale and unprecedented military exercise in six maritime areas and air space around Taiwan after the visit of the third-most-senior figure in the U.S. government to Taiwan. According to a video released by the state broadcaster CCTV, the PLA engaged more than 100 fighter jets and bomber aircraft as well as 10 warships in the waters of the Taiwan Strait.²



Chinese Air Force two JH-7As fighter-bomber jets at Chelyabinsk Shagol Air Base. (Image Credit: Wikimedia Commons)

1. IRIA, China launches live-fire drills around Taiwan after Pelosi's visit, IRIA News, August 04, 2022. <https://www.ir-ia.com/news/china-launches-live-fire-drills-around-taiwan-after-pelosis-visit/>

2. Teddy Ng and Minnie Chan, PLA sends in 100+ warplanes on day 1 of military drills near Taiwan, South China Morning Post, August 04, 2022. <https://www.scmp.com/news/china/military/article/3187636/mainland-drone-spotted-flying-over-taiwan-hours-after-pelosis>

The military exercise involved the use of advanced weapons including J-20 stealth fighter jets and DF-17 hypersonic missiles after the drills. The J-20 fighter jet, H-6K bomber, J-11 fighter jet, Type 052D destroyer, Type 056A corvette, and DF-11 short-range ballistic missile were among the weapons used in the drills, Chinese media reported.³

Taiwan said that Chinese warships and aircraft crossed the median line of the Taiwan Strait and that Taiwan's armed forces dispatched air and naval patrols around the island, and activated land-based missile systems in response to the Chinese exercises. Taiwan emphasized that its military does not seek war, but would prepare and respond to it accordingly.

China fires Dongfeng missiles over Taiwan for the first time

On the first day of the drills, at least 11 Dongfeng long-range ballistic missiles were launched to hit the targets near the north, east, and south of Taiwan. Rockets were also fired around the islands of Matsu, Wuqiu, and Dongyin in the Taiwan Strait. It is the first time after 1966 that China has chosen these islands as the targets to conduct its live-fire military drills. The DF-11 is a short-range ballistic missile (SRBM) with a range of up to 600 km and is believed to be China's first conventionally-armed SRBM.⁴



China's Dong Feng-11 (DF-11A) short-range ballistic missile (SRBM) system. (Image Credit: SinoDefence)

The Chinese missiles flew over Taiwan Island for the first time, a Chinese military expert said. The conventional missiles flew over airspace covered by Taiwanese defense missiles, said Maj. Gen. Meng Xiangqing, a professor of strategy at the National Defense University in Beijing. "We hit the targets under the observation of the U.S. Aegis combat system and hit the area where the Patriot missile defense system is densely deployed, which means the Chinese military has solved the difficulties of hitting long-range targets on waters," said Meng.⁵

Chinese Air power

China mobilized hundreds of fighter jets, helicopters, and aircraft following Pelosi's visit to Taiwan island. According to reports, PLA dispatched multi-type aircraft in its drills, including its latest J-20 stealth fighter jets, J-11, J-10, J-16, Su-30 jets, JH-7 fighter-bomber H-6K bomber,

3. GT, PLA drills around Taiwan continue to 'rehearse reunification operation' after Pelosi's visit, 'exercises blockading island to become routine', Global Times online news, August 03, 2022. <https://www.globaltimes.cn/page/202208/1272108.shtml>

4. Missile Threat (CSIS Missile Defense Project), DF-11 Missile, Center for Strategic & International Studies, August 03, 2021. <https://missilethreat.csis.org/missile/dong-feng-11/>

5. Lu Feiran, PLA fires Dongfeng missiles over Taiwan for first time, Shina, Shanghai Daily, August 05, 2022. <https://www.shine.cn/news/nation/2208058856/>

Shaanxi KJ-500 Airborne Early Warning and Control (AEW&C) aircraft, as well as Y-8EW, Y-8ASW, Y-9 EW planes.

China's Aviation Regiment of Air Force of Eastern Theater Command Pilot Gong Yulong told CGTN that "During the [PLA] operation, we advanced according to orders, further familiarized ourselves with the battlefield environment, and verified our tactical methods, focusing on the capabilities of coordinated operations, ground assault, and precision strikes.



China's Special operations soldiers assigned to the "Thunder" Commando of the PLA Air Force airborne troops line up to board the aircraft during a parachuting training exercise. (Image Credit: China Military Online)

This operation proved that we have the ability and means to carry out precise point-and-kill operations from the air to defeat any opponent."⁶

China's PLA Air Force Staff Department of Eastern Theater Command's Section Director Wu Bian during an interview with the Chinese media outlet highlighted that the "mission was heavy, as the

time was tight, the aircraft types were various and the sorties were numerous." Wu added that the PLA Air Force conducted operations "in strict accordance with the standards and norms formed in the actual-combat training, and ensure the success of the air strike mission."

Chinese Naval power

China conducted anti-submarine operations and air-to-sea strikes in the "space near Taiwan Island" during the fresh military drills on August 8. "The eastern theatre of the Chinese People's Liberation Army continued to carry out practical joint exercises and training in the sea and airspace around Taiwan island," the Chinese military said. The exercises were "focusing on organizing joint anti-submarine and sea assault operations".

Experts have claimed that China is currently building amphibious vessels and helicopters that can help stage a possible full-scale invasion of Taiwan if needed. China's Type 055 destroyer, "the largest surface combatant currently being built in the world," is compared with its U.S. and British counterparts, the U.S. Navy's Ticonderoga-class cruiser, and the Royal Navy Type 45 in that order.

The People's Liberation Army Navy (PLAN) is now the largest navy in the world and has surpassed the U.S. Navy in the number of battle force ships, according to the Department

6. CGTN, PLA Eastern Theater Command holds military drills around island of Taiwan, China Global Television Network Online, August 08, 2022. <https://news.cgtn.com/news/2022-08-08/PLA-holds-military-drills-around-island-of-Taiwan-1cjiAKHxjnW/index.html>

of Defense (DoD). PLAN has a battle force of approximately 355 platforms, including major surface combatants, submarines, aircraft carriers, ocean-going amphibious ships, mine warfare ships and fleet auxiliaries, and 85 patrol combatants and crafts that carry anti-ship cruise missiles (ASCMs). China has also been steadily modernizing its submarine force and operates a small number of nuclear-powered ballistic missile submarines (SSBNs).

Taiwan blockade simulated

It's the first time the Chinese military has staged such massive drills with a joint blockade of the island, sea assault, and land and air combat training. All PLA drill areas took place across the median line that divides the Taiwan Strait. Chinese media quoted experts saying that Chinese drills surrounding Taiwan are "intended to show that it is capable of blockading the entire island and of resolving the Taiwan question through non-peaceful ways, if the situation becomes irretrievable".⁷



Chinese Navy ships including the aircraft carrier Liaoning (C) take part in a military drill in the western Pacific Ocean. (Image Credit: Reuters/via CGTN)

China's live-fire drills around Taiwan also simulated an economic blockade, posing a serious threat to major ports and shipping lanes in Taiwan. "This blockage style could be one of the action plans taken in the future for achieving the reunification by force," according to Herman Shuai, a retired Taiwan lieutenant general, as quoted by Chinese media Global Times. If the PLA exercises continue for a long time, "it will constitute a substantial blockage of Taiwan" Shuai feared. Any conflict in the Taiwan Strait would severely impact global trade as the island's east is a major route for ships transporting goods from East Asia to the United States and Europe.

Chinese cyber and space technology

Besides the military, air force, and naval force, China's space and cyber capabilities have significantly improved over the years. Before and after Nancy Pelosi's, Taiwanese government websites experienced cyberattacks. Reports suggested that cyberattacks against official Taiwanese websites such as the presidential office and the ministry of foreign affairs doubled in weeks before the exercises.

Western countries have recently accused Beijing of engaging in cyber warfare against governments and businesses. The FBI and MI5 chiefs have also warned that China is carrying

7. GT, PLA drills around Taiwan continue to 'rehearse reunification operation' after Pelosi's visit, 'exercises blockading island to become routine', Global Times online news, August 03, 2022. <https://www.globaltimes.cn/page/202208/1272108.shtml>

out massive cyber espionage that poses a long-term threat to economic and national security. China, however, has consistently denied being involved in hacking and accused Washington of being the “largest source of cyber attacks in the world.”⁸

China halts military dialogue with the United States

China called off formal talks with the United States on several issues including military-to-military channels and maritime consultations as Pelosi left the region.⁹

U.S. Pentagon, State Department, and White House officials condemned the move, describing it as an irresponsible overreaction. United States Secretary of State Antony Blinken has accused China of “irresponsible steps” by halting key communication channels with Washington.

On August 5, China officially announced countermeasures by canceling Theater Commanders Talk, Defense Policy Coordination Talks, and Military Maritime Consultative Agreement meetings between the two countries. China also suspended cooperation with the United States on several key issues, such as transnational crimes, counternarcotics, cooperation on the repatriation of illegal immigrants, and legal assistance in criminal matters, as well as climate change talks.

Missiles and Aircraft

- ✈ Chengdu J-20 Stealth Fighter
- ✈ Shenyang J-11 Fighter Jet
- ✈ Xi'an H-6K Bomber
- 🚀 DF-17 Hypersonic Missile
- 🚀 DF-11 Short-range Ballistic Missile
- ✈ Chengdu J-10 Fighter Jet
- ✈ Sukhoi Su-30 Fighter Jet
- ✈ Shaanxi Y-8 Transport Plane

Warships

- Type-052D Destroyer
- Type-056A Corvette
- Type-055 Destroyer
- Liaoning Type 001 Carrier
- Shandong Type 002 Carrier

8. Xinhua, U.S. is world’s largest source of cyber attacks: FM spokesperson, XinhuaNet, July 20, 2021. https://www.xinhuanet.com/english/2021-07-20/c_1310072999.htm

9. IRIA, China halts military and climate dialogue with US over Taiwan issue, IRIA News, August 06, 2022. <https://www.ir-ia.com/news/china-halts-military-and-climate-dialogue-with-us-over-taiwan-issue>

Russian Navy's largest submarine: Belgorod K-329

After being planned and prepared for more than 30 years, the Russian navy finally received its behemoth submarine, Oscar II-class Belgorod K-329. Belgorod was originally laid down in 1992 under Project 949A as a cruise missile submarine, however, it was later reconfigured into a special operation submarine.¹

Due to chronic underfunding and other delays, the construction of Belgorod was put to a halt. The submarine was re-laid in December 2012 and completed construction in April 2019. After completion of the testing phase, the giant submarine was commissioned into the Russian navy in August 2022.²

The 184 meters long and 15 meters wide Belgorod submarine has a displacement is 14,700 tons on the surface and 24,000 tons submerged. With a surface top speed of 32 knots or 59 km/h. The armament of the Belgorod nuclear submarine is standard for an Oscar II class, which includes torpedoes, cruise missiles, and mines.

Belgorod had been through heavy modifications to make it capable of carrying six Poseidon nuclear-tipped unmanned underwater autonomous vehicles, each of which is the size of a school bus and acts as an attacking torpedo. Belgorod can also carry a detachable smaller submarine for precision missions. Currently, Russian-made Project 10831 Losharik has been allotted under its keel to perform deep-sea diving and rescue operations.³

Length: 184 meters (604 feet)

Displacement: 14,700 tonnes (Surface), 24,000 tonnes (Submerged)

Beam: 15 meters (49 feet)

Top speed: 32 knots or 59 km/h

Endurance: 120 days

Weapons: 6 strategic nuclear torpedoes, cruise missiles, mines, smaller submarines.



Photo of the launch ceremony of Russia's Project 09852 Special Mission Submarine 'Belgorod'. (Image Credit: Oleg Kuleshov)

1. IRIA, Russian navy acquires the world's largest nuclear-armed submarine, IRIA News, July 9, 2022. <https://www.ir-ia.com/news/russian-navy-acquires-worlds-largest-nuclear-armed-submarine>

2. Tessaron, Russian federation navy accepts the submarine Belgorod, Atlas News, July 8, 2022. <https://theatlasnews.co/business/2022/07/08/russian-federation-navy-accepts-the-submarine-belgorod>

3. Brad Lendon, Russian navy's massive submarine could set the stage for a 'new cold war' in the oceans, CNN, July 24, 2022. <https://edition.cnn.com/2022/07/23/europe/russia-belgorod-submarine-nuclear-torpedo-intl-hnk-ml/index.html>

This is not the first time that the Russian navy has used this approach and attached a midget submarine with its large-scale special-purpose submarine to make it undetectable and more maneuverable, as many of the small-scale and deep-diving operations are held by the smaller submarines.



Official sources from Russia released very little information about the world’s largest submarine, where it would be stationed, and what exactly Russia aims to achieve with this submarine. Soon after making headlines for induction into the Russian navy, the Belgorod K-329 vanished from the spotlight.

It was not until October 2022 that the whereabouts of Belgorod resurfaced in the headlines. A wide degree of hysteria was stirred by the reports that Belgorod has been deployed near Finland with its nuclear ‘apocalypse’ and ‘doomsday’ weapons. However, experts were not surprised by Belgorod’s disappearance. Submarines are made to keep a low profile and to stay out of sight for weeks and months. Images appeared in October 2022 that showed Belgorod operating in the Barents Sea, north of Russia’s Kola Peninsula.⁴

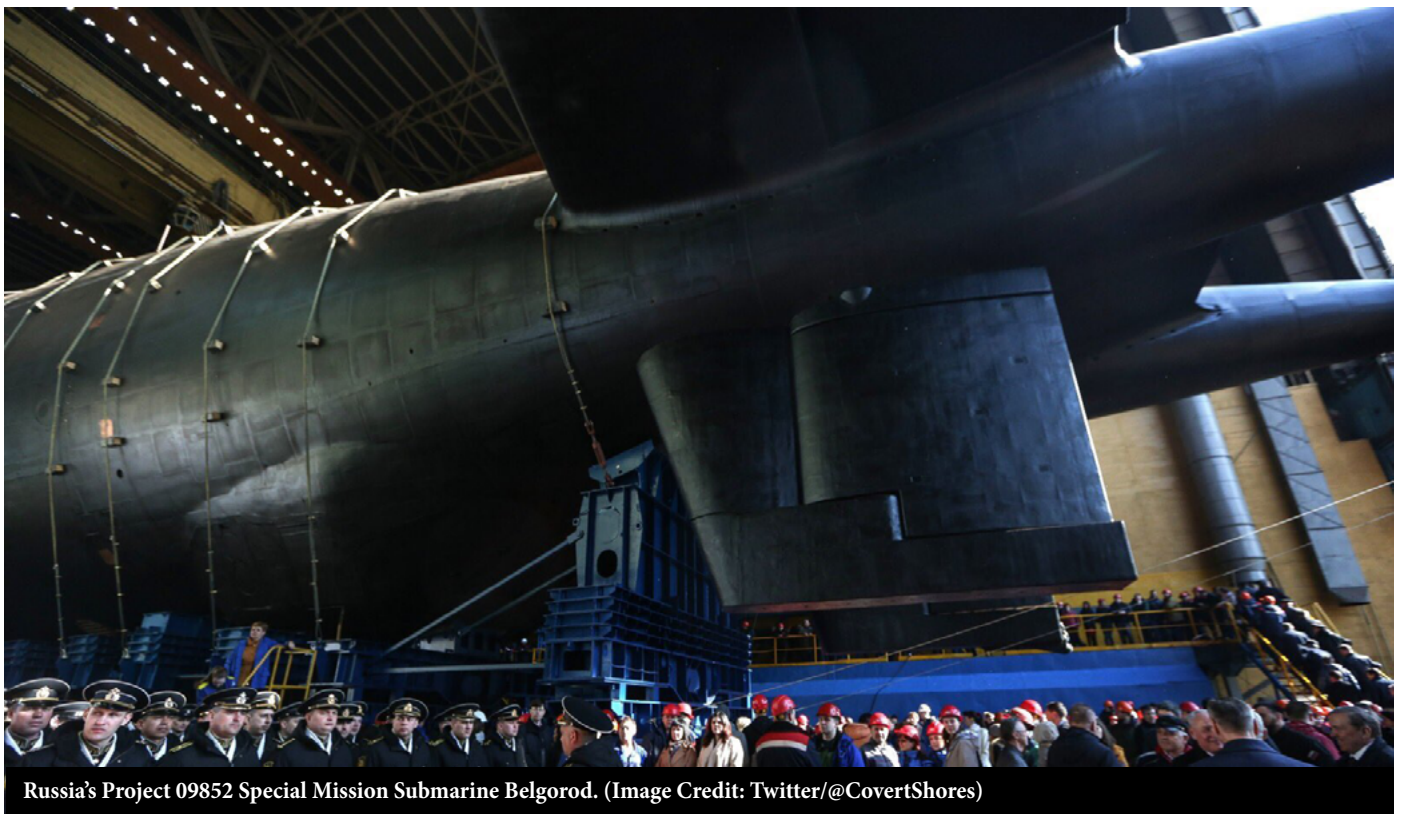
Poseidon is an intercontinental nuclear-powered nuclear-armed autonomous torpedo. It is the largest torpedo currently in existence. The 24 meters long autonomous torpedo has a diameter of 2 meters and works are a drone submarine to navigate itself toward the target. It can attain remarkably high speeds underwater traveling up to 70 knots or 120 km/h. The torpedo can autonomously detect a target from as far as 1 kilometer away. It uses nuclear energy for its propulsion which gives it extremely high speeds compared to any other underwater cruiser in existence. Poseidon can carry 2 megatons or a nuclear warhead.

4. Natalie Huet, What is Russia’s Poseidon nuclear drone, and could it wipe out the UK in a radioactive tsunami?, EuroNews, May 05, 2022. <https://www.euronews.com/next/2022/05/04/what-is-russia-s-poseidon-nuclear-drone-and-could-it-wipe-out-the-uk-in-a-radioactive-tsun>

Why Russia prefers larger submarines?

Where the U.S. and other powers operate smaller, faster, and more maneuverable submarines, the Russian navy prefers gigantic submarines. Russia's military strategy, unlike the U.S., does not rely on aircraft carriers and strike attacks. Russian military uses missiles as well as Intercontinental ballistic missiles as the first line of attack. These missiles and torpedoes are large and heavy, hence carrying them from one place to another, large submarines provide the best stealthy cover. Apart from the Oscar class, the Russian navy also operates the Typhoon class submarines, also one of the largest class of submarines in the world.

The Soviet Union developed a double hull design for submarines that allowed them to have a very wide body with plenty of room for missiles. Most Russian submarines still follow the same design technique as they have two side-by-side cylindrical inner hulls connected. The side-by-side hull designed not only help to make the structure of the submarine stronger it also provides more room to carry larger crew and supplies. Larger submarines dive deeper and stay submerged far longer than an attack submarine.⁵



Russia's Project 09852 Special Mission Submarine Belgorod. (Image Credit: Twitter/@CovertShores)

Attack submarines do not need to be large, they are mainly used to carry smaller torpedoes or shorter-range anti-ship and land missiles. They need to have very powerful sensors and be very quiet and fast. The Attack submarines can be used to hunt other subs or ships and do not need to carry large missiles with multiple nuclear warheads, however, they could carry smaller nuclear missiles or torpedoes.

5. Alexey Timofeychev, The biggest, deepest, and fastest: The record-breaking world of Soviet subs, RussiaBeyond, August 28, 2018. <https://www.rbth.com/history/329045-biggest-deepest-fastest-soviet-subs>

Russia's Naval Modernization Program

The Russian Navy is actively working to upgrade, replace and revive its Soviet-era naval equipment as a part of its decades-long naval modernization program. Two of Russia's biggest shipyards are busier than ever. The Severodvinsk shipyard has been designated to work on new projects under Sevmash, while the Zvezdochka shipyard has been designated to work on repairing and upgrading the old submarines and warships.

One of the biggest ongoing restoration projects at Zvezdochka shipyard is the restoration and upgradation of the Soviet Navy's nuclear battlecruiser Admiral Nakhimov. The ship was originally commissioned to the Soviet Navy in 1988, however, it was barely deployed to the sea and spent most of its time docked at the Severodvinsk shipyard. The ship is now undergoing some major repairs and upgradation to be commissioned back to the Russian Navy in near future.

Apart from having a large fleet of diesel-electric powered submarines ready to be commissioned, the following 13 nuclear-powered submarines are being constructed at the Severodvinsk shipyard to be commissioned into the Russian Navy by 2027, including *Yasen-class*: Krasnoyarsk, Arkhangelsk, Perm, Voronezh, Vladivostok, *Borei-A class*: Generalissimo Suvorov, Imperator Aleksandr III, Knyaz Pozharskiy, Dmitry Donskoy, Knyaz Potyomkin, and *Special Purpose Nuclear Powered Submarines*: Belgorod, Khabarovsk, and Ulyanovsk.⁶

With the fourth generation of Russia's nuclear-powered submarines being under construction process, the fifth generation is also being designed and referred to as Husky-class submarines, however, very little information about design or construction contracts is available regarding Russia's fifth-generation nuclear-powered submarine projects.



Russia's Borei-A class submarine before launching on water. (Image Credit: Sevmash)

6. IRIA Report, Russian Navy's Modernization Program with New Nuclear Submarines, IRIA, February 2022. <https://www.ir-ia.com/Russian-Navy-Modernization-Program-with-New-Nuclear-Submarines.html>

India's Naval Modernization

India has been modernizing its naval capabilities in recent years, building its own aircraft carrier, constructing new attack submarines, enhancing its maritime capabilities, and influence to become a major player in the Indian Ocean region (IOR).

As the Indo-Pacific strategic and economic importance increased, India, the largest country in South Asia, initiated efforts to strengthen its naval defense and enhance regional influence. Some of the significant activities by India included improving maritime domain awareness, maritime partnerships and joint exercises with the US, Japan, Australia, and France, and regional partnerships through port access and logistics agreements.

India's naval fleet and strategy

India's naval fleet now includes two aircraft carriers, 10 destroyers, 12 frigates, and 20 corvette ships. India is increasingly positioning itself in the region as a 'net security provider' (a term first suggested by former U.S. Secretary of Defense Robert Gates in 2009) to emerge as a key regional and security player.¹ To address new challenges and strengthen its capabilities, India is focused on naval modernization efforts to improve the country's maritime security, expand regional influence, and to better respond to potential threats.

Some of the major initiatives and developments in India's naval modernization include:

- Development of indigenous vessels, systems, and weapons
- Acquisition of new ships and submarines
- Construction of new naval bases and facilities
- Strengthening cooperation with other countries through joint exercises, training programs, and defense cooperation agreements.



Indian Navy's MIG-29K aircraft on the flight deck of the indigenous aircraft carrier Vikrant. (Image Credit: PTI/via ET)

INS Vikrant - India's first home-built aircraft carrier

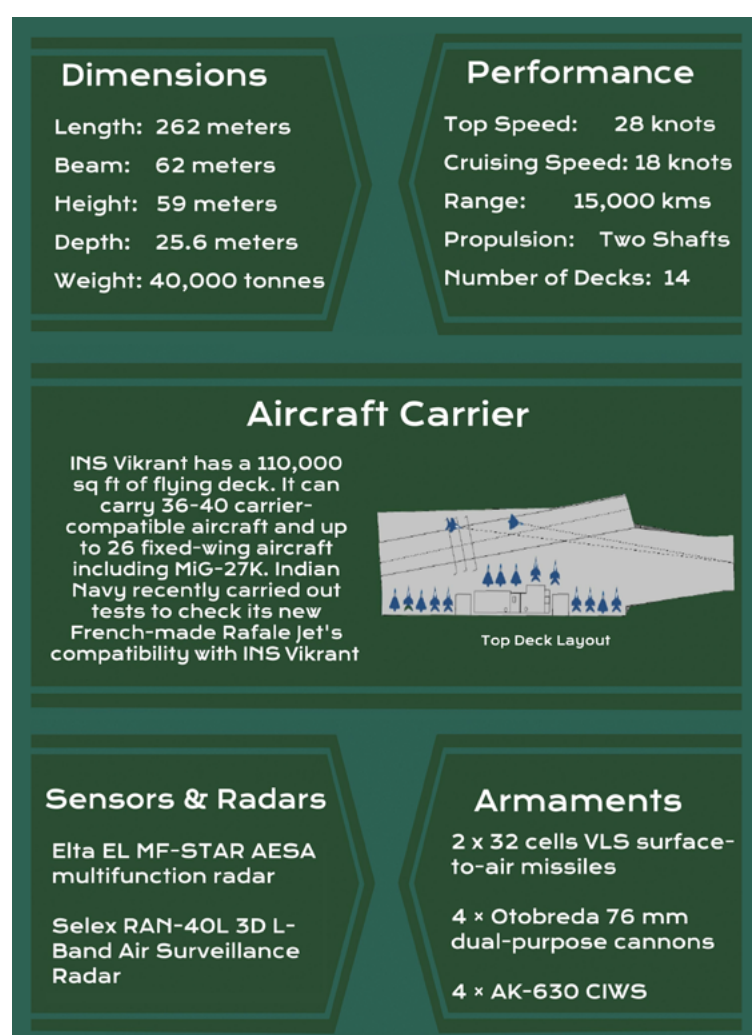
In recent years, New Delhi is bolstering its domestic defense industry since Prime Minister Modi aligned the vision of the country's development and security with self-reliance. One of

1. Anit Mukherjee, India as a net security provider: Concept and Impediments, RSIS, August 2014. https://www.rsis.edu.sg/wp-content/uploads/2014/09/PB_140903_India-Net-Security.pdf

the notable examples of this strategy was the commissioning of India's first indigenously aircraft carrier ship, INS (Indian Naval Ship) Vikrant, in September 2022.² Prime Minister Modi said that the aircraft carrier is a symbol of India's "indigenous potential, indigenous resources, and indigenous skills."

INS Vikrant is a modern and technologically advanced aircraft carrier, with a length of about 262 meters and a displacement of 43,000 metric tons. "The carrier is equipped with the latest equipment and systems" and is designed with a "very high degree of automation for machinery operations, ship navigation and survivability".³ It has the capacity for over 1,600 crew on board. The warship can carry 30 aircraft. The aircraft carrier's estimated cost was around \$2.5 billion.

India now has two aircraft carriers. INS Vikramaditya, the country's older aircraft carrier, was built in the Soviet Union in 1987. It served with the Soviet navy under the name Admiral Gorshkov, and later India purchased it in 2004 for \$2.35 billion.



As India looks to counter growing Chinese influence and developments in the region, it has also planned a third aircraft carrier, 65,000 tonne INS Vishal, with superior power projection capabilities. Girish Luthra, retired vice admiral and India's former commander-in-chief of the Western Naval Command, said that India must accelerate its naval capability development, including the acquisition of a third aircraft carrier, as a key regional player "to strengthen stability, security, and safety in the Indo-Pacific" and to respond to "security challenges posed by the widening footprint of the PLA Navy, the potential of China-Pakistan collusion". He emphasized that a third locally-built aircraft carrier is "very much needed and fits well with the role that India should play in the region, as well as for our security requirements."⁴

2. IRIA, India commissions its first indigenously built aircraft carrier after 17 years of construction, IRIA News, September 03, 2022. <https://www.ir-ia.com/news/india-commissions-its-first-indigenously-built-aircraft-carrier-after-17-years-of-construction>

3. ABB, VM, Savvy, Prime Minister Shri Narendra Modi commissions India's first indigenous aircraft carrier INS Vikrant in Kochi, Press Information Bureau Government of India Ministry of Defence, September 02, 2022. <https://www.pib.gov.in/Pressrelease-share.aspx?PRID=1856230>

4. Shashank Mattoo, India must acquire its third aircraft carrier, says retired vice admiral, Mint, September 07, 2022. <https://www.livemint.com/news/india/india-must-acquire-its-third-aircraft-carrier-says-retired-vice-admiral-11662541368636.html>

Some other major projects for naval modernization:

- Project-75 to build six Scorpene class conventional attack submarines. India launches its sixth and final Scorpene submarine in April 2022. Designed and developed by French naval shipbuilder Naval Group, the submarines were built at the state-owned Mazagon dockyard in Mumbai under a transfer of technology partnership.⁵
- Indian Navy has also built four stealth guided-missile destroyers under its Project 15B. The fourth stealth destroyer under this program was launched in May 2022.⁶ The ships are equipped with state-of-the-art weapons and sensors, including a vertically launched missile system for long-distance engagement of shore, sea-based, and air targets. The P15B destroyers have been designed by the Indian Directorate of Naval Design. It features “improved survivability, seakeeping, stealth, and ship maneuverability” and can carry and operate two multi-role helicopters.⁷
- India is also building stealth frigates under Project 17A and the third frigate of this project was launched in September 2022. This indigenously designed stealth frigate will be equipped with advanced weapons. The Nilgiri-class frigates will be fitted with a 127mm main gun, two 30 mm AK-630M anti-aircraft artillery systems, two torpedo tubes, and launchers for eight BrahMos surface-to-surface supersonic cruise missiles, and 32 Barak-8 surface-to-air missiles.⁸

Nuclear-powered submarines

India is the sixth country to have nuclear-powered submarines with ballistic missile launch capabilities alongside the United States, United Kingdom, Russia, France, and China.

The successful test of a ballistic missile fired from its first indigenous nuclear-powered submarine, INS Arihant, on October 14, 2022, validated India’s second strike nuclear capability. The submarine-launched ballistic missile (SLBM) is “significant to prove crew competency and validate” its ballistic



Indian Navy's Visakhapatnam-class indigenous P15B stealth guided missile destroyer. (Image Credit: Wikimedia Commons)

5. Press Release, Launching of the Vagsheer, the sixth Indian Kalvari-class submarine with Scorpene® design, entirely made in India, Naval Group, April 20, 2022. <https://www.naval-group.com/en/launching-vagsheer-sixth-indian-kalvari-class-submarine-scorpener-design-entirely-made-india>

6. Indian Navy Press Release, Second Project 15B Destroyer Delivered to the Indian Navy, Naval News, November 24, 2022. <https://www.navalnews.com/naval-news/2022/11/second-project-15b-destroyer-delivered-to-the-indian-navy>

7. Indian Navy, Mormugao-Second Ship of Project 15B Launched at Mazagon Docks Mumbai, Indian Ministry of Defence, February 26, 2019. <https://www.indiannavy.nic.in/content/mormugao-second-ship-project-15b-launched-mazagon-docks-mumbai>

8. Naval Technology, Nilgiri-Class (Project 17A) Frigates, Naval-technology.com, December 17, 2020. <https://www.naval-technology.com/projects/nilgiri-class-project-17a-frigates>

missile submarines (SSBN) program which is “a key element of India’s nuclear deterrence capability,” according to the Indian Ministry of Defense.⁹

The ballistic missile test from its submarine, named the Arihant (Destroyer of Enemies), hit the target area in the Bay of Bengal with “very high accuracy”, allowing the Indian Navy to assess and verify various technological and operational capabilities of the system.

The Indian Navy currently has 15 diesel-electric submarines, one nuclear-powered general-purpose attack submarine, leased from Russia, and one ballistic missile submarine. In 2019, New Delhi signed a \$3 billion contract for the lease of another Akula-class nuclear submarine (SSN) from Russia for 10 years. India is also pursuing an ambitious plan to build six nuclear-powered submarines as an effective deterrent against China and Pakistan. India has also recently constructed two submarine bases.

India, which has historically imported submarines from France, Russia, and Germany, has now focused efforts to develop more vessels indigenously to have its own infrastructure and technology as well as to boost the local defense industry. India is rigorously upgrading its naval capabilities, prioritizing submarines powered by nuclear reactors that have abundant power, and can operate for extended periods of time with unlimited range.



9. ABB/Savvy, INS Arihant carries out successful launch of Submarine Launched Ballistic Missile, Press Information Bureau Government of India Ministry of Defence, October 14, 2022. <https://pib.gov.in/PressReleasePage.aspx?PRID=1867778>

North Korea Missile tests in 2022

North Korea escalated its nuclear weapons program in 2022, firing off a record number of nearly 70 missile tests this year alone. This is more than double the total amount of tests conducted during the over 60-year period before Kim Jong Un's regime began in 2011.

Experts say that North Korea's recent spate of launches signals a more robust development by the nuclear-armed country towards weapons capable of carrying multiple nuclear warheads. The increase in missile tests should not only be seen as a provocation but as "a continuous development of their capabilities, including deterrence," according to Antoine Bondaz, director of the Korea program at the Foundation for Strategic Research.¹

The United States and its allies urged the UN Security Council to impose more sanctions on Pyongyang but both Russia and China used their vetoes to block any attempt to expand the sanctions list.

From the first missile launch in 1984 to December 2022, North Korea has conducted six nuclear tests and nearly 235 missile launches, according to records by the CNS North Korea Missile Test Database and Missile Threat (CSIS).

In 2022, North Korea's latest missile launches included the launch of an intermediate-range ballistic missile (IRBM) over Japan on October 4 and two short-range ballistic missiles (SRBMs) on October 6. The missile fired over Japan that flew into the Pacific Ocean flew for more than 4,600 kilometers making it the longest-flying missile ever traveled by a North Korean missile.²

On November 2, North Korea fired a record barrage of 23 missiles, mostly into the ocean.³ In November, the



A projectile is fired during North Korea's missile tests in this undated picture released by North Korea's Central News Agency on November 28, 2019. (Image Credit: KCNA/Reuters)

1. Romain Geoffroy and Pierre Breteau, The growing threat of North Korea, which is launching missiles more frequently and at longer range, *Le Monde*, November 24, 2022. https://www.lemonde.fr/en/les-decodeurs/article/2022/11/24/the-growing-threat-of-north-korea-which-is-launching-missiles-more-frequently-and-at-longer-range_6005411_8.html

2. IRIA, North Korea fires its longest-range ballistic missile over Japan, *IRIA News*, October 04, 2022. <https://www.ir-ia.com/news/north-korea-fires-its-longest-range-ballistic-missile-over-japan>

3. Josh Smith and Soo-Hyang Choi, North Korea fires 23 missiles, one landing off South Korean coast for first time, *Reuters*, November 02, 2022. <https://www.reuters.com/world/asia-pacific/north-korea-fires-ballistic-missile-says-south-korean-military-2022-11-02>

Democratic People's Republic of Korea (DPRK) launched its second intercontinental ballistic missile this month and one of its most powerful yet. South Korean defense officials said the missile appeared to be a Hwasong-17, North Korea's newest and most powerful ICBM. North Korea's "ultimate goal is to possess the world's most powerful strategic force, the absolute force unprecedented in the century," Kim said following the November 18 test. The North Korean leader said that the country's nuclear capabilities would protect the dignity and sovereignty of the state and the people.⁴

North Korea missile activity in 2022

In the year 2022, North Korea has launched approximately 50 short-range ballistic missiles (SRBMs) — the highest number in any year to date. North Korea also tested its latest and biggest missile yet with two likely successful tests of the Hwasong-17 in March and November this year.



North Korea test-fired its new hypersonic missile on January 5, 2022.
(Image Credit: KNCA)

January 5 - North Korea launches its second-ever hypersonic missile in a test with "strategic significance in that they hasten a task for modernizing strategic armed force of the state," according to state media.⁵

January 11 - Pyongyang conducted a ballistic missile launch, the second test of the year. South Korea's Joint Chiefs of Staff said the missile "flew more than 700 kilometers at a maximum altitude of 60 km and at a top speed of Mach 10."

January 14 - North Korea tested two short-range ballistic missiles. The missiles that were launched from train cars flew 267 miles before hitting targets on an island off the east coast. The tests continued interest in rail-mobile missile deployment.

January 17 - Two road-mobile KN-24 SRBMs were fired on January 17 from an airport in the capital city of Pyongyang.⁶

January 25 - North Korea fired two cruise missiles into the sea off its east coast to bolster its defenses and evaluate "restarting all temporally suspended activities," according to state media Korean Central News Agency (KCNA).

January 27 - North Korea two road-mobile KN-23 short-range ballistic missiles.

4. Josh Smith, Kim Jong Un says North Korea aims to have the world's strongest nuclear force, Reuters, November 27, 2022. <https://www.reuters.com/world/asia-pacific/kim-jong-un-says-north-koreas-goal-is-worlds-strongest-nuclear-force-2022-11-26>

5. Josh Smith, N.Korea launches second hypersonic missile in fiery test, Reuters, January 06, 2022. <https://www.reuters.com/world/asia-pacific/nkorea-says-launch-wednesday-was-hypersonic-missile-yonhap-2022-01-05>

6. AFP, North Korea Confirms Latest Missile Test, Voice of America News, January 17, 2022. <https://www.voanews.com/a/north-korea-confirms-latest-missile-test-/6400824.html>

January 30 - North Korea launched a Hwasong-12 ballistic missile. It has estimated to have reached an altitude of 2,000 kilometers and the missile flew for about 30 minutes to reach a distance of 800 kilometers (about 500 miles). It is the same weapon it had once threatened to target the U.S. island territory of Guam which is just 3,380 kilometers (2,100 miles) from North Korea.⁷

February 27 - North Korea fired a possible ballistic missile off the east coast of the Korean Peninsula on February 27. It was fired from a location near Sunan, where Pyongyang's international airport is located.⁸ The official media KCNA said that it tested cameras to be installed on a satellite, adding that the test "is of great significance in developing the reconnaissance satellite" and released photos of the Korean Peninsula that appeared to be taken from space.⁹

March 4 - North Korea conducted its ninth round of weapons tests in 2022 on March 4 with the firing of a ballistic missile. Its neighbor South Korea's Joint Chiefs of Staff said the missile flew about 270 kilometers (168 miles) eastward at a maximum altitude of 560 kilometers (348 miles) before landing in waters between the Korean Peninsula and Japan.¹⁰

March 16 - Pyongyang tested a suspected ballistic weapon that appeared to have exploded in midair after reaching an altitude of less than 20 kilometers (12 miles). It was likely the new ICBM, the Hwasong-17, which was first unveiled at a military parade in 2020.¹¹

March 20 - South Korea's Yonhap news agency reported North Korea fired four rockets over the span of an hour from South Pyongan province into the sea off the country's west coast.¹²

March 24 - North Korea launched its first intercontinental ballistic missile since 2017. It was the country's biggest and most powerful ICBM test to date. Its altitude of 6,200 km (3,852 miles) demonstrated that it hit the United States with ease. The South Korean military responded by firing ballistic missiles off its east coast to demonstrate its "retaliatory" and "precision strike" capabilities while the White House called the launch "a brazen violation" of U.N. Security Council resolutions.¹³

7. IRIA, North Korea conducts longest-range missile test in four years, IRIA News, January 31, 2022. <https://www.ir-ia.com/news/north-korea-conducts-longest-range-missile-test-in-four-years>

8. IRIA, North Korea test-fires at least one ballistic missile, IRIA News, February 27, 2022. <https://www.ir-ia.com/news/north-korea-test-fires-at-least-one-ballistic-missile>

9. Hyung-Jin Kin, North Korea says it tested cameras for spy satellite, The Associated Press, February 28, 2022. <https://apnews.com/article/space-launches-technology-business-south-korea-north-korea-b94f39427af0da1df5a1a882bd266909>

10. Kim Tong-Hyung and Mari Yamaguchi, North Korea fires ballistic missile in extension of testing, The Associated Press, March 5, 2022. <https://apnews.com/article/united-states-south-korea-north-korea-joint-chiefs-of-staff-2ba339b1be098620902a40947b5b-11bc>

11. Michelle Ye Hee Lee and Min Joo Kim, North Korea may be gearing up for a full ICBM test, when U.S. attention is focused elsewhere, The Washington Post, March 16, 2022. <https://www.washingtonpost.com/world/2022/03/16/north-korea-ballistic-missile-launch>

12. Deutsche Welle, North Korea fires multiple rocket launcher, DW, March 20, 2022. <https://www.dw.com/en/north-korea-fires-multiple-rocket-launcher/a-61189170>

13. IRIA, North Korea tests its biggest Intercontinental Ballistic Missile yet, US announces new sanctions, IRIA News, March 25, 2022. <https://www.ir-ia.com/news/north-korea-tests-its-biggest-intercontinental-ballistic-missile-yet-us-announces-new-sanctions>

April 16 - North Korea carried out its 12th missile test of the year, launching a pair of short-range projectiles from Hamhung. The North Korean state media said that Kim Jong-un supervised the launching of a “new-type tactical guided weapon,” and that the test would help the North improve its “efficiency in the operation of tactical nukes.”¹⁴

May 4 - North Korea fired a ballistic missile toward its east coast. Japan’s Defense Ministry said that the missile had traveled 500 kilometers (310 miles) and hit a maximum height of 800 km and landed in the Sea of Japan. North Korean Leader Kim warned that Pyongyang could “pre-emptively” use its nuclear weapons.¹⁵

May 7 - North Korea fired a short-range, submarine-launched ballistic missile off its east coast from near Sinpo, where it keeps submarines as well as equipment for test-firing SLBMs.

May 12 - North Korea fired three short-range ballistic missiles toward the sea on May 12. These were the first tests after the inauguration of the new South Korean President Yoon Suk Yeol. South Korea, Japan, and the U.S. condemned the tests.¹⁶

May 25 - North Korea test-launched three missiles, a suspected intercontinental ballistic missile and two shorter-range weapons. The test came hours after U.S. President Biden concluded his trip to Asia where he reaffirmed the U.S. commitment to defend its allies in the face of the North’s nuclear threat.¹⁷



A combination image of Hwasong-12 intermediate and long-range ballistic missile test, along with pictures taken from outer space with a camera at the warhead of the missile. (Image Credit: KCNA)

June 5 - North Korea fired off at least eight short-range ballistic missiles into the Sea of Japan from multiple sites. The tests marked the 17th launch by North Korea this year. South Korea said the eight missiles traveled distances of between 110 to 670 kilometers (68 to 416 miles) at altitudes of 25 to 90 kilometers (15 to 55 miles) and speeds from Mach 3 to Mach 6.

August 17 - Two cruise missiles were fired by North Korea in the first weapons test since early last month. The launches come a day after South Korea and the United States began a four-day

14. Choe Sang-Hun, North Korea Launches 2 Short-Range Missiles, The New York Times, April 16, 2022. <https://www.nytimes.com/2022/04/16/world/asia/north-korea-missile-launch.html>

15. Jesse Johnson, North Korea launches apparent ballistic missile as Kim doubles down on tests, The Japan Times, May 4, 2022. <https://www.japantimes.co.jp/news/2022/05/04/asia-pacific/north-korea-missile-launch-may-4>

16. Hyung-Jin Kim, Kim Tong-Hyung and Mari Yamaguchi, N Korea fires 3 ballistic missiles amid 1st virus outbreak, The Associated Press, May 13, 2022. <https://apnews.com/article/seoul-south-korea-north-327a81d1281f2fadeb430e4c632458b7>

17. The Associated Press, North Korea launches three missiles into the sea, including suspected ICBM, National Public Radio, May 25, 2022. <https://www.npr.org/2022/05/25/1101137516/north-korea-launches-three-missiles-into-the-sea-including-suspected-icbm>

preliminary joint drill in preparation for the exercise Ulchi Freedom Shield.¹⁸

September 25 - North Korea launched a short-range ballistic missile off its east coast on Sunday in its first ballistic missile test in nearly four months. The missile test came days after the United States aircraft carrier Ronald Reagan arrived at Busan, in South Korea, to participate in a joint exercise with the South Korean military.¹⁹

September 29 - Pyongyang fired two short-range ballistic missiles toward the East Sea just a day before U.S. Vice President Kamala Harris visit to South Korea.²⁰

October 1 - North Korea test-fired two short-range ballistic missiles in its fourth round of weapon tests in a week of weapons launches. Japan's Ministry of Defense described the first missile's range as 400 kilometers (250 miles) and the second's range as 350 km (220 miles) and said that missiles possibly followed "irregular" flight paths.²¹ It reached a maximum altitude of 30 kilometers (18 miles) and a top speed of Mach 6.



North Korean leader Kim oversaw the launch of the intercontinental ballistic missile, which was termed by the state media as "new type" of weapon. (Image Credit: KCNA)

October 4 - North Korea fired an intermediate-range ballistic missile over Japan on October 4, 2022, for the first time since 2017, leading to a dramatic escalation that prompted Tokyo to issue a rare alert for residents to take cover. The test was described as "a highly provocative and reckless act" marking a significant escalation in Pyongyang's weapons testing program.

October 6 - North Korea launched two more SRBMs just two days after firing an intermediate-range ballistic missile that flew over

Japan. The launch marked the 24th time this year that North Korea has conducted weapons tests.²²

18. Al Jazeera, N Korea fires cruise missiles, as US and Seoul prepare for drills, Al Jazeera Media Network, August 17, 2022. <https://www.aljazeera.com/news/2022/8/17/north-korea-fires-two-cruise-missiles-in-first-tests-in-weeks>

19. AP, Reuters, AFP, North Korea fires ballistic missile towards sea, says South Korean military, The Guardian, September 24, 2022. <https://www.theguardian.com/world/2022/sep/25/north-korea-fires-ballistic-missile-says-south-korean-military>

20. Hakyung Kate Lee, North Korea launches 2 ballistic missiles as Seoul says nuclear test is imminent, ABC News, September 28, 2022. <https://abcnews.go.com/International/north-korea-launches-ballistic-missiles-seoul-nuclear-test/story?id=90624801>

21. Japanese Ministry of Defense, Information related to North Korean missiles, Japan MOD, October 01, 2020. <https://www.mod.go.jp/j/press/news/2022/10/01b.html>

22. Yonhap, N. Korea fires 2 short-range ballistic missiles into East Sea: S. Korean military, Yonhap News Agency, October 06, 2022. <https://en.yna.co.kr/view/AEN20221006000853325>

October 9 - North Korea fired two ballistic missiles into the Sea of Japan, conducting its seventh launch in two weeks. Japan said that both missiles had flown about 350 km, hitting a maximum altitude of around 100 km.²³

October 12 - North Korea launched two long-range cruise missiles toward the eastern waters. The missiles reportedly traveled for 2,000 kilometers (1,240 miles) before falling into the sea.

October 14 - North Korea fired a ballistic missile and hundreds of artillery shells toward the sea and flew warplanes near the border with South Korea, amid heightened tensions. Observers described it as North Korea's "third and most direct violation of the 2018 agreement", which created buffer zones and no-fly areas along the land and sea boundaries to prevent accidental clashes between North Korea and South Korea.²⁴

October 28 - North Korea fired two short-range ballistic missiles towards the Sea of Japan, also known as the East Sea. The launches came as Seoul and Washington were preparing for massive joint air drills, called Vigilant Storm. South Korean military said "The North's ballistic missile launches this time are acts of significant provocation that undermine peace and stability not only on the Korean Peninsula but also in the international community."²⁵



North Korea displayed several missiles during a military parade in April 2017. (Image Credit: Wong Maye-E/Associated Press)

23. Jesse Johnson, North Korea fires off two more missiles for seventh launch in two weeks, The Japan Times, October 09, 2022. <https://www.japantimes.co.jp/news/2022/10/09/asia-pacific/north-korea-missiles-launch-october-9>

24. Hyung-Jin Kim and Kim Tong-Hyung, N. Korea fires missile, artillery shells, inflaming tensions, The Associated Press, October 14, 2022. <https://apnews.com/article/south-korea-north-joint-chiefs-of-staff-government-and-politics-e9dd7ea833f7809d-e151669242d88913>

25. Yonhap, N. Korea fires 2 short-range ballistic missiles toward East Sea: S. Korean military, Yonhap News Agency, October 28, 2022. <https://en.yna.co.kr/view/AEN20221028005657325>

November 2 - North Korea launched a record number of 23 short-range ballistic missiles on November 2, prompting residents of neighboring South Korea to go into underground shelters. One of the missiles landed south of the buffer zone in the sea border between the two countries for the first time since the Korean Peninsula was divided in 1948. South Korea responded by firing three air-to-surface missiles toward the northern side. North Korea rapidly followed with 100 rounds of artillery and additional missile launches, leading to significant escalation between the two neighbors.²⁶

November 3 - North Korea has fired multiple missiles, including a failed suspected intercontinental ballistic missile (ICBM) that prompted the Japanese government to issue evacuation alerts in the northern and central parts of the country.²⁷

November 5 - North Korea fired four short-range ballistic missiles on November 5, adding more of its barrage of missiles fired in response to the U.S. and South Korea's joint military training.²⁸

November 8 - North Korea fired a short-range ballistic missile into the East Sea, also known as the Sea of Japan.

November 16 - North Korea launched another ballistic missile toward its eastern waters. The launch reportedly originated in the North Korean city of Wonsan. The missile flew a distance of about 240 kilometers, at an altitude of 47 kilometers, and at a speed of Mach 4, South Korea's military said.²⁹



North Korea's missile tests in this undated picture released by North Korea's Central News Agency. (Image Credit: KCNA)

November 18 - North Korea fired a suspected long-range missile with the range to hit the United States mainland. The test came a day after it warned of "fiercer military responses" if Washington further bolsters its security ties with South Korea and Japan.³⁰ North Korea claimed that it successfully tested the

Hwasong-17 ICBM as the country's leader Kim Jong Un oversaw the launch conducted by the Korean People's Army Strategic Force. According to the estimates, the long-range missile

26. Stella Kim and Jennifer Jett, North Korea launches 23 missiles as Kim Jong Un climbs the 'escalation ladder', NBC News, November 02, 2022. <https://www.nbcnews.com/news/world/north-korea-south-air-raid-alert-missiles-rcna55166>

27. Philippe Mesmer, New North Korean missile launches cause false alarm in Japan, Le Monde, November 03, 2022. https://www.lemonde.fr/en/international/article/2022/11/03/new-north-korean-missile-launches-cause-false-alarm-in-japan_6002792_4.html

28. IRIA, North Korea launches four ballistic missiles toward the South, IRIA News, November 6, 2022. <https://www.ir-ia.com/news/north-korea-launches-four-ballistic-missiles-toward-the-south>

29. CBS News, North Korea launches another ballistic missile, Seoul says, CBS, November 16, 2022. <https://www.cbsnews.com/news/north-korea-launch-ballistic-missile>

30. Nicola Smith, North Korea fires nuclear-capable missile with range to hit US, The Telegraph, November 18, 2022. <https://www.telegraph.co.uk/world-news/2022/11/18/north-korea-has-fired-icbm-intercontinental-ballistic-missile>

traveled 999 km (620 miles) and went as high as 6,041 km (3,753 miles) across a flight time of 68.9 minutes.³¹

December 18 - North Korea claims significant progress toward developing a spy satellite after it fired a test satellite in an important final-stage test for the development of reconnaissance satellite at the Sohae Satellite Launching Ground on December 18.³² DPRK's National Aerospace Development Administration (NADA) said it would complete preparations for the first military reconnaissance satellite by April 2023. The North's official news agency also released low-resolution, black-and-white photos showing a space view of the South Korean capital and Incheon in an apparent attempt to demonstrate that the North is pushing to acquire a surveillance tool to monitor its rival.

December 23 - North Korea fired two short-range ballistic missiles toward the sea from its eastern coast on December 23. North Korea did not release any statement linking the missile test to the military drills, however, it is evident that North Korea conducted the missile tests to send a message to the U.S. and South Korea about its disapproval of their joint military exercise. North Korea typically views such military exercises as a rehearsal for an invasion.³³

December 31 - North Korea ended the year 2022 with the launch of three short-range ballistic missiles, with a maximum altitude of 100 kilometers (62 miles) and a flight distance of 350 kilometers (217 miles), toward the sea to the east of the Korean Peninsula



North Korean government released a photo showing a missile test at an undisclosed location taken sometime between 25 September and 9 October. (Image Credit: KCNA/AP)

31. Ifang Bremer, North Korea claims it successfully tested a Hwasong-17 ICBM, NK News, November 19, 2022. <https://www.nknews.org/2022/11/north-korea-claims-it-successfully-tested-a-hwasong-17-icbm>

32. KCNA, NADA Conducts Important Test for Development of Reconnaissance Satellite, KCNA Watch, December 12, 2022. <https://kcnawatch.org/newstream/1671538138-926873655/NADA-Conducts-Important-Test-for-Development-of-Reconnaissance-Satellite>

33. IRIA, North Korea fires two ballistic missiles toward eastern waters, IRIA News, December 24, 2022. <https://www.ir-ia.com/news/north-korea-fires-two-ballistic-missiles-toward-eastern-waters>



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Cover Images:

Left 1 - A North Korean intercontinental ballistic missile is launched in this photo released on November 19, 2022 by North Korea's Korean Central News Agency. (Image Credit: KCNA/via Reuters)


Center 1 - U.S. Air Force B-21 Raider unveiling ceremony at Palmdale, California on December 2, 2022. (Image Credit: U.S. Department of Defense/Chad McNeeley)

Right 1 - Chinese PLA guided-missile frigate Yulin (Hull 569) attached to a destroyer flotilla with the PLA navy Southern Theater Command fires its rocket-propelled depth charges at mock hostile submarine during a maritime training exercise in waters of the South China Sea in late March, 2020. (Image Credit: China Military)

Left 2 - Turkish made Bayraktar TB2 unmanned combat aerial vehicle. (Image Credit: Wikimedia Commons)

Center 2 - German soldiers take part in a military exercise in Lithuania on Oct. 10, 2022. Enhanced German vigilance in Lithuania is part of an agreement reached after Russia's large-scale invasion of Ukraine in February. (Image Credit: Mindaugas Kulbis/AP)

Right 2 - Russia's largest nuclear submarine K-329 Belgorod. (Image Credit: Twitter/tvtoront)

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