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Nuclear Sharing in Europe

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EXECUTIVE SUMMARY

Europe's rapidly shifting security landscape has prompted a reevaluation of nuclear sharing policies, extending beyond those among NATO allies to include new dynamics between Russia and Belarus. This report analyzes the various forms that nuclear sharing policies and debates take through evaluating cases across seven countries. It examines how both domestic and international security dynamics influence the decision-making of current and prospective participants in such arrangements.

The case studies highlight three broad trends:

- The diplomatic value of nuclear sharing arrangements outweighs their military utility. Sharing arrangement are perceived as playing a vital role in reassuring allies, facilitating alliance negotiations and signaling resolve to adversaries.
- The perceived balance of conventional military power significantly influences nuclear sharing decisions. States facing conventional disadvantages are more likely to advocate for new or expanded nuclear sharing arrangements. Currently, most states involved in nuclear sharing arrangements are focusing on modernizing conventional forces rather than enhancing nuclear-specific capabilities.
- Nuclear sharing arrangements are extremely durable once established. Existing arrangements have prevailed through periods of domestic opposition and instability, transformed threat environments and rifts within an alliance.

Risks

Nuclear sharing does not simply "strengthen deterrence." In addition to imposing elevated financial burdens and environmental hazards, an increased number of sub-strategic nuclear weapons would also have a deleterious effect on arms racing dynamics and crisis stability.

Policy recommendations

Countries should emphasize the political commitments behind nuclear sharing arrangements rather than fundamentally change their posture by increasing numbers or introducing new capabilities. This can include scheduled and announced exercises, intra-alliance consultation and public solidarity commitments.

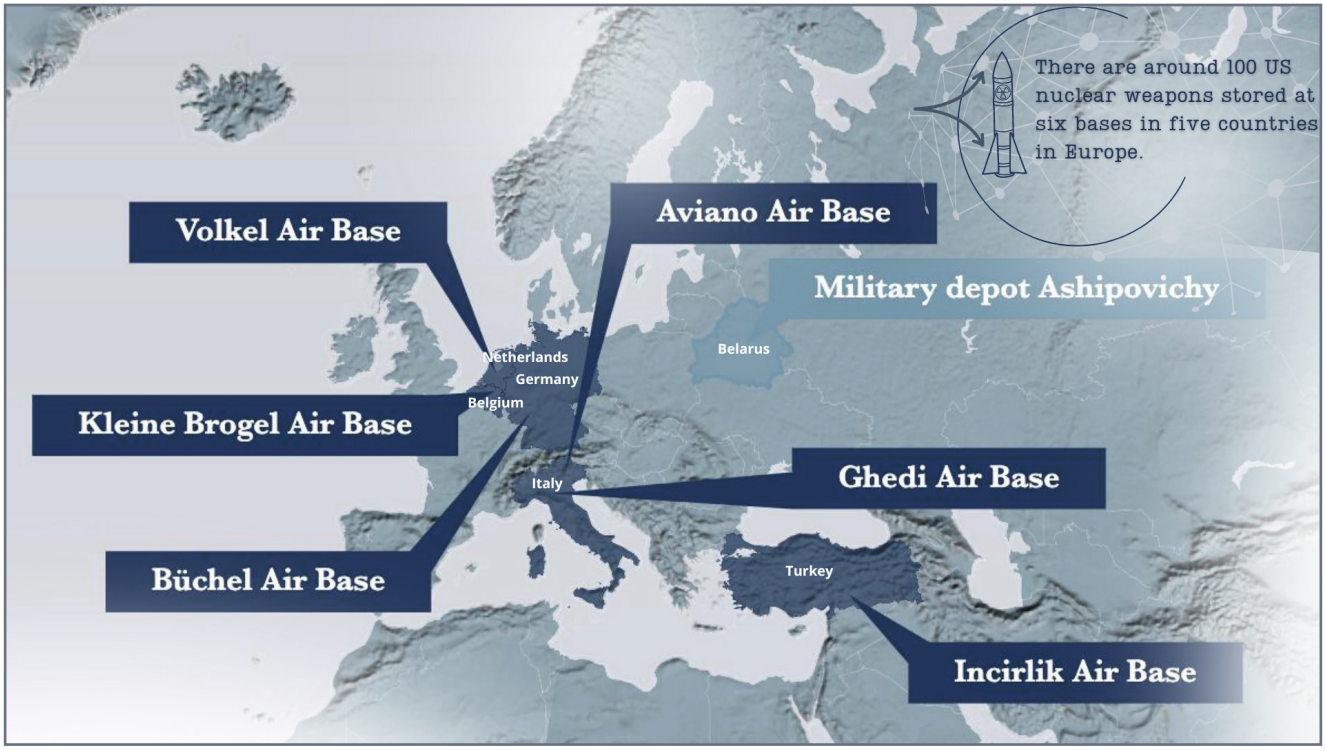

Figure 1: Current European countries with active nuclear sharing agreements and the locations of the bases where nuclear weapons are stored.

Summaries from Case Studies

Germany page 9

Germany's position on the Cold War frontline made it a central case in the evolution of nuclear sharing strategies. At the height of the Cold War, thousands of U.S. nuclear weapons and a myriad of delivery systems were stored in Germany. Now, the arrangement consists of as few as 10-15 gravity bombs stored at Büchel Air Base.

The volatile nature of domestic politics surrounding nuclear sharing in Germany has sparked significant debate and driven policy shifts over the years. Maintaining alliance cohesion has been a key motivator for Germany's continued participation in NATO's nuclear sharing arrangement despite domestic scrutiny. Most recently, this commitment was reaffirmed in the 2022 decision to purchase the F-35A to replace aging Tornado jets.

Türkiye page 10

The strategic rationale for deploying nuclear weapons in Türkiye mirrored many of the considerations that guided similar installations in Germany. The U.S. deployment of intermediate-range missiles in Türkiye in 1959 heightened tensions between the United States and the Soviet Union. The number of nuclear weapons has since been significantly reduced, with an estimated 20 to 30 gravity bombs now stored at Incirlik Air Base.

Türkiye's nuclear-sharing relationship with the United States has been marked with diplomatic tensions, safety concerns and apprehension over internal political instability, including multiple military coups. Despite repeated calls for the removal of nuclear weapons from Turkish soil due to these issues, a restricted sharing arrangement continues. However, the Turkish Air Force is no longer certified for nuclear delivery.

Belarus page 11

Belarus is unique in that it underwent a nuclear disarmament process after the Soviet Union's dissolution and has since reintroduced nuclear weapons through an agreement with Russia in 2023. Russian deployment of nuclear weapons to Belarus have reportedly been used to bolster deterrence and signal political resolve.

This marks a shift in the region's nuclear balance. Russia and Belarus announced the deployment of Russian tactical nuclear weapons on Belarusian territory. While the agreement does not change strategic military deliberations due to redundancy with existing capabilities, it is highly symbolic in mirroring NATO's nuclear arrangements and signaling an enhanced Russian-Belarusian defense alliance.

Poland page 12

Poland has repeatedly advocated for hosting U.S. nuclear weapons on its soil, with its most recent push coming in response to Russian Iskander deployments in Kaliningrad and Belarus. Poland's recently magnified interest highlights the domino effect in regional dynamics of nuclear sharing arrangements.

However, the United States has rejected Poland's petitions based on escalation concerns, political considerations, financial burdens, redundancy with existing NATO infrastructure and emphasis on conventional forces.

Finland page 13

Finland's recent decision to join NATO marks a departure from its former neutrality policy and reflects a shift in its perceived security environment. Finnish officials emphasized that they joined NATO without limitations, including on nuclear deployments. However, there is strong public opposition to the permanent stationing or transport of nuclear weapons in Finland.

Finland displays significant confidence in its conventional military capabilities, reinforcing deterrence against Russia without relying on nuclear weapons. It also incorporates reassurance measures, such as restricting foreign bomber deployments, acknowledging its proximity to Russian strategic areas like the Kola Peninsula and the St. Petersburg metropolitan region.

Sweden page 15

Sweden's NATO accession signals the end of its two-century-long neutrality policy. Sweden has also reduced its nuclear disarmament efforts, including its leadership role in the Stockholm Initiative for Nuclear Disarmament.

Sweden explicitly made no reservations against nuclear deployments upon joining NATO. A U.S.-Sweden Defense Cooperation Agreement could provide the legal basis for nuclear weapon deployments despite an existing ban in Sweden. This appears unlikely, though, due to domestic politics, comparisons with past Nordic countries' NATO membership and U.S. interest to avoid increasing the number of states hosting nuclear weapons.

United Kingdom page 15

While the United Kingdom maintains its own nuclear deterrent, it also has experience with allied nuclear sharing arrangements. Recent U.S. infrastructure plans include funding to upgrade legacy nuclear storage facilities across the United Kingdom. Additionally, the U.S. presence in the United Kingdom already features advanced combat aircraft, including the F-15E and F-35A.

NUCLEAR SHARING IN EUROPE

The political landscape surrounding nuclear sharing in Europe has undergone dramatic changes over the past few years. A recent public opinion study indicates that European citizens now view nuclear weapons more favorably, are more supportive of nuclear weapon use and have become far more vigorous in their support of nuclear forces remaining in Europe.[1] This shift is reflected in recent policy decisions to expand nuclear sharing relations and extended security guarantees in Europe. Key developments include Russia's announcement of plans to deploy nuclear weapons in Belarus and the reconsideration by Sweden and Finland of their long-standing support for nuclear disarmament, now opting to seek nuclear protection under the NATO alliance.

Debates over how best to re-invigorate sharing relationships have generated renewed attention from scholars and policy-makers.[2] In his initial "Zeitenwende" speech in February 2022 German Chancellor Olaf Scholz specifically linked Germany's role in a nuclear sharing partnership to the decision to spend a total of $8.4 billion on the acquisition of 35 dual-capable F-35 airframes. This also indicated a departure from previous deliberations about terminating Germany's participation in NATO nuclear sharing. About a year after Scholz's speech, Russian President Vladimir Putin and Belarusian President Alexander Lukashenko jointly announced plans to station Russian nuclear weapons in Belarus, confirming that the delivery of nuclear-capable SU-25 planes and Iskander missile systems had already occurred.[3] This sparked new vigor in the Polish campaign to either host U.S. nuclear weapons on Polish soil or certify future Polish F-35 planes to carry nuclear weapons.[4] Meanwhile, other countries had more cautious responses. For example, to allay concerns both at home and in Moscow, then-President Sauli Niinistö emphasized that Finland's NATO membership would not lead to nuclear weapons being deployed on Finnish territory.[5]

In light of these developments, this report re-evaluates classical drivers for extended deterrence arrangements in Europe, surveys current and possible future deployment situations across a range of cases and provides recommendations for reinforcing regional strategic stability, limiting escalation risks, and minimizing arms racing dynamics amidst resurging interest in nuclear sharing.

Nuclear sharing generally refers to arrangements under which one country hosts nuclear weapons that are under the control of an allied state but has command over the delivery vehicle and thereby is guaranteed a role in the planning and execution process. This concept is similar but different from *forward-deployed* nuclear weapons which refers to weapons stored in the theater of a potential conflict while under complete control by the nuclear weapon state. Other countries can be included in the planning process for either arrangement. Similar deliberations around nuclear sharing and extended deterrence are highly relevant to the Indo-Pacific and the Gulf regions as well, but these will not be discussed here given the geographic focus of the report.

Nuclear Sharing Infrastructure

Given the inherently international nature of nuclear sharing, there is inevitably some disagreement over the terminology between affected countries that merits further clarification. The scope of what constitutes a strategic, sub-strategic, tactical or operational nuclear weapon is usually based on weapon design, yield and the range of delivery vehicles as well as operational concepts. But understanding also varies between the United States, the Russian Federation and European countries due to their geographical contexts. European states tend to stress that any nuclear weapon available for use on the continent has strategic implications. The distinction between strategic and non-strategic is therefore made based on targeting choices rather than technical characteristics. The United States perceives a clearer distinction between strategic weapons that can target the continental United States, usually carried by delivery systems with a range above 5,500 km and non-strategic ones, which cannot.[6] The Russian delineation falls between those conceptions and doctrinal documents do not make a distinction between strategic and non-strategic nuclear weapons.[7] A substantial part of the Russian arsenal is designed to deter the United States, necessitating a range of over 5,500 km, therefore making it functionally strategic. However, systems of shorter operational range are also capable of targeting the capitals of France and the United Kingdom, two other nuclear weapon states, giving them a strategic dimension. This report will follow the codification made in the New START Treaty and use the term *sub-strategic* to refer to any nuclear weapon that is not meant to be delivered by intercontinental ballistic missiles, submarine-launched

ballistic missiles or air-launched cruise missiles from a strategic bomber.*

Beyond the actual nuclear weapons involved in a sharing agreement, supporting infrastructure is also required. The extent of the supporting infrastructure necessary is dependent on the type of nuclear forces intended to be deployed, the scope of political obligations and the mission. As will be reviewed in the case studies, sharing agreements commonly entail the forward deployment of nuclear weapons by a nuclear weapon state, reinforced with the provision of some sort of delivery vehicle by the non-nuclear weapon state. In addition to the delivery vehicle itself, additional infrastructure may be required to ensure readiness and reliability of the systems, including reinforced storage facilities and air bases with protected military structures to support the delivery vehicles in crises. Storage facilities must also be reinforced to ensure maximum security of nuclear weapons deployed to the host country. NATO predominantly relies on dual-capable aircraft (DCA) as the main delivery vehicles, where host countries are expected to provide DCAs, protected aircraft facilities, runways and crew that are trained to deploy nuclear weapons. However, other delivery vehicles, such as missile launchers, may be involved depending on the agreement. Lastly, some degree of conventional forces may be required to support the nuclear mission as dictated by the scope of the agreement.

EVOLUTION OF NUCLEAR SHARING ARRANGEMENTS

Since its formation in 1949, NATO has consistently placed nuclear weapons at the core of its deterrence and defense strategy. An enduring commitment to nuclear weapons within the alliance reflects the historical context from the Cold War era. The alliance's early history was characterized by a prevailing perception among Western military strategists that NATO countries faced a significant conventional military power imbalance when compared to the Soviet Union. As NATO's security environment evolved, the nature and extent of the sharing arrangements also shifted.

Relying on its initial nuclear monopoly and the resulting advantage in weapon quantity, NATO's early strategy was to threaten retaliation against any attack by the conventionally superior Soviet Union with nuclear strikes against both frontline forces and Soviet infrastructure in the rear. To address numerical disparity in NATO's conventional forces and manpower, the United States sought to ensure the Alliance's "ability to use atomic weapons as conventional weapons"[8] from the immediate outset of hostilities. The primary concern lay in preventing the rapid Soviet occupation of Europe through the establishment of well-prepared and strategically positioned NATO forces with an "integrated atomic capability."[9]

In 1954, the U.S. military began deploying nuclear weapon infrastructure and delivery systems to West Germany and the United Kingdom. Concurrent with ongoing efforts to further integrate nuclear and non-nuclear powers on nuclear matters, the North Atlantic Council authorized "planning for the use of atomic weapons in the event of an all-out attack" and "training of relevant NATO military forces, in addition to those of the United States and the United Kingdom."[10]

With the rapid expansion of the Soviet nuclear arsenal in the 1950s, it became clear that any use of nuclear weapons in defense of European allies could trigger escalation that would lead to destruction on an unprecedented scale. Countries on the frontlines of the Cold War, like Germany and Türkiye, had a strong vested interest in preventing the use of nuclear weapons on their territory or, at the very least, having a say in how they would be deployed.[11] The United States addressed this concern by establishing the practice of nuclear burden sharing. Under this type of arrangement, nuclear weapons stored in Germany would be controlled by U.S. forces, but the delivery vehicles would remain under German command. In theory, this established a two-key principle for nuclear use on German territory. For the United States, this setup afforded control over nuclear weapons at the Cold War frontline, while also sharing the financial and political burdens with its alliance partners.

This arrangement was later formalized with the creation of the NATO Nuclear Planning Group in 1966, granting NATO allies, including those not hosting nuclear weapons, access to information regarding their intended use and targeting decisions.[12] To support nuclear weapons deployed in Europe, non-nuclear NATO members were encouraged to participate in Support to Nuclear Operations with Conventional Air Tactics (SNOWCAT)

* U.S. strategic bombers can carry gravity bombs as well as ALCMs and are able to carry out "strategic" and "sub-strategic" missions.

missions.** This initiative - and the practice of nuclear sharing more broadly - aimed to impede the development of independent national nuclear programs and enhance allied interoperability and political harmony by supporting the alliance's nuclear mission with conventional operations.[13]

Over the ensuing decade, this practice expanded to other European nations, namely Belgium, Denmark, Greece, Italy, the Netherlands, Spain and Türkiye. In total, the United States introduced 24 different nuclear-capable weapon systems to Europe, the majority of which were B61 gravity bombs, specifically the B61-3, B61-4 and B61-10 variants.[14] The overall number of nuclear weapons deployed is said to have peaked in 1971, reaching approximately 7,000.[15]

In stark contrast with NATO's nuclear posture, Soviet strategic planning was initially focused on avoiding escalation to the nuclear level to the greatest extent possible. With nuclear arsenals rapidly expanding during the 1960s, Soviet military planning worked under the assumption that limiting escalation would be impossible and any conflict would quickly escalate to prolonged nuclear exchanges. With the development of long-range missile technology and the establishment of a survivable second-strike capability, the idea of limited nuclear use in Europe became more conceivable.[16] This marked a shift in the Soviet approach to sub-strategic nuclear weapons, which were no longer viewed solely as theater weapons but also as tools for disrupting supply and reinforcement flows in the rear areas of an active conflict.[17]

Much remains unknown regarding the extent of Soviet nuclear weapon deployments in Eastern Europe, including precise locations, employment guidelines, numbers and time frames, as many original sources are still classified. An estimated total of around 3,000 nuclear warheads are reported to have been deployed in Bulgaria, Czechoslovakia, East Germany, Hungary and Poland.[18] Though much less information is available regarding the character of the Soviet Union's joint nuclear exercises with Hungary and Poland, as well as the specific forward deployment and sharing arrangements. One recently published account indicates that local military personnel "practiced the mounting and firing of the weapons with training rounds." This implies that the arrangements were not too dissimilar from NATO's nuclear missions.[19] Other accounts indicate that launch control may have been delegated to the Polish military in the case of war with the West.[20]

Expanding the Scope to Address Alliance Abandonment Concerns

The early U.S. strategy of "Massive Retaliation" came to an end with the arrival of the Kennedy administration in 1961. Technological improvements in intermediate-range and intercontinental ballistic missile technology substantially increased the threat to U.S. and Soviet Union territories, making it less credible that the superpowers would react to conventional war in Europe with massive nuclear attacks on the homeland of their adversary. Fears of direct strikes against U.S. and Soviet territories were magnified by the near-catastrophe of the Cuban Missile Crisis in 1962, sparking interest among the superpowers to take measures to reduce the likelihood of automatic escalation from a regional crisis to strategic nuclear war. As one element of this transition, NATO shifted to a "Flexible Response" nuclear strategy in 1967, which would allow the United States to respond to different levels of conflict with proportionate conventional or lower-level nuclear force.

For Western European states, this development created a dilemma that has remained a persisting feature of extended deterrence alliances. They depended on the United States for nuclear deterrence, and although the superpower went to great lengths to assure its allies of its commitment to retaliate against the Soviet Union on their behalf, it would not necessarily be rational for an American president to do so, considering the catastrophic risk of escalating to a strategic nuclear war. To address this issue, "Flexible Response" contained elements for first nuclear use that would be limited through the number of weapons, targeting choices and yield. Crucially, it contained the option to avoid attacking the territory of the Soviet Union and thereby offered a threshold for controlling escalation after a first nuclear strike. This made the threat of initial nuclear escalation more credible from the American perspective. But, it accepted the implicit risk of the devastation of European countries who wanted to avoid a limited nuclear war in Europe. For France, doubts about the reliability of an external deterrent provided by the United States, in addition to a desire for diplomatic prestige, had been a key reason to develop a national nuclear program and test a nuclear weapon in the 1960s. While the weapons program was not sufficiently large, survivable or reliable to deter a Soviet attack by itself, it could force U.S. intervention by escalating beyond the nuclear threshold against the Soviet Union.[21]

** The name for these missions has later shifted to Conventional Support of Nuclear Operations (CSNO).

Concerns of alliance abandonment became especially pronounced in the late 1970s and 1980s. After the superpowers accepted mutual vulnerability and agreed to limit their strategic capabilities in the SALT negotiations, the Soviet Union used newly available resources to revamp its intermediate-range*** missile arsenal in Europe, which was excluded from the treaty. This included the installation of SS-20 missiles, which provided increased range, better accuracy, the ability to carry multiple warheads and improved reload capacities. Although the United States and the Soviet Union initially assessed the deployment as a routine modernization, European countries perceived the added capacity as critically offsetting the regional balance, making them more vulnerable to Soviet nuclear threats.[22] While the nuclear capabilities available in Europe were numerous, the delivery vehicle ranges were deemed too short to fully satisfy deterrence and defense mission requirements.

In response, European countries sought renewed security assurances from the United States. To accommodate this, nuclear-armed intermediate-range ballistic and cruise missiles were forward deployed under complete U.S. control in Germany, Belgium, the Netherlands, Italy and the United Kingdom. However, the short flight times of the ballistic missiles and low detectability of the cruise missiles undermined crisis stability by reducing decision times and introducing new first-strike incentives. Aware of these destabilizing effects, NATO deployments were accompanied by an offer to negotiate arms control measures that would cover intermediate-range missiles in Europe, which resulted in the signing of the Intermediate Nuclear Forces Treaty in 1987. The end of the Cold War in the 1990s, coupled with the implementation of these key arms control agreements, eased tensions over strategic stability and enabled substantial reductions in both the quantity and alert status of tactical nuclear weapons deployed in Europe.

*** *Intermediate* and *medium* range missiles refer to the same category of systems. The respective Russian word *средний* in other contexts is often translated as medium. For consistency we use *intermediate-range missiles* when referring to systems with a range between 1000 and 5000 km.

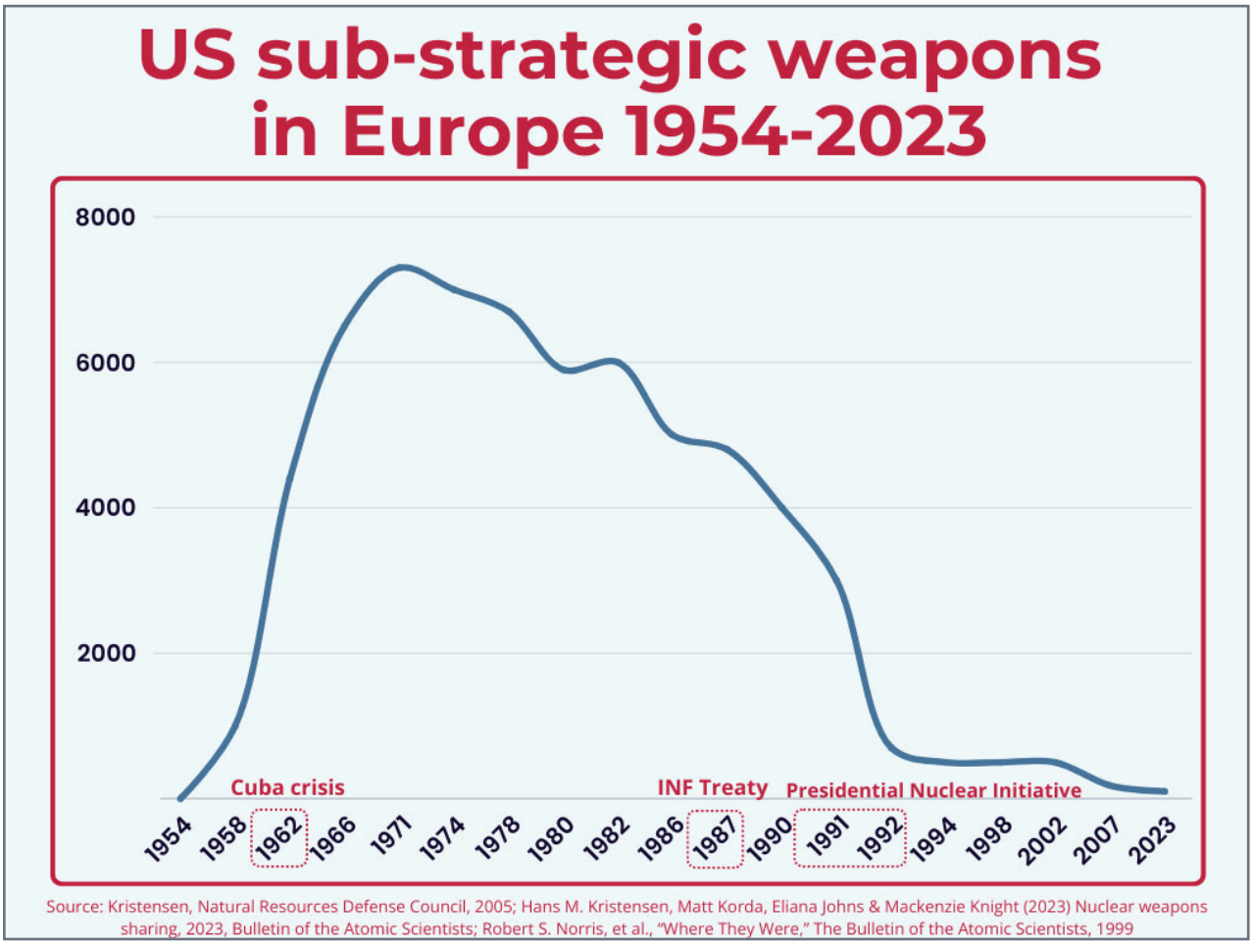

Figure 2: US sub-strategic nuclear weapons in Europe.

Reducing the numbers

The conclusion of the Cold War marked a significant shift in the relations between the two blocs and the power balance in Europe. The withdrawal of Soviet forces in Central Europe from 1989 to 1994, combined with the signing of the Treaty on Conventional Armed Forces in Europe (CFE) in 1990, had a profound impact on the continent's security landscape. The substantial reduction of conventional forces in Europe, along with the implementation of transparency measures through the CFE Treaty, diminished the possibility of surprise attacks and consequently reduced the need for large numbers of sub-strategic nuclear weapons. These developments prompted NATO, the Soviet Union and its successor states to undergo drastic changes in their force structures and overall postures, transitioning from strategies based on deterrence to approaches focused on cooperative security.

"The substantial reduction of conventional forces in Europe, along with transparency measures through the CFE Treaty, diminished the possibility of surprise attacks and consequently the need for large numbers of sub-strategic nuclear weapons."

After the dissolution of the Soviet Union in 1991 and upon efforts to achieve a more cooperative relationship, Russian and U.S. strategists were more concerned with reducing military expenses than deterring and neutralizing large-scale conventional attacks. In parallel, ensuring the safety of the thousands of deployed sub-strategic weapons amidst regional instability and terrorism threats became a policy priority. In this context, U.S. President George H.W. Bush introduced Presidential Nuclear Initiatives (PNIs) aimed at reducing the number of nuclear weapons and enhancing the safety and security of Soviet nuclear weapons following the dissolution of the Warsaw Pact. The United States also unilaterally committed to reducing and dismantling foreign-deployed non-strategic weapons, excluding those involved in nuclear burden sharing. This initiative prompted reciprocal proposals from Mikhail Gorbachev (5 October 1991) and Boris Yeltsin (29 January 1992), resulting in the consolidation of all Soviet non-strategic nuclear weapons in central storage facilities in Russia, and separation of warheads from delivery systems.

Within the NATO alliance, nuclear posture changes were reflected in both the overall reduction of nuclear weapons in Europe and the withdrawal of nuclear weapons from several bases.**** Specifically, nuclear weapons were withdrawn from German bases at Memmingen and Norvenich (1996) and Ramstein (2005), the Greek base at Araxos (in 2001), the Turkish bases at Akinci and Balikesir (1995) and the U.K. base at Lakenheath (2008).[23] The number of U.S. nuclear gravity bombs forward deployed in Europe has gradually dwindled since, reaching an all-time low of approximately 100.[24]

Amid reductions in conventional and nuclear forces, Russia found itself confronted with NATO's significant conventional superiority, which was expected to further increase in the event of an eastward enlargement of the alliance. Given the lack of available economic resources necessary to catch up, Moscow felt compelled to increase reliance on its own sub-strategic nuclear weapons to compensate for the conventional disparity, much in the same way that NATO did during the Cold War. The 1993 Military Doctrine notably reflected this strategy adoption by omitting any reference to the policy of no-first-use of nuclear weapons.[25] Currently, Russia maintains a substantially larger stock of sub-strategic nuclear weapons than the United States, estimated at around 1,500, although there is significant uncertainty with regard to the exact numbers and deployment locations.[26]

U.S. nuclear weapons deployments in Europe were also perceived as one of the major obstacles to substantive negotiations on sub-strategic arms control.[27] The idea of such negotiations was briefly entertained during the 1997 U.S.-Russia summit in Helsinki but was subsequently shelved. However, that same year, nuclear weapon deployments were featured in the NATO-Russia Founding Act commitments, which included a reiteration by NATO that it would not forward deploy nuclear weapons to the territory of new NATO states or build related infrastructure.[28] The issue once again resurfaced during discussions related to a follow-on to the 2011 Strategic Arms Reduction Treaty at the initiative of the U.S. negotiators. Since then, the topic has been drifting in and out of the global and regional security discussion agenda. Most recently, developments in Ukraine have propelled conventional and nuclear deterrence to the forefront of political debates. This has also brought increased attention to nuclear sharing, despite the fact that such arrangements remain much more circumscribed compared to those in previous decades.

**** Even after the PNI the U.S. maintained nuclear weapons in Europe that are not part of nuclear sharing but reserved for U.S. use. This is the case today.

CONTEMPORARY AND POSSIBLE FUTURE NUCLEAR SHARING CASES

This section surveys cases of different European countries that participate in nuclear sharing arrangements or that could plausibly do so in the future. Specifically, it examines the cases of Germany, Türkiye, Belarus, Sweden, Finland, Poland and the United Kingdom. Analysis across these cases illustrates the different forms that nuclear sharing can or could take and the factors that shape nuclear sharing policy debates.

Germany & East Germany

Germany's geopolitical history has significantly influenced the evolution of nuclear sharing as a tool of extended deterrence and alliance management. The political salience of nuclear sharing in the Federal Republic of Germany is rooted in the country's geographic position on the frontlines of the Cold War and its close alliance with the United States and other countries in Europe.[29] Amid geopolitical tension with the Soviet Union, Konrad Adenauer, a politician who rose to power in the 1950s, garnered popularity by demanding that the German armed forces be equipped with "the most modern weapons." Given contemporaneous developments in atomic weapons, this likely encompassed nuclear intrigue. Given the near history of World War II, however, Washington, Moscow, and European capitals were concerned about the prospect of Germany developing an independent nuclear capability.[30] As the Cold War raged on, the United States decided to include Germany among the countries where it placed forward deployed nuclear weapons. After the Cold War, the United States withdrew almost all of its nuclear weapons from Germany, mirroring the withdrawal of Soviet forces from Eastern Germany. According to recent estimates, only 10 to 15 U.S. B61 bombs remain at Büchel Air Base today.

Considerably less information is available regarding nuclear sharing in the German Democratic Republic (GDR), better known as East Germany. Again, this is likely due to a lack of declassified Russian documentation.[31] The first known deployment of Soviet nuclear weapons to the GDR occurred in 1959 when the Soviet Union stationed R-5M intermediate-range missiles in garrisons near Vogelsang and in the Fürstenberg/Havel region.[32] However, this deployment lasted only a couple of months and did not necessarily constitute a case of nuclear sharing as the delivery systems remained in Soviet custody. In 1962, East Germany's armed forces, the National People's Army (NVA), received 2K6 Luna short-range ballistic missiles from the Soviet Union. The NVA's missile systems were equipped only with conventional warheads and the nuclear warheads stayed strictly under Soviet control. Yet, the poor accuracy of the missiles (which limited the conventional utility) and the existence of special underground storage facilities implied that the Soviet Western Group of Forces stationed in East Germany would have provided the NVA with nuclear warheads in the case of armed conflict.[33] All Soviet nuclear weapons were later removed from East Germany in August 1991.[34]

Nuclear sharing has been a contentious topic in German domestic politics for many years reaching back to large scale protests against the deployment of intermediate-range missiles in the 1980s. In the 2000s, several parties advocated for Germany's departure from NATO's nuclear sharing arrangement completely. In April 2009, Germany's former Foreign Minister Frank-Walter Steinmeier of the Social Democratic Party called for a withdrawal of U.S. nuclear weapons from Germany, directly contradicting the view of then-Chancellor Angela Merkel.[35] After the parliamentary elections in 2009, the newly formed coalition government explicitly endorsed the removal of remaining nuclear warheads in its policy agenda.[36] This initiative then sparked a debate within NATO about how to deal changing political winds in Germany.[37] The liberal Foreign Minister, Guido Westerwelle, adamantly pressed for the removal of remaining U.S. nuclear weapons but faced resistance among NATO's nuclear powers and member states in Eastern Europe. Eventually, Germany agreed to support NATO's 2010 Deterrence and Defense Posture Review which designated nuclear weapons as a "core component" of the alliance's deterrence capabilities.[38]

The domestic debate about Germany's future participation in NATO nuclear sharing arrangements resurfaced in 2020. Former Minister of Defense Annegret Kramp-Karrenbauer submitted a letter of interest for ordering 30 F/A-18 Super Hornets and 15 EA-18G Growlers to then-U.S. Secretary of Defense Mark Esper. The new Eurofighter systems were intended to replace the aged

Tornado fleet in fulfilling the role of nuclear delivery.***** Following Russia's invasion of Ukraine, however, the decision to procure the Super Hornet was shelved. Instead, the new coalition government, which included the Green party that emerged at least partly out of the 1980's peace and anti-nuclear movement, decided to buy the F-35A Lightning II stealth fighter, which is now set to replace the Tornado DCA fleet from 2027 onwards.

Although the total cost of Germany's continued participation in NATO's nuclear-sharing arrangement is hard to quantify, it has committed significant resources to maintaining the infrastructure necessary for nuclear sharing. The estimated price tag of Germany's Foreign Military Sales contract for the F-35A, related munitions and training is valued at $8.4 billion.[39] Moreover, Germany is currently modernizing infrastructure at Büchel Air Base to fulfill U.S. security requirements for the F-35A, which is estimated to cost about $600 million. An additional $216 million must be allocated for resurfacing the runways to permit continued use, though this is not strictly related to the procurement of the F-35A.[40]

Overall, the case of Germany's nuclear sharing history illustrates that nuclear weapons and nuclear sharing are still considered important contributors to extended deterrence and alliance management. The recent purchase of the F-35A reinforces the nuclear character of the alliance and makes it highly unlikely that Germany will end its participation in NATO's nuclear sharing arrangement.[41]

Türkiye

Türkiye also played a key role as a potential front-line state during the Cold War due to its geographical positioning. To the east, Türkiye shares a direct land border with Georgia and Armenia, both of which were part of Soviet Union until 1991. To the northwest, it borders Bulgaria, a former Warsaw Pact member until the treaty's dissolution in 1991. It also borders the Black Sea, which was surrounded by Soviet and Soviet-aligned countries.

This territorial positioning left Türkiye notably exposed during the early years of the Cold War. One of its primary concerns was the potential for a Soviet campaign to seize control of the Bosphorus Strait as an ingress to Mediterranean ports.[42] America and its allies were also concerned that Soviet campaigns in the region could impede access to an important land-based supply route between Europe and American allies in the Middle East.[43] Consequently, Western regional war plans were devised to counteract this perceived threat through early escalation to nuclear use with strikes on the operational and tactical depth that would deny the advancement of Soviet forces. Threat perceptions evolved after the Soviet Union expanded its own nuclear arsenal and could theoretically use sub-strategic nuclear weapons to disrupt Western supply lines and impede the flow of U.S. reinforcements by destroying logistical infrastructure and threatening escalation to the strategic level. However, the Southern border between NATO and the Warsaw Pact never saw the same concentration of conventional forces that was present in the center of Europe. Therefore, the perceived threat of conventional invasion decreased during the later years of the Cold War. Accordingly the number of nuclear weapons in Türkiye peaked at a few hundred in the 1980s, never surpassing those deployed in Germany.[44]

Nuclear deployments to Türkiye commenced in 1959. They initially entailed the short-range, unguided rocket system MGR-1 "Honest John," nuclear artillery shells and the intermediate-range liquid fuel PGM-19 "Jupiter" missile system based in the Southwest of Türkiye. The latter was vulnerable to a potential first strike due to its long fuel time, but with a range of 2,500 km the missiles were capable of reaching Moscow and therefore served to reinforce U.S. deterrence after Soviet advances in missile technologies in the 1950s generated domestic U.S. concern over a proclaimed "missile gap."[45]

As part of the secret agreement that resolved the Cuban Missile Crisis in 1962, the United States terminated its deployment of Jupiter missiles in Türkiye (and Italy). Deployments in Türkiye then relied solely on nuclear artillery systems and air-dropped gravity bombs. This transition generated opposition from the Turkish political and military elite who had not been included in the secret negotiations over the withdrawal and demanded continuation of a U.S. nuclear presence in the country and increased military aid as an offset for withdrawing the weapons.[46] To abate concerns, bomber aircraft were constantly kept on high-alert status with nuclear bombs directly loaded onto the planes to react to possible nuclear preemptive strikes.[47] Despite U.S. efforts to provide reassurance of alliance commitment, the abrupt policy change underscored the unequal power distribution in nuclear sharing relationships.

***** While the F/A-18 Super Hornet at the time was not certified for nuclear delivery, officials expected a cheaper and faster certification process as an earlier version of the aircraft had been certified for nuclear delivery missions. Thomas Wiegold, "Neue Kampfjets Für Die Luftwaffe: F-18 Wird Teuer. Aber Eurofighter Nicht?," Augen geradeaus, July 29, 2020, https://augengeradeaus.net/2020/07/neue-kampfjets-fuer-die-luftwaffe-f-18-wird-teuer-aber-eurofighter-nicht/comment-page-1/.

After the Cold War ended, the number of American nuclear weapons in Türkiye was greatly reduced. Today, only gravity bombs remain, stored exclusively at Incirlik Air Base, located in the southeast of the country and roughly 160 km from the Syrian border. The number of weapons is currently estimated at around 20, enabling a swift evacuation in case the storage site is threatened.[48] The decision to consolidate to a small, easily mobilized fleet reflects Western perceptions after the end of the Cold War that sub-strategic nuclear weapons constitute a political commitment that comes with some liability rather than a central part of its deterrence posture.

Another interesting feature is that Türkiye, which has the second largest military in NATO, is the only country that participates in nuclear sharing without an assigned nuclear strike role. While F-16 fighter aircrafts in the Turkish Air Force are technically capable of carrying current U.S. nuclear weapons, they are not stationed at the Incirlik Air Base and would only serve in a support role in a nuclear mission. Accordingly, Turkish pilots are also not trained to carry out nuclear strike missions. Instead, they fulfill a supportive role for their participation, as evidenced by NATO's Steadfast noon exercise.[49] As a result, NATO planes from other countries would need to retrieve nuclear bombs stored in Türkiye and then deliver them to potential targets, making the use of weapons stored in Türkiye implausible in a crisis situation compared with weapons stored in other countries. This underscores the lower priority ascribed to the deterrent value of nuclear weapons by the Turkish government, and the impact of limitations imposed by the United States following the strain in their relationship during the 2010s.

Türkiye has also navigated periods of contentious bilateral relationship with the United States on the diplomatic stemming from regional foreign policy issues, conflicts with U.S. allies in the region and safety concerns arising from the series of security crises and military coups the country underwent. Illustratively, the two leaders who agreed to the deployment of Jupiter missiles in 1959 were executed after a coup before the missiles were withdrawn in 1963.[50] Other coups took place in 1971, 1980, 1997 and most recently in 2016. In 2016, electricity to the American base hosting nuclear weapons was turned off before Turkish security forces entered the area to arrest a general who had been involved in the coup attempt.[51]

Accordingly, the safety and security of nuclear weapons stored at Incirlik have repeatedly been the subject of U.S. apprehension. This concern has been underscored by calls from expert for the removal of nuclear weapons from Türkiye. The issue has also been linked to U.S.-Turkish diplomatic negotiations on a range of issues. For example, during Türkiye's invasion of Cyprus in 1974 the United States threatened withdrawal of its nuclear weapons to push for a ceasefire.[52] Türkiye responded to a congressional blockade of military aid to Türkiye by closing down U.S. military bases.[53] Shortly after Türkiye had been expelled from the F-35 program as a result of its acquisition of the Russian S-400 air and missile defense system, Turkish President Tayyip Erdogan even alluded to a potential proliferation threat by indicating that it would be unacceptable for Türkiye, as a developed nation, not to possess its own nuclear weapons.[54]

Due to its unique geographic position and internal political circumstances, Türkiye illustrates a variety of challenges that can arise from forward-deployed nuclear weapons. First, despite technological improvements in safety and control over sub-strategic nuclear warheads, they are at risk during moments of unexpected loss of state control amidst a coup or regional violence. Second, forward-deployed ground-based intermediate-range ballistic missiles with nuclear warheads have a net destabilizing effect as they increase the threat perception of the opposing side while remaining vulnerable to preemptive strikes. They also contribute to arms-racing dynamics and undermine crisis stability by significantly reducing decision times, creating first-strike incentives and prohibiting clarification or mediation attempts after launch detections. Third, bureaucratic inertia and bargaining related to alliance cohesion can impede the termination of nuclear sharing arrangements, even if they don't fulfill a clear purpose, invoke strategic stability risks and generate safety concerns.

Belarus

Belarus is unique in that it is the only state in the world that underwent a nuclear disarmament process and has since opted to reintroduce nuclear weapons to its territory. As a post-Soviet state, Belarus inherited a significant strategic and non-strategic arsenal in the form of 81 Soviet RT-2PM Topol (SS-25 Sickle) ICBMs and an undisclosed quantity of non-strategic nuclear warheads after the Union's dissolution in 1991. These assets were later transferred to Russia, with the withdrawal finalized in November 1996 after facing several technical and political delays. Many of the old nuclear storage sites in Belarus were then either retired, re-purposed or simply abandoned.[55]

Following Finland and Sweden's formal request to join NATO in March 2022, Putin and Belarusian President Alexander Lukashenko held a meeting in June, where they agreed to transfer the dual-capable Iskander

missile system to Belarus and to train Belarusian crews to operate Su-25 aircraft capable of carrying nuclear weapons.[56] In March 2023, Putin announced plans for the deployment of nuclear weapons in Belarus and confirmed the delivery of 10 nuclear-capable aircraft. Putin emphasized that Russia did not intend to transfer nuclear weapons under the control of Belarus, adding that, "neither does the U.S. to its allies. We basically do the same that it has been doing for decades. It has [nuclear weapons] in certain allied countries and prepares its delivery vehicles and crews. We are going to do the same <...> without violating our international obligations on the non-proliferation of nuclear weapons".[57]

In June 2023, Putin announced the delivery of the initial batch of nuclear warheads to Belarus. Lukashenko corroborated this statement, specifying that the transfer occurred through means other than ground transportation. Using open-source tools, experts studied possible weapons movement routes but were unable to find definitive evidence indicating the exact weapons location. Senior officials from the U.S. Defense Intelligence Agency said that they have "no reason to doubt" that the transfer of nuclear weapons from Russia to Belarus took place.[58]

The 2023 decision to reintroduce nuclear weapons to Belarus followed years of intermittent discussions on the topic of nuclear weapons deployments in Europe. Russia had consistently criticized NATO's decision to continue nuclear missions in the post-Cold War era and urged the United States to withdraw its nuclear weapons from Europe. At the same time, Poland more or less openly expressed interest in hosting nuclear weapons, but evidently did not gain traction in Washington.[59] In 2021, NATO Secretary General Jens Stoltenberg elicited a strong reaction from Moscow and Minsk by acknowledging that if Berlin were to withdraw from nuclear sharing, "we could easily end up with nuclear weapons in other countries in Europe, also to the east of Germany".[60] Following this, Lukashenko repeatedly expressed willingness to host Russian nuclear weapons in the event that Poland became a host for U.S. nuclear weapons. On February 27, 2022, the Belarusian parliament ratified a new constitution, notably removing the previous pledge to maintain neutrality and keep the country free of nuclear weapons.

The transfer of nuclear weapons to Belarus can be interpreted as a strategic and symbolic move by Russia to strengthen its defense alliance with Belarus while simultaneously mirroring and challenging NATO's nuclear posture. Strategically, the deployment of Russian nuclear weapons does not significantly alter the regional balance, particularly given the presence of nuclear-capable Iskander systems and other comparable platforms in Kaliningrad. Additionally, the SU-25 is of a similar age to the Tornado and is deemed vulnerable against modern air defense and preemptive strikes.

For its part, Belarus probably weighed factors similar to those considered by West Germany in the Cold War. Given its position at the frontline of a new confrontation and with conventionally inferior forces, its government sought to strengthen alliance commitments from its larger ally and increase the credibility of hypothetical nuclear escalation. At the same time, however, the decision to enter a sharing arrangement poses new escalation risks for Belarus. In an escalation scenario, Russian nuclear systems stored in Belarus could become targets of both nuclear and conventional attacks.

Poland

In addition to precipitating motivation for nuclear sharing between Belarus and Russia, Poland also has a unique history of nuclear sharing by participating in (or seeking to participate in) nuclear sharing agreements from two different partners. While Poland originally sheltered Soviet warheads at the height of the Cold War, the stockpile was removed during the PNIs when Soviet nuclear weapons were withdrawn from foreign deployment (and well before its accession to NATO). In more recent years, Poland has repeatedly sought to host U.S. nuclear weapons since joining NATO, but has not yet gained enough traction to seriously engage Washington on the issue.

As a former member of the Warsaw Pact, Poland's history of participating in nuclear sharing predates its status as a NATO member. In the 1960s, Soviet nuclear warheads were stored in bunkers in Poland. Interestingly, despite the fact that the military sites housing the bunkers were operated by Russian soldiers, Moscow and Warsaw had agreed that in the event of an offensive attack from the West, the warheads would fall under control of the Polish army.[61] This agreement afforded a higher degree of Polish agency over the nuclear forces and absolved Moscow of the burden of protecting and controlling forward deployed forces in crisis scenarios.

In more recent years, Poland has sought to host U.S. nuclear weapons to assuage concerns generated by Russian activities. On October 5, 2022, Polish President Andrzej Duda announced Polish willingness to engage in nuclear sharing with the United States and insinuated that political conditions were auspicious, declaring that the "issue is open."[62] Despite Duda's favorable outlook, a U.S. State Department spokesman rejected the idea, claiming that the United States rebuked the proposal on the basis that it did not intend to deploy nuclear weapons to NATO members that had joined after 1997, citing the NATO-Russia Founding Act.[63]

More recently, Poland has again petitioned to host U.S. nuclear weapons in June 2023. Polish Prime Minister Mateusz Morawiecki announced this campaign as a response to the reported deployment of Russian nuclear weapons to Kaliningrad and Belarus. Polish officials expanded the scope of the policy campaign by declaring interest in certifying Polish F-35A aircraft (Lightning II) to support B61 bombs******, thereby establishing a DCA fleet.[64] As a diplomatic agreement below the threshold of hosting nuclear weapons, Polish policymakers perceived this to be the most plausible route through which Poland could garner political support from Washington. Other options would be to station Polish aircraft abroad, such as at German bases with nuclear weapons, or to deploy them abroad in a contingency.[65]

The obstacles to a nuclear sharing arrangement between the United States and Poland are both practical and political. Responding to claims made by Ambassador Mark Brzezinkski in 2020, U.S. experts argued that forward deployment of nuclear weapons to Poland would be a strategic mistake.[66] First, it would be expensive and require construction of new, intensive storage facilities equipped with high security vaults. But even with such construction, nuclear deployment to Poland would increase susceptibility of B61 bombs to Russian preemptive strikes with Iskander-M ballistic missiles based nearby at Kaliningrad.[67] Politically, nuclear deployment to Eastern European NATO countries also risks provoking Russia and sparking contention among NATO members due to the commitment not to deploy nuclear weapons in members that joined after 1997. Meanwhile, proponents argue that nuclear sharing with Poland would not "prompt Russia to take hostile steps substantially different from those it is already taking," and additionally that bombs deployed in Poland would be equally vulnerable to those already distributed in other European countries. They also argue that more countries involved in nuclear sharing in Europe would improve overall survivability.[68]

Given its entanglement with Russian nuclear-sharing arrangements, the Poland case study demonstrates the significance of regional dynamics in the politics of nuclear sharing. Although nuclear sharing with Poland may not substantially increase nuclear force vulnerability and could provide meaningful stability and signal political support from the United States, it has also been implicated as a motivation for Russian nuclear sharing in the region. This increases the perceived cost and reduces the perceived benefit of a future sharing arrangement, despite serious regional security concerns.

Finland

Together with Sweden, Finland has recently joined NATO. This newly minted membership reflects the transformed threat perception of Finland towards Russia and the fairly close relations the country experienced with Russia until the beginning of the Russo-Ukrainian war in 2022. The decision to previously avoid joining the alliance was influenced by Finland's traditional foreign policy of formal neutrality to which it was forced to adhere following military defeats in the Finno-Soviet Winter War and World War 2.[69] ******* While Finland abstained from supporting the Treaty on the Prohibition of Nuclear Weapons (TPNW) out of concern of straining its defense partnership with the United States,[70] it has historically been a proponent of multilateral nuclear arms control. Despite the country's accession to NATO, there continues to be broad public support for nuclear disarmament in the country and strong opposition to the permanent stationing of nuclear weapons in Finland or the transport of nuclear weapons through Finnish territory.[71] Former Finnish president Sauli Niinistö, who also acted as the commander-in-chief of the country's armed forces, had publicly spoken out against basing nuclear weapons in Finland following its accession to NATO, declaring "Finland has no intention of allowing nuclear weapons to be located on its territory".[72]

However, after joining the NATO nuclear alliance, the Finnish expert community engaged in deliberations regarding the country's nuclear policy.[73] Given its position as a state on NATO's border with Russia, many of the reasons that underly Polish preferences for hosting American nuclear weapons also resonated in Finland. Current Finnish President Alexander Stubb, a member of the conservative party, has proposed that Finland should adopt a more open stance towards participating in NATO nuclear sharing arrangements. He emphasized the distinction between the transport of a nuclear weapons and their permanent stationing in the country.[74]

Apart from reputation factors, the strategic rationale for Finnish plans to integrate into NATO's nuclear sharing arrangement are three-fold. First, it could strengthen

****** All current versions of the F-35A may be wired for nuclear weapons, including those ordered by Poland. However certification for nuclear missions requires additional steps and training and does not necessarily lead to deployments of B61s in the country.

******* Cold War neutrality included secret ISR cooperation with Western states during Cold War and de-facto alignment with Western security policy through membership in EU after the Cold War (Charly Salonius-Pasternak, "Friends with (Some) Benefits: How Non-Allied Sweden and Finland View Long-Range Conventional Precision Strike," The Nonproliferation Review 27, no. 1–3 (January 1, 2020).

Finnish ability to withstand direct coercive Russian military threats, especially nuclear ones. Second, hosting nuclear weapons could ameliorate tensions within the alliance and address Finnish fears of alliance abandonment in case of military conflict. This was a key factor that motivated Finland to join NATO in 2022. Third, in the case of actual use, sub-strategic nuclear warheads would have a strong effect that could disrupt Russian operations or threaten strategic population centers and Russian strategic nuclear forces. According to this logic, a forward deployment of sub-strategic nuclear weapons to Finland would function as a symbolic demonstration of NATO's resolve to use nuclear weapons in a conflict and thereby strengthen deterrence efforts.

Substantiation for all three arguments however remains under question, which is why neither Finnish policymakers nor NATO or U.S. officials have voiced plans to deploy nuclear weapons in Finland. Nuclear weapons work quite well for deterring large-scale aggression and have some effect in constraining third-party intervention in an ongoing conflict. But they generally are not very useful at deterring lower levels of conflict or coercing countries to undertake desired actions.[75] Hosting nuclear weapons would thus hardly increase Finland's ability to withstand nuclear threats more than its NATO membership. Finnish defense planners also have exhibited confidence in their conventional capabilities and stressed that they are a net contributor to NATO's collective security. In contrast to other European states, Finland maintained national territorial defense as the main priority of its armed forces through the 2000s and 2010s, rather than out-of-area stabilization missions.[76] As a result, it kept a large military reserve and operates the largest artillery force in Western Europe which has proven to be a key asset in the current war in Ukraine. Finland is also on course to modernize and expand its air force and will operate one of the largest F-35 fleets in Europe, with initial deliveries scheduled for 2026. If politically desired, this would allow Finland to easily integrate into NATO nuclear sharing arrangements or to contribute to SNOWCAT missions. Finland has also developed a substantial conventional long-range precision strike capability that now outnumbers those of other large European countries, such as Germany.

Finland's exceptional conventional forces further undercut arguments for nuclear sharing. Similar to the U.S. nuclear triad, the Finnish program is based on three different domains and consists of JASSM-ER American air-launched cruise missiles, Israeli sea-launched Gabriel anti-ship missiles and ground-based M270 MLRS systems.[77] Each leg is expected to expand over the coming years. This allows Finland to hold Russian military facilities and supply nodes in operational depth at risk and impose significant costs on Russia during a potential war without resorting to nuclear use. Given the lower escalation risks and full national control over these systems, threats of conventional strikes would arguably be more credible and thereby impose a greater deterrent effect than the abstract presence of foreign nuclear weapons.

As the NATO country sharing the longest border with Russia, Finland faces added challenges in managing escalation risks with Russia. One risk is the potential for air-to-air contact in patrols over the Baltic and Arctic seas. Other risks stem from the geographic proximity to two Russian areas of strategic importance, which would make nuclear deployments to Finnish territory likely very sensitive to Russia. The first is the city and metropolitan area of St. Petersburg. The second is the Kola peninsula which houses Russia's Northern fleet and the larger part of its ballistic missile submarine force. Integration of Finland into NATO and modernization of its long-range precision strike capabilities have increased the number of Western systems that could target Russian strategic missile forces. Access to Finnish air space also improves Western intelligence collection in the region. While Russia's strategic deterrent is unlikely to become vulnerable for the foreseeable future due to its extensive size, geographic diversity and mobile platforms, a perceived increase in Western interference could incentivize Russia to reduce its reliance on sea- and submarine-based systems and strategic bombers that are based in the Kola peninsula. This could also further strain efforts to retain adherence to New START numerical limitations on nuclear warheads and delivery systems. Russian efforts to ensure the defense of its strategic deterrent could also cause increase crisis instability in the border zone.

Efforts undertaken by countries in similar positions to reduce these arms racing and crisis stability risks may not be achievable in the case of Finland. Since the Cold War, neighboring Norway has maintained fairly strict limitations on any foreign fighter and intelligence aircraft deployments within about 250 km of its air space bordering Russia as part of its approach to balance deterrence and assurance requirements.[78] A similar geographic approach seems implausible for Finland, however, as much of its territory would fall under such a zone due to its long border with Russia. Currently, Finland allows broad access to NATO intelligence and fighter aircraft, but maintains limits on strategic bomber overflights while it develops a more long-term approach for complementing its deterrence posture with reassurance and risk reduction elements.

Sweden

On May 16, 2022, Sweden officially declared its intention to join NATO, marking the end of its policy of neutrality that dates back over 200 years. Sweden has historically played a key role in facilitating dialogue between supporters of nuclear deterrence and proponents of nuclear abolition. Stockholm was one of the architects of the 'stepping stones' approach to nuclear disarmament (also known as The Stockholm Initiative for Nuclear Disarmament) – a set of measures aimed at establishing incremental and verifiable reductions in nuclear arsenals.

The decision to join NATO, and thereby participate in a nuclear alliance, required Sweden to scale back its involvement in nuclear disarmament initiatives and revisit its stance on nuclear weapons. Unlike Finland, Sweden does not have any national legislation that would ban nuclear weapons from its territory, leaving open the possibility of their deployment. Such a debate emerged soon after the government change on November 1, 2022, when Micael Bydén, the Supreme Commander of the Swedish Armed Forces, issued a recommendation that the government not make any reservations initially upon accession to NATO, which would include reservations regarding potential deployment of nuclear weapons on Swedish soil. Prime Minister Ulf Kristersson swiftly endorsed Bydén's stance. At the same time, he highlighted the cases of Denmark and Norway. Both countries spoke out against stationing nuclear weapons on their soil during peacetime.[79]

Following a few weeks of intragovernmental debates and criticism from the Social Democrats, who advocated for a clear stand against nuclear weapon deployment, Foreign Affairs Minister Tobias Billström indicated the intention to follow Denmark and Norway's example.[80] Similar to the case with Finland, U.S. and NATO officials have not indicated any serious consideration of the transfer of nuclear weapons to Sweden.

There is some legal and technical precedent for future nuclear sharing arrangements. The Defense Cooperation Agreement between Sweden and the United States signed on December 5, 2023, introduced a new angle to the discussion. The agreement stipulates that "U.S. forces may transport, preposition and store defense equipment, supplies and materiel ('prepositioned materiel') at Agreed Facilities and Areas and at other locations as mutually agreed. <...> U.S. forces shall have exclusive control over the access to, use of and disposition of such prepositioned materiel..." These transfers would not necessitate Sweden's approval but only prior notice. Some speculate that this agreement could provide a legal basis for future U.S. nuclear weapons deployment.[81] Technically, Sweden's military air fleet consists of several advanced aircraft, including the Saab JAS 39 Gripen (Griffin). Its modular design would theoretically allow for nuclear integration. While designed to carry guided weapons, Gripens reportedly have been spotted carrying unguided bombs and rocket pods.[82]

Sweden's NATO membership has resulted in the entire Baltic coastline falling under NATO jurisdiction, enabling easier deployment of troops and equipment along the coast. However, as the cases of Finland, Sweden, and even Poland exemplify, joining NATO does not necessarily indicate greater likelihood for a nuclear sharing arrangement. And, certainly Swedish domestic politics will influence future policymakers' willingness to engage Washington on potential arrangements.[83]

United Kingdom

Although the United Kingdom is a nuclear weapon state itself, a history of forward deployment of U.S. nuclear weapons on U.K. soil, along with continued nuclear diplomacy between the two countries, makes a future nuclear sharing or renewed forward deployment arrangement at least somewhat conceivable. U.S. B61 nuclear bombs were originally deployed in the United Kingdom in 1954 at the Lakenheath Air Base, near Suffolk, England, which is run and operated by the U.S. Air Force. A close U.S. ally and a NATO member, the United Kingdom was seen as a strategic location for the deployment of nuclear weapons due to its geographical separation from mainland Europe and its position as a hub for NATO operations.

The release of the 2007 NATO Strategic Concept, which underscored the significance of nonproliferation and disarmament efforts, marked NATO's departure from a rigid deterrence strategy towards a more flexible approach. Consequently, nuclear weapons were withdrawn from several European bases, including Lakenheath. When the withdrawal started, the base hosted approximately 110 B61 gravity bombs intended for delivery by F-15E Strike Eagles.[84]

Discussions about a potential reintroduction of U.S. nuclear weapons to U.K. soil emerged in 2022 when the Federation of Atomic Scientists (FAS) called attention to the U.S. Department of Defense's plans to enhance European infrastructure needed for storing 'special weapons,' which, for the first time in more than a decade, mentioned Lakenheath Air Base.[85] Additional confirmation came in 2023 when the U.S. Department

of Defense published the Air Force 2024 Military Construction Program, specifying the construction process of a Lakenheath surety dormitory.[86] Both U.K. and U.S. defense departments opted not to comment on the matter, citing "longstanding UK and NATO policy to neither confirm nor deny the presence of nuclear weapons at a given location."[87] But if the United States were to deploy the latest B61-12 to Lakenheath, there would be no shortage of suitable delivery systems. Lakenheath has long operated a fleet of F-15E, which are reportedly capable of carrying the B61-12 variation. Furthermore, in 2015, Lakenheath was chosen to host the first U.S. Air Force F-35A squadrons in Europe, receiving its first delivery in 2021.[88] The United Kingdom itself operates 30 F-35B aircraft with more deliveries scheduled, although the aircraft is currently not planned to be certified for nuclear weapons.

Domestic reaction to the potential renewal of nuclear sharing arrangements was not at all favorable. Six U.K. parliament members introduced an Early Day Motion in the House of Commons urging the government to reject the deployment of U.S. nuclear weapons on U.K. soil. The motion has garnered 46 signatures from MPs representing opposition parties. The possibility of U.S. nuclear weapons re-introduction was also heavily criticized by civil society members, who threatened to take the case to court over potential environmental harm.[89]

However, even with the necessary infrastructure and precedent in place, these concern may still be overblown. Considering that NATO Secretary General Stoltenberg has reiterated that NATO has no intentions to deploy nuclear weapons in countries that do not host them as of now, as agreed in the NATO-Russia Founding Act of 1997, FAS suggests that the Lakenheath infrastructure overhaul may be linked to contingency planning and intended as a fallback option in the event of a crisis.[90]

CONCLUSIONS FROM CASES

Due to the armed conflict in Ukraine, debate over the importance ascribed to nuclear deterrence and nuclear sharing has increased significantly. Such debates are occurring in both Russia and Western countries, as can be seen with the deployment of Russian sub-strategic nuclear weapons to Belarus and the German procurement of the F-35A DCA after years of discussing a possible end to the participation in NATO's nuclear sharing arrangement. Moreover, as the contention over possible nuclear sharing arrangements between Poland and the United States suggests, nuclear sharing politics for Russia and Western countries are once again inextricably linked to questions of arms racing-style buildups and intra-alliance management.

Rationales Behind Nuclear Sharing

Nuclear sharing serves both a military and a political purpose. Even though current modernization efforts such as the introduction of the F-35A DCA and the modernized B61-12 nuclear bomb with limited standoff capability offer new military options that did not previously exist, the military utility of nuclear sharing today is by far outweighed by political factors

From a political perspective, nuclear sharing fulfilled a symbolic function of connecting military conflict in Europe to U.S. strategic systems in an effort to strengthen deterrence. Nuclear sharing also helped to address the delicate issue that Western European states – and the Federal Republic of Germany in particular – were non-nuclear powers but could conceivably have become nuclear battlefield in the event of Cold War escalation. Nuclear sharing offered a solution to this dilemma by giving states a voice on how nuclear weapons would be used on their territory. Besides distributing the risks and the burden of nuclear escalation, nuclear sharing also reinforces alliance management as it promotes alliance cohesion through force commitments, consultations and integrated planning. Additionally, nuclear sharing aims to limit nuclear aspirations of host countries, thereby strengthening nonproliferation norms. Consistent with extended deterrence policies, sharing provides a positive security assurance that could conceivably prevent nuclear coercion and deter aggression without actual possession of nuclear weapons.

From a military perspective, the key driver for initial nuclear sharing agreements and forward-based nuclear systems (in Europe) was the fear of conventional inferiority vis-a-vis the Warsaw Pact and the willingness for nuclear first use to deny a successful conventional attack. After the Cold War, the military significance of sub-strategic nuclear weapons and nuclear sharing has diminished substantially for Western states, though less so for the Russian Federation. This is in part because of the reversed conventional balance between NATO and the Russian Federation, which disincentivizes nuclear escalation for Western states. But it is also a result of technological progress in conventional precision-strike capabilities that have led militaries to conclude that many missions for which sub-strategic nuclear weapons were previously required could now be accomplished

using precision-guided munitions. Indeed, nuclear weapons have even come to be seen as an impediment to conventional superiority and military dominance because nuclear employment could complicate conventional operations on the battlefield.[91]

Trends in Nuclear Sharing

Through comparing different cases of nuclear sharing arrangements, several trends emerge. First, nuclear sharing arrangements tend to **be very durable**. Most Western countries that have instituted a nuclear sharing arrangement have held on to the practice for 70 years, despite drastic transformations in threat environments, changes in government and, at times, tense bilateral relations with the United States. Although nuclear sharing arrangements may be motivated by contemporary geopolitics, this sticking power imposes a long-term commitment that must be considered when deliberating on the costs and benefits of a nuclear sharing arrangement.

Second, Western countries **are prioritizing conventional defense investments over changes to existing nuclear sharing agreements**. While long-range precision strike capabilities play an especially prominent role in rearmament programs, Western countries have so far abstained from basing their nuclear sharing arrangements on nuclear or designated dual-use missile capabilities. In contrast to the Cold War, this indicates a strategic decision to de-prioritize nuclear warfighting scenarios and to avoid inadvertent escalation risks that could stem from misperception of conventional strikes or mobilization of conventional forces.

Third, prestige associated with the military power and intra-alliance status of hosting countries play a role in initiating and maintaining nuclear sharing agreements. Although geographical context was another deciding factor for where to base nuclear weapons in the Cold War, and thus could conceivably influence future decisions, military power and intra-alliance status were also consequential.

Tradeoffs of nuclear sharing agreements

Despite the fact that nuclear sharing has significant political utility, it comes with several tradeoffs. First, the effect of nuclear sharing on deterrence is more nuanced than simply "strengthening deterrence." The presence of dual-capable aircraft and nuclear weapons can indeed complicate nuclear targeting for the adversary, as the adversary would need to attack a greater number of targets (and countries) in a potential first strike to limit the damage of nuclear retaliation, thus increasing the requirements for escalation. An adversary also risks attacking nuclear systems when targeting dual-capable systems for other missions, thereby initiating conflict at a higher escalation level. However, the presence of nuclear warheads, DCAs or missiles in theater may well have the very opposite effect: countries with dual-capable systems could restrain their use in conventional operations, owing to concerns that a conventional attack could be perceived as a nuclear strike and prompt retaliation (in this case, a catalyzing a premature escalation) from the adversary.******** From this point of view, the presence of nuclear warheads in a country can make deterrence by conventional threats less credible.

Second, forward-deployed sub-strategic nuclear weapons have effects on the threat perception of neighboring states and contribute to arms racing dynamics. Depending on their location and their range they can create incentives to either increase numbers of strategic nuclear weapons (as for Russia) or further expand conventional strike capabilities and push for the expansion of nuclear sharing agreements in the region that would otherwise be deemed unnecessary (as for Poland and possibly Finland.) This could result in a buildup of nuclear arsenals, including increased delivery ranges, in unstable regions, thus elevating the risk of escalation.

Third, whereas nuclear sharing is often touted as an effective nonproliferation practice, mainly by the United States, many non-sharing states view the practice as undermining international nonproliferation efforts by expanding the regional scope and the role of nuclear weapons in defense strategies. Transferring nuclear weapons or control of them to non-nuclear weapon states is prohibited under the Treaty on the Nonproliferation of Nuclear Weapons, however, it is disputed what constitutes the "transfer of control." Until 2022, Russia and China routinely used the NPT as a platform to criticize Western states for the practice, while China and other states continue to do so.

Fourth, a series of safeguard and maintenance issues surrounding the long history of nuclear weapons in general and nuclear weapons stored abroad in particular casts doubt on the stability of these arrangements. While technical safeguards and maintenance procedures have improved significantly, a higher number of overall

********NATO F-35 will be used in any conventional conflict involving NATO states from the very beginning. Restraints could take the form of avoiding areas, where nuclear systems of an adversary are stored or in the size of an attack to avoid misinterpretation of a conventional attack for a strategic attack.

weapons increases the possibility for failures. This is especially true if infrastructure for storage is constructed hastily and new personnel need to be trained for maintenance.

Policy Recommendations

New threat landscapes and a shifting distribution of conventional and nuclear capabilities present Russia and the United States with different considerations regarding nuclear sharing decisions than those of the Cold War era. Russia currently maintains a higher number of sub-strategic nuclear weapons and a broader range of potential delivery vehicles than Western states in Europe. Western deterrence builds on its cumulative conventional superiority, extensive conventional precision strike capabilities and varied nuclear escalation options. Absent drastic domestic changes or nuclear armament/disarmament initiatives, this will continue to be the foundation of sub-strategic nuclear deterrence in Europe for the foreseeable future which the two sides will need to manage.

Countries should emphasize the political aspects of nuclear sharing, which includes intra-alliance consultations on plans, public solidarity commitments and scheduled exercises. On the other hand, they should be very careful to make fundamental changes to their nuclear posture. Any discussion that includes benefits of expanding nuclear sharing or sub-strategic warhead numbers should also include the drawbacks:

- Each nuclear warhead imposes financial costs, safety risks and environmental hazards. These costs are long-term and grow proportionally with the number of weapons while the added security per weapon falls off.
- Relocating nuclear weapons and deploying new systems creates incentives for regional and global arms racing dynamics that can cause large, unexpected follow-on costs and a net loss of security.
- The presence of dual-capable systems and nuclear weapons in an active conflict theater impacts crisis stability by increasing chances of misinterpretation and by creating first-strike incentives.
- Nuclear sharing agreements establish long-term diplomatic ties that remain subject to changing political tides. Policymakers must recognize the long-term diplomatic tradeoffs when initiating discussions on nuclear-sharing arrangements.

Nuclear sharing is not a straightforward issue. Even though it can be argued that it offers some advantages, it also comes with serious drawbacks. Policymakers within NATO and Russia would, therefore, be wise to ask themselves whether the political benefits of expanding nuclear sharing outweigh the drawbacks and risks of doing so.

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About Deep Cuts

For years, more and more arms control treaties have been eroding and nuclear disarmament is in a deep crisis. The goal of this research and transfer project is to analyze obstacles to U.S.-Russian nuclear and conventional disarmament, to strengthen European security and to develop concrete risk-reduction measures that limit the potential for military escalation in the short term and aim to cut nuclear stockpiles in the long term. The Young Deep Cuts Commission is part of the Challenges to Deep Cuts Project which was established in 2013 and is coordinated by IFSH. The project partner is the independent Arms Control Association in Washington, D.C.

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