Dominika Kunertova

NEW MISSILES, ERODING NORMS

European Options after the Demise of the INF Treaty

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Editors' preface

The publications of this series present new research on defence and security policy of relevance to Danish and international decision-makers.

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Our studies aim to provide new knowledge that is both academically sound and practically actionable. All studies in the series have undergone external peer review. And all studies conclude with recommendations to Danish decision-makers. It is our hope that these publications will both inform and strengthen Danish and international policy formulation as well as the democratic debate on defence and security policy, in particular in Denmark.

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Copenhagen, March 2021
Henrik Breitenbauch & Kristian Søby Kristensen

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A2/AD: anti-access, area-denial
ABM: anti-ballistic missile
BMD: ballistic missile defence
CBM: confidence-building measures
CFE Treaty: Treaty on Conventional Armed Forces in Europe
CTBT: Comprehensive Test Ban Treaty
EPAA: European Phased Adaptive Approach
EU: European Union
HCM: hypersonic cruise missile
HGV: hypersonic glide vehicle
IAMD: integrated air and missile defence
ICBM: intercontinental ballistic missile
INF Treaty: Intermediate-Range Nuclear Forces Treaty
IRM: intermediate-range missile
IRBM: intermediate-range ballistic missile
MAD: mutual assured destruction
MDA: Missile Defence Agency
NASAMS: Norwegian Advanced Surface to Air Missile System
NATO: North Atlantic Treaty Organization
NPT: Treaty on the Non-Proliferation of Nuclear Weapons
OODA: observe, orient, decide, act
OSCE: Organisation for Security and Cooperation in Europe
OST: Open Skies Treaty
PAC: Patriot configuration
SALT: Strategic Arms Limitation Talks
SAMP/T: surface-to-air missile platform/terrain
SLBM: submarine-launched ballistic missile
SLCM: sea-launched cruise missile

SORT: Strategic Offensive Reductions Treaty
START: Strategic Arms Reduction Treaty
THAAD: Terminal High Altitude Area Defence
TPNW: Treaty on the Prohibition of Nuclear Weapons
USSR: Union of Soviet Socialist Republics

Abstract and Recommendations

This report contributes to the debate on the strategic consequences of the demise of the Intermediate-Range Nuclear Forces (INF) Treaty in the Euro-Atlantic area by offering a better understanding of the interplay between missile technology and arms control. Observing the alarming erosion of the arms control architecture, the report examines how recent developments in missile technology can create cracks in strategic stability at the same time as military competition dominates the relations between the great powers.

Mapping the current and planned R&D projects on missile technology in the United States, Russia, China, and major European powers, this report identifies five important trends that will continue to affect strategic stability: 1) more mobile missile systems with new ranges; 2) faster and more manoeuvrable missiles thanks to the weaponization of hypersonic technology; 3) new types of nuclear weapons with new roles; 4) increased investments in longer-range air defence systems; and 5) advanced delivery systems becoming cheaper, increasing the availability of missiles.

Together, these trends have exacerbated the security dilemma and increased the missile threat in the Euro-Atlantic region. The improved speed, manoeuvrability, and mobility of the new offensive missile systems, together with dual capable missiles, are feeding mistrust and increasing the risk of misperceptions, while arms control treaties and confidence-building measures (CBMs) have been disappearing one by one. As a product of the Cold War, the INF Treaty would not have been able to control these new developments in the missile technology landscape.

Even if the INF Treaty was collateral damage of broader geostrategic changes, its demise has contributed to the further erosion of the European security architecture. The end of the INF Treaty has not yet sparked a new quantitative arms race between the United States and Russia in the traditional Cold War sense – even if it could still do so, albeit on a

different scale due to Russia's current resource constraints and economic stagnation. NATO allies are now facing the main challenge of how to patch gaps in the NATO defence and deterrence posture, which Russia created by deploying its new INF-range nuclear-capable missiles to the Alliance's vicinity. It is unlikely that NATO will repeat the dual-track game plan from the late 1970s to persuade Russia to withdraw them. Europe is no longer at the centre of this debate in Washington. Today, as seen from Washington, the European theatre is interconnected with the Asia-Pacific region, and considerations concerning strategic stability in one theatre will affect such considerations in another.

Importantly, a rather different arms race is already under way among the great powers: the quest for *qualitative* military superiority that would give a strategic advantage in the 21st century warfare. The United States, Russia, and China find themselves in a ticking-clock situation as they race for a technological edge and national prestige, making massive investments in the capability development of new classes of weapons based on hypersonic technology. Nuclear weapons are also returning to the fore, as both Russia and the United States are exploring new ways of modernizing and upgrading their nuclear deterrents. Concurrently with these arms-race like dynamics, none of the great powers are interested in negotiating new arms control agreements or CBMs. Should new weapons remain unchecked, however, they can potentially alter the balance of power, upset strategic stability, and make the security environment considerably more volatile.

This report identifies a dangerous imbalance in the strategic stability parameters: more players and more diverse weaponry, yet fewer tools for political control. From the European perspective, the recent geopolitical shifts have resulted in challenges along three main dimensions: 1) horizontal: more than the Euro-Atlantic region, the Asia-Pacific is now at the fore of strategic stability considerations; 2) vertical: new classes of weapons, the new generation of nuclear weapons, the return of low-yield nuclear weapons; and 3) political: great power leaders undermining arms control norms and abandoning treaties without replacing them with new ones.

To sum, the report concludes that although European security concerns remain lower in the absence of the INF Treaty than during the Cold War confrontations, and below the level of panic in the short term, due to the ongoing technological competition that can spiral out of control

given the eroding institutional safety net, they should be above the level of complacency. The increased unpredictability and an accident-prone security environment require European leaders to take action.

This report ultimately provides a set of recommendations to the Euro-Atlantic expert community for new arms control practices and CBMs. While recognizing the limited agency of European countries in restoring and maintaining strategic stability, the report outlines the European options for mitigating the destabilizing effects of the eventual future arms race on European security in the context of the crumbling post-Cold War order.

European leaders could:

1. Strengthen National Air Defence Systems and Boost NATO Integrated Air and Missile Defence (IAMD) (Short Term)

Regardless of their institutional affiliation with NATO and/or the EU, European countries have a strategic need to modernize their air defence systems. They therefore should:

1) continue to boost their investments in early warning missile systems and medium- and long-range NATO-compatible air defences, preferably not of Russian origin, and in the NATO IAMD system to make it multi-layered and interoperable;
2) use the new EU cooperative defence funding schemes to develop their own air defence systems technologies (however, this requires a longer timeframe);
3) improve NATO's intelligence, surveillance, and reconnaissance capabilities to gain better situational awareness and more time for decision-making; and
4) launch a new NATO-wide nuclear debate to re-engage leaders with nuclear deterrence issues, while making arms control a top priority of the Alliance's nuclear policy and defence planning.

2. Modernize and Globalize Confidence-Building Measures (Short to Mid Term)

Given the disappearing arms control agreements, the practice of transparency becomes crucial. These CBMs should include periodical dialogues among Russia, the United States, and China to address the destabilizing potential of new weapons, limit the proliferation of strategic nuclear and conventional weapons, and eliminate dangerous operating procedures. European countries should 1) facilitate NATO-Russia dialogue to address paranoid Russian fears about American air defence sites in Europe; 2) coordinate their approach to the United States and promote a U.S. return to the Open Skies Treaty (OST); and 3) work towards modernizing and potentially globalizing the Vienna Document to include the Asia-Pacific region.

3. Contribute to Designing New Strategic Arms Control Architecture (Long Term)

Crafting new arms control architecture will involve fierce negotiations among great powers in which strong alliances might prove crucial. European countries should shape this process in two ways:

Multilateralize strategic arms control: As the major-power competition between Washington and Beijing is going to be a long-term reality, the strategic arms control regime must adapt in two ways: 1) trilateral or multilateral arms control with new rules for counting and verification methods; 2) asymmetric arms control to address differences in systems and numbers. European allies can help the United States address the challenge of getting China on board by socializing Chinese leaders and bending Beijing's long-lasting scepticism towards arms control, while promoting collaboration within the arms control expert community to change the Chinese secretive attitude. Since China is not likely to agree on any quantitative or qualitative limitations in the short term, the focus on improving transparency is the first fundamental step towards future arms control negotiations. Even dialogue and transparency might prove challenging, however, as some experts believe that the lack of transparency is a part of China's nuclear strategy. Cultivating greater

appreciation of transparency, mutual restraint, and verification on the Chinese side will therefore likely only be achieved in combination with persuasion, inducement, and coercion.

Include new military technology other than strategic nuclear weapons: European countries should insist that the future arms control regime must contain new rules and standards for technologies that can potentially disrupt strategic stability, such as hypersonic missiles, autonomous weapon systems, conventional precise munition, missile defences, and cyber capabilities. Particular attention should be paid to dual use, mobility, speed, and yield to moderate and/or limit their proliferation. Arms control negotiations with Russia could consider the eventual removal of tactical nuclear weapons from Europe.

Resumé og anbefalinger

Denne rapport bidrager til debatten om de strategiske konsekvenser af INF-traktatens (Intermediate-Range Nuclear Forces) ophør i det euro-atlantiske område ved at give en bedre forståelse af samspillet mellem missilteknologi og våbenkontrol. I en tid, hvor eksisterende våbenkontrolaftaler på alarmerende vis bliver udhulet, og militær konkurrence præger forholdet mellem stormagterne, undersøger rapporten, hvordan den seneste udvikling inden for missilteknologi kan skabe sprækker i den strategiske stabilitet.

På baggrund af eksisterende og planlagte forsknings- og udviklingsprojekter inden for missilteknologi i USA, Rusland og Kina samt i større europæiske stater identificerer rapporten fem vigtige tendenser, som kan og fortsat vil påvirke den strategiske stabilitet: 1) missilsystemers større rækkevidde og øgede mobilitet; 2) hurtigere missiler med forbedret manøvredygtighed pga. militariseringen af hypersonisk teknologi; 3) nye typer af atomvåben med nye egenskaber; 4) øgede investeringer i langdistanceluftforsvarssystemer; og 5) faldende priser på avancerede missilsystemer, hvilket øger deres tilgængelighed.

Disse tendenser har tilsammen forværret sikkerhedssituationen og øget missiltruslen i det euro-atlantiske område. Med deres forbedrede hastighed, manøvredygtighed og mobilitet samt deres kombinerede konventionelle og nukleare kapacitet afføder de nye, offensive missilsystemer mistillid og øger risikoen for misforståelser. Samtidig er våbenkontrolaftaler og tillidsbyggende foranstaltninger forsvundet en efter en. INF-traktaten, som var et produkt af Den Kolde Krig, ville dog formentlig ikke have været i stand til at kontrollere disse nye udviklinger inden for missilteknologi.

Selv om INF-traktatens ophør var et resultat af en bredere geostrategisk dynamik, har traktatens ophør bidraget til en yderligere udhuling af den europæiske sikkerhedsarkitektur. INF-traktatens ophør har endnu ikke resulteret i et nyt kvantitativt våbenkapløb mellem USA og Rus-

land i traditionel koldkrigsforstand – men dette er stadig en mulighed. På nuværende tidspunkt er den største udfordring for NATO's allierede at lappe de huller i NATO's forsvars- og afskrækkelsespositur, som Rusland skabte ved at opstille nye missiler, som kan bære atomsprænghoveder, i alliancens nærområde. Det er ikke sandsynligt, at NATO vil gentage dobbeltbeslutningen fra de sene 1970'ere for at presse Rusland til at trække dem tilbage. Europa er ikke længere i centrum for en sådan debat i Washington. I dag er det europæiske område, set fra Washington, forbundet med Asien og Stillehavsområdet, og overvejelser om strategisk stabilitet i ét område vil påvirke tilsvarende overvejelser i det andet.

Det er vigtigt at pointere, at et anderledes våbenkapløb mellem stormagterne allerede er i gang nemlig bestræbelsen på at opnå *kvalitativ* militær overlegenhed, der vil sikre en grundlæggende strategisk fordel, når det kommer til krigsførelse i det 21. århundrede. USA, Rusland og Kina er under tidspres, eftersom de alle kæmper for at opnå et teknologisk forspring og national prestige ved at investere store summer i udviklingen af nye våbensystemer baseret på bl.a. hypersonisk teknologi. Derudover vinder atomvåben igen frem, da både Rusland og USA undersøger nye muligheder for at modernisere og opgradere deres atomafskrækkelse. Ingen af stormagterne er interesserede i at forhandle om nye våbenkontrolaftaler eller tillidsskabende foranstaltninger parallelt med disse accelererende, våbenkapløbslignende dynamikker. Forbliver nye våbensystemer ukontrollerede, vil de potentielt kunne forskubbe magtbalancen og obstruere den strategiske stabilitet.

Rapporten identificerer en farlig ubalance med hensyn til de parametre, som er bestemmende for den strategiske stabilitet: Flere aktører, stadig mere avancerede missilsystemer samt færre våbenkontrolaftaler og tillidsskabende foranstaltninger peger alt sammen i retning af øget ustabilitet. Fra et europæisk perspektiv har de seneste geopolitiske forandringer skabt udfordringer i tre dimensioner: 1) Horisontalt: Asien og Stillehavsregionen har overhalet den euro-atlantiske region som fokusområde for overvejelser om strategisk stabilitet. 2) Vertikalt: Der er introduceret nye missilsystemer og en ny generation af atomvåben samt sket en tilbagevenden til taktiske atomvåben. 3) Politisk: Stormagtsledere underminerer våbenkontrolnormer og forlader traktater uden at erstatte dem med nye.

Opsummerende konkluderer rapporten, at selv om sikkerhedssituationen i Europa med et fravær af INF-traktaten stadig er bedre end under Den Kolde Krigs konfrontationer og ikke vil give anledning til panik på kort sigt, bør den fortsatte teknologiske konkurrence, der kan komme ud af kontrol pga. et udhulet institutionelt sikkerhedsnet, vække stor bekymring. Den øgede uforudsigelighed kombineret med et sikkerhedsmiljø, hvor der er en øget risiko for misforståelser, kræver, at europæiske ledere skrider til handling.

Slutteligt giver rapporten en række anbefalinger rettet mod det euro-atlantiske ekspertfællesskab til nye praksisser for våbenkontrol og tillidsskabende foranstaltninger. I erkendelse af, at verdensordenen etableret efter Den Kolde Krig er i opbrud, og at de europæiske staters handlerum med hensyn til at genskabe og vedligeholde strategisk stabilitet er begrænset, kommer rapporten med en række europæiske forslag til, hvordan det er muligt at afbøde de destabiliserende konsekvenser for europæisk sikkerhed af et potentielt, fremtidigt våbenkapløb.

Danmark er som småstat afhængig af sikkerhedsgarantier fra sine allierede i det internationale system – i særdeleshed fra verdens dominerende militær- og atommagt, USA – og det er derfor afgørende, at Danmark vedligeholder det transatlantiske forhold. Ikke desto mindre bør Danmark sammen med sine europæiske allierede arbejde for at etablere en stærk, legitim europæisk stemme, der kan blive hørt i våbenkontroldebatten mellem stormagterne. Danmark kan søge indflydelse i NATO og EU såvel som bilateralt sammen med Tyskland, Frankrig og Storbritannien. Pga. det danske EU-forsvarsforbehold og i lyset af brexit virker NATO som den mest lovende institutionelle ramme for sådanne bestræbelser på både multilateralt og bilateralt niveau. Danmark kan støtte denne proces på europæisk niveau på to måder.

For det første kan Danmark opbygge kapacitet til at støtte de normsættende våbenkontrolprocesser gennem ekspertise og diplomatiske indsatser med henblik på at skabe nye, tidssvarende tillidsskabende foranstaltninger og forme fremtidens sikkerhedsarkitektur. Det vil kræve, at Danmark øger sin ekspertise inden for våbenkontrolområdet, både i Udenrigsministeriet og i Forsvarsministeriet. Dansk støtte til de normsættende våbenkontrolprocesser kan inkludere:

A. At bevare og implementere målsætningerne i Den Atomare Ikke-spredningstraktat.
B. At redde OSCE fra glemslen – Danmark bør, bevidst om sine egne begrænsninger som småstat, arbejde for at genoplive organisationen ved gennem diplomatiske indsatser at inspirere europæiske stormagter til at lancere initiativer til fremme af gennemsigtige foranstaltninger, såsom at modernisere Wien-dokumentet.
C. At organisere en international konference til fremme af tillidsskabende foranstaltninger på globalt niveau og til lancering af et globalt Wien-dokument-initiativ. Uanset om det viser sig muligt at realisere et sådant initiativ, vil Danmark dermed signalere sin interesse i en inkluderende dialog om tillidsskabende foranstaltninger.

For det andet bør Danmark fortsætte med at bidrage til NATO's forsvars- og afskrækkelsespositur. Danske forsvarspolitiske beslutningstagere bør sikre, at:

A. De nyligt anskaffede F-35-fly vil forblive en aktiv del at NATO's luftrumsovervågning.
B. Danmark forbedrer sit luftforsvar og kapaciteter til tidligt varsel i samarbejde med lande i Østersøregionen i en NATO-ramme, såsom det nyligt afsluttede samarbejde med ni andre NATO-allierede om udvikling af landbaserede kort- og mellemdistanceluftsvarskapaciteter.

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1

Introduction

Citing repeated Russian violations, the United States terminated the Intermediate-Range Nuclear Forces Treaty (INF Treaty) in August 2019. As Russia has already acquired operational, ground-launched intermediate-range missile systems, the United States had no interest in keeping the bilateral treaty alive. More broadly, the INF Treaty fell victim to wider geopolitical dynamics as both Russia and the United States realized that this treaty, concluded in 1987, cannot put any checks on China, the rising great power rival. Nonetheless, the INF Treaty had great symbolic value for Europeans, as it eliminated an entire class of weapons that directly threatened European soil. With the INF Treaty gone, the demolition of the arms control architecture with roots in the Cold War is almost complete.

Was the INF Treaty doomed to fail? Can we expect new Euromissiles to be deployed in Europe? How has the disappearance of the INF Treaty changed the strategic stability parameters in the Euro-Atlantic region? What can Europeans do to help restore strategic stability? This report answers these questions by analyzing how the interplay between the recent developments in the missile technology landscape (the military low-end) and the withering arms control regime (the political-strategic high-end) affects security in the Euro-Atlantic area through the prism of strategic stability.

1.1. Overview and Research Strategy

Although NATO's European allies face an increased missile threat, which is particularly destabilizing as INF-range missiles take little time to reach their target, the main threat lies in the increased insecurity and unpredictability that will follow from the development and deployment of new hypersonic missiles and new types of tactical nuclear weapons. Hence, while the United States is primarily reacting to a revisionist Russia and rising Chinese assertiveness in the Asia-Pacific region, European countries should worry that Europe is effectively no longer at the centre of the strategic stability debate, while the transatlantic alliance is not as politically robust as it once was. European countries may find themselves left behind to suffer the consequences of the intensifying great power competition. The debate surrounding the INF Treaty relevance confirms that European security is becoming more interconnected with the Asian Pacific.

The post-INF Treaty world is loaded with more uncertainties: where negotiating a new INF-like arms control agreement appears highly unlikely and extending New START, the last remaining strategic nuclear arms control treaty, seems unpromising; a world in which CBMs and arms control treaties are disappearing one by one, the Open Skies Treaty being the latest example; one in which European security norms have been gradually eroding since the conflicts in Georgia (2008) and Crimea (2014); and one in which none of the great powers have a plan for how to restore trust and propose a new type of arms control agreement suitable for the 21st century.

Strategic stability is endangered by the uncontrolled developments in new missile technology, while at the same time the traditional arms control norms have been gradually disappearing because none of the great powers are interested in keeping them alive, just as they do not pay policy attention to modernizing CBMs. Moreover, nuclear weapons are enjoying a comeback in both capability development projects and military doctrinal changes. Under these conditions of renewed military competition, the quest for military technological superiority can potentially turn into a full-fledged arms race.

The demise of the INF Treaty arrived at the time when the relations between NATO and Russia are at their lowest since the end of the Cold War. Both the United States and Russia bear responsibility for letting

the cornerstone of European security die. By withdrawing, the United States has given Russia free rein to build more nuclear missiles unpunished. The introduction of INF Treaty-range weapons to the Russian arsenal has created gaps in NATO's defence and deterrent posture, which threatens to undermine its effectiveness. Even more worrisome is that the arms control architecture has been eroding at a time when recent advances in the hypersonic missile technology have opened the path for the development of a new class of weapons with dual-capable missiles. Hypersonic weapons have the potential to undermine the basic parameters of nuclear deterrence, further raise the level of uncertainty, aggravate the security dilemma in the Euro-Atlantic region, and create cracks in strategic stability by the end of the 2020s.

The research strategy of this report consists of mapping the key developments in the missile technology landscape and the proliferation of old and new weapons systems and of assessing their impact on the strategic stability in the Euro-Atlantic area. In other words, this report analyzes the military steps taken by the United States and Russia in terms of technological developments and doctrinal changes, examining whether any arms race is underway. Based on the careful analysis of publicly available data, this report identifies five important trends that will continue to affect strategic stability: 1) longer-range and increasingly mobile missile systems, 2) improved speed and manoeuvrability thanks to the weaponization of hypersonic technology, 3) new roles and types of nuclear weapons, 4) increased investments in longer-range air defence systems, and 5) greater availability of missiles and advanced delivery systems possibly becoming cheaper in the future.

The report argues that the competition between the United States and Russia in the short term is about dominating the technological edge, as opposed to the traditional Cold War tit-for-tat arms race and deployment of a large number of previously prohibited INF-range systems. It also puts forward that it is unlikely for the United States to repeat in Europe the dual-track scenario from the late 1970s that led to the signing of the INF Treaty. The report estimates that, in the long term, the new 21st century arms control architecture will need to accommodate the multipolar great power dynamics; that is, to multilateralize but also diversify arms control and to account for the new classes of weapons, such as hypersonic missiles and non-strategic, nuclear-powered/nuclear-armed missiles.

This report identifies a dangerous imbalance in the strategic stability parameters, as there are more players, more diverse weaponry, yet fewer tools for political control. Although European security concerns remain lower in the absence of the INF Treaty than during the Cold War confrontations, and below the level of panic in the short term, due to the ongoing technological competition that can spiral out of control given the eroding institutional safety net, they should be above the level of complacency.

The report also concludes that European countries have only limited influence and ability to shape the great power competition, which now largely takes place outside the European continent. While the ambition of European strategic autonomy remains illusionary, this does not mean that European countries cannot contribute to the restoration of strategic stability. The report outlines two sets of recommendations: 1) European options for future arms control architecture and modernized CBMs that the Euro-Atlantic experts can bring to the negotiation table; and 2) suggestions for what the Danish authorities can do to support this process on the European level.

1.2. Methodology

This report relies on a careful desk study of available open-source data and on applying scientific methods of inquiry while undergoing both internal and external peer-review. The consulted material includes:

- Arms control specialists at think-tanks and non-governmental organizations: International Institute for Strategic Studies' Military Balance, Federation of American Scientists, Bulletin of the Atomic Scientists, Arms Control Association, RAND, Council on Foreign Relations, Center for Strategic and International Studies' Missile Defense Project, Center for Strategic and Budgetary Assessments
- Magazines and news portals specialized in defence and military affairs: *Jane's*, *Défense et Sécurité Internationale*, *Military Technology*, *Defense News*, *defense-aerospace*
- Relevant academic journal papers
- Reports and documents by international organizations
- Official documents published by the U.S. and Russian governments.

It is important to note that since the content of this report is limited to the publicly available information, this may affect the accuracy of the analysis, as it could not include classified missile development programmes or triangulate data to verify findings in already-published research reports.

1.3. Outline of the Report

The report is divided into four main chapters. After first contextualizing the report itself, Chapter 2 examines how security is made in Europe and what the erosion of the arms control architecture means for European countries, while linking the INF Treaty debate to the concepts of strategic stability, deterrence, arms control, and security dilemma. The second part of Chapter 2 analyzes five main trends in the missile technology landscape, while Chapter 3 discusses the strategic implications of these trends for security in the Euro-Atlantic region in the wider, post-INF-Treaty geopolitical dynamics. Chapter 4 concludes the report with a set of recommendations to Euro-Atlantic and Danish policymakers regarding the future arms control architecture.

2

Changes to the European Security Architecture: Norms and Missiles

This Chapter first outlines recent challenges to how security has been traditionally made and administered in the Euro-Atlantic area and examines how the main institutional pillars in terms of norms, regimes, and organizations have been eroding to an unprecedented level in recent years. Second, it maps the key trends in the missile technology landscape in terms of both offensive and defensive systems and conventional and nuclear payloads. This assessment of the key technological trends in this section, contextualized in the current European security architecture, then informs the analysis of the strategic implications of the demise of the INF Treaty for Europe in Chapter 3.

2.1. An Eroding European Security Architecture

Throughout the second half of the 20th century, European security depended directly on strategic stability being maintained by the two nuclear superpowers. Indeed, the contemporary European security architecture combines the Cold War logic of bilateral arms control treaties between the United States and the Soviet Union/Russia and a set of post-Cold War multilateral agreements, including the CBMs established among the former adversaries. These formal and informal rules exist to mitigate the so-called security dilemma, a vicious circle wherein one state's pursuit of security is perceived as another state's source of insecurity.

They do so by providing a set of mutually accepted norms to guide and legitimate state actions and by fostering a common understanding of how security should be produced.

Why is it important to keep missile technology in check? Missiles come in various shapes and ranges,[1] the two main types being cruise and ballistic missiles.[2] Their speed, range, altitude, manoeuvrability, and delivery vehicles (conventional, nuclear, or dual-capable), together with the mobility of the launcher, all contribute to uncertainty, unpredictability, and target ambiguity. When combined with a lack of transparency and verification measures, they can create a security environment prone to miscalculation and misperception. In short, missile technology, whether conventional or nuclear, has significantly affected military operations, continues to shape how security is administrated in (not only) the Euro-Atlantic region, and ultimately can profoundly affect strategic stability.

What Is Strategic Stability in the 21st Century?

While the concept of strategic stability has traditionally been tightly linked to nuclear weapons and the fear of a surprise attack, strategic stability has become more than a nuclear balance: it includes a wider concept of arms control and goes beyond US-Russia relations. Strategic stability means 'to think in peacetime about the conditions that, irrespective of strategic objectives, limit the incentives to escalate in conflicts opposing nuclear-armed adversaries', while preferably avoiding altogether 'conflict situations which structurally encourage escalation between nuclear-armed adversaries'.[3] In this sense, strategic stability can be understood as both *crisis stability* (to disincentivize leaders to strike first during a conflict) and *arms race stability* (the absence of perceived or actual incentives to augment, qualitatively or quantitatively, a nuclear

1. Missile ranges are usually categorized as close (< 300 km), short (300-1,000 km), medium (1,000-3,000 km), intermediate (3,000-5,500 km), and intercontinental (> 5,500 km).
2. For a detailed categorization of missiles based on the aerodynamic manoeuvrability and propulsion characteristics of their weaponized payload (munition), see Steven Dunham and Robert S. Wilson, "The Missile Threat: A Taxonomy For Moving Beyond Ballistic," *Aerospace* (Center for Space Policy and Strategy), 2020.
3. Corentin Brustlein, "The Erosion of Strategic Stability and the Future of Arms Control in Europe" (*Proliferation Papers*, IFRI Security Studies, 2018), 17, 23.

force).[4] Importantly, the strategic conventional force posture can change the strategic calculations significantly. Dual-capable delivery technology, which can carry either conventional or nuclear warheads, introduces uncertainty about the nature of the strike. Together with the proliferation of longer-range offensive and defensive systems and doctrinal changes, new capability developments have extended the scope of possible areas of confrontation (e.g. electronic warfare, cyber, hybrid).[5]

Textbox 1: Origins of the Strategic Stability Concept

For most of the Cold War, Europe was a theatre for bipolar US-USSR hostilities. This period was characterized by a rather narrow understanding of strategic stability linked to atomic weapons, one that was guaranteed by mutual vulnerability (i.e. mutual assured destruction: MAD), and their belief in deterrence.[6] With the development of ICBMs, which further reduced the warning and reaction times for the attacked party, the fear of surprise attacks became central to the emergence of the strategic stability concept. As late as 1990, the USA and USSR understood strategic stability as 'the absence of incentives for any country to launch a first nuclear strike'.[7] In this Cold War context, strategic stability meant a reduced risk of war between NATO and the Warsaw Pact that was solidified by the strategic nuclear arms control treaties and the non-proliferation regime, which created a set of expectations regulating their relations.[8]

Strategic stability therefore 'stems from doctrinal restraint, as well as from technological and organizational solutions'[9] in terms of both nuclear and strategic conventional weapons. Consequently, conflict pre-

4. Brustlein, "The Erosion of Strategic Stability," 18-19.
5. Brustlein, "The Erosion of Strategic Stability," 19.
6. John D. Steinbruner, "National Security and the Concept of Strategic Stability," *The Journal of Conflict Resolution* 22, no. 3 (1978): 411-28; 411.
7. Dmitri Trenin, "Strategic Stability in the Changing World" (Carnegie Moscow Center, 2019), 1.
8. Gary Schaub, "Adjusting the Architecture: Arms Control, Disarmament, and Non-Proliferation in NATO" (CMS-report, Center for Military Studies, 2013), III.
9. Trenin, "Strategic Stability," 10.

vention mechanisms, CBMs, transparency, consultation, and dialogue play an increasingly central role in maintaining strategic stability. One implication of this is that 'functioning arms control treaties are not a sine qua non requirement for strategic stability'.[10] What is important for maintaining strategic stability is to have the right tools to reduce the risk of conflict escalation along three dimensions: *vertical* (material intensity of hostilities accounting for qualitative and quantitative aspects of deployed weapon systems), *horizontal* (increase in the geographical scope of the conflict), and *political* (changing the rules of engagement, violating norms of behaviour).[11] Lastly, the alliances, diplomatic-military, and military-military relations with non-nuclear countries are vital in the Euro-Atlantic region.

The INF Treaty was part of this European security architecture and played an important role in alleviating the security dilemma. The demise of the INF Treaty further reinforced a wider, worrisome pattern: arms control has been significantly eroding over the past years and opened cracks in strategic stability. Since 2014, the European security architecture has been weakened by a renewed geopolitical global power competition, new technological and military developments, and governments violating, bypassing, or abandoning international commitments.[12]

Textbox 2: Arms Control and the Overview of Main Strategic Arms Control Treaties

The umbrella concept *arms control* aims at overcoming the security dilemma via institutionalized cooperation.[13] There are three ways of controlling the weapons: *prohibiting* their use, *limiting* their numbers, and *disarming* actors in a controlled manner. Arms control can also be understood as an instrument of human security contributing to the survival and well-being of civilians.

10. Trenin, "Strategic Stability," 9.
11. Brustlein, "The Erosion," 24.
12. Brustlein, "The Erosion," v.
13. Harald Mueller, "Arms Control and Arms Reductions in Foreign Policy" (Oxford Research Encyclopedia of Politics, 2016).

Each arms control strategy has its own objective:

- arms control per se: preserve stability
- non-proliferation: preserve the distributive status quo regarding a certain weapon type
- disarmament: eliminate a specific weapon type.

Three logics or schools of thought can guide arms control:[14]

A) Path to disarmament: freeze the production of new weapons, limit the deployment of new forces, reduce the size of arsenals, and in some cases eliminate entire classes of weapons; e.g. Article VI of the Nuclear Non-Proliferation Treaty.

B) Path to strategic stability: reduce the incentives for states to engage in peacetime arms racing and remove the temptation to strike first in a crisis; stability can be obtained when states agree to build and deploy only weapons that guarantee retaliation rather than promise victory (e.g. the Anti-Ballistic Missile Treaty).

C) Path to comparative advantage: arms control negotiations as a tool to achieve relative gains, either in terms of numbers or technology. For instance, the Cold War arms control and détente in the 1970s was in fact the USA manoeuvring the USSR into a position of qualitative weakness.[15]

Confidence-building measures represent a cross-functional concept that can serve all three arms control objectives, and usually do so by increasing transparency and reducing tensions, exchanging information, or providing crisis-communication channels.

14. John D. Maurer, "The Purposes of Arms Control," *Texas National Security Review* 2, no. 1 (2018): 9-27.
15. Joshua Rovner, "Has the United States Abandoned Arms Control?" *War on the Rocks,* June 2, 2020, https://warontherocks.com/2020/06/as-the-united-states-abandoned-arms-control/.

Strategic Arms Control Agreements between the USA and USSR/Russia:

- Strategic Arms Limitations Talks I (SALT I, 1972-79) froze the number of ground-based ICBM and SLBM launchers at then-current levels for 5 years.
- Anti-Ballistic Missile (ABM) Treaty (1972-2002) limited the USSR/Russia and the USA to one ABM system deployment area protecting its national capital and one ABM system with ICBM silo launchers.
- Strategic Arms Limitations Talks II (SALT II, 1979-86) limited the numbers of strategic nuclear delivery vehicles and the numbers of ballistic missile delivery systems with multiple payloads and heavy bombers with long-range cruise missiles.

Intermediate-Range Nuclear Forces (INF) Treaty (1987-2019) eliminated all ground-launched intermediate-range and shorter-range ballistic and cruise missiles, both conventional and nuclear.

- Strategic Arms Reduction Treaty (START, 1991-2009) reduced the number of ICBM and SLBM delivery systems, heavy bombers, and the total number of deployable warheads, as well as banned the production, testing, and deployment of ASBMs/ALBMs.
- Strategic Offensive Reductions Treaty (SORT, 2003-11) reduced the number of deployed strategic nuclear forces to 1,700-2,200 warheads per country.
- New START (2010-21) has reduced and limited the total number of ICBM and SLBM delivery systems as well as the total number of accountable deployed strategic nuclear warheads and bombs to 1,550 per country.

Other Treaties Regulating Nuclear Weapons:

Treaty on the Non-Proliferation of Nuclear Weapons (NPT, in force 1970-indefinite) represents the cornerstone of the nuclear non-proliferation regime and outlines three objectives: (i) prevent the spread of nuclear weapons and weapons technology, (ii) promote coopera-

tion in the peaceful use of nuclear energy, and (iii) achieve nuclear disarmament and general and complete disarmament.

Comprehensive Test Ban Treaty (CTBT, adopted 1996) aims to introduce the universal norm against testing nuclear weapons and nuclear explosions anywhere on the Earth's surface, in the atmosphere, underwater, and underground.

Treaty on the Prohibition of Nuclear Weapons (TPNW, adopted 2017) is a legally binding instrument prohibiting nuclear weapons that is entering into force in January 2021 after having reached the ratification threshold in October 2020. None of the nuclear states have signed this treaty.

Treaty on Conventional Weapons

Treaty on Conventional Armed Forces in Europe (CFE Treaty, 1990/1992) has limited major military equipment systems in Europe (both quantitative ceilings and geography-based limits to their deployment) with an objective to establish a military balance between former adversaries, NATO, and the Warsaw Pact at a lower level of armaments. This resulted in the large-scale destruction of conventional military equipment and the elimination of the USSR's quantitative conventional advantage in Europe. It further established a practice of regular information exchanges, on-site inspections, challenge inspections, and on-site monitoring of destruction. Russia suspended its participation in 2007 and formally withdrew in 2015.

Confidence-Building Measures:

Open Skies (1992, in force 2002-present) establishes a regime of unarmed observation flights over the territories of signatory states.

Vienna Document (2011 version-present) is a politically-binding agreement aimed at building trust and predictability through transparency and verification measures covering the armed forces and major equipment systems based on the principle of reciprocity.

The INF Treaty and What Killed It

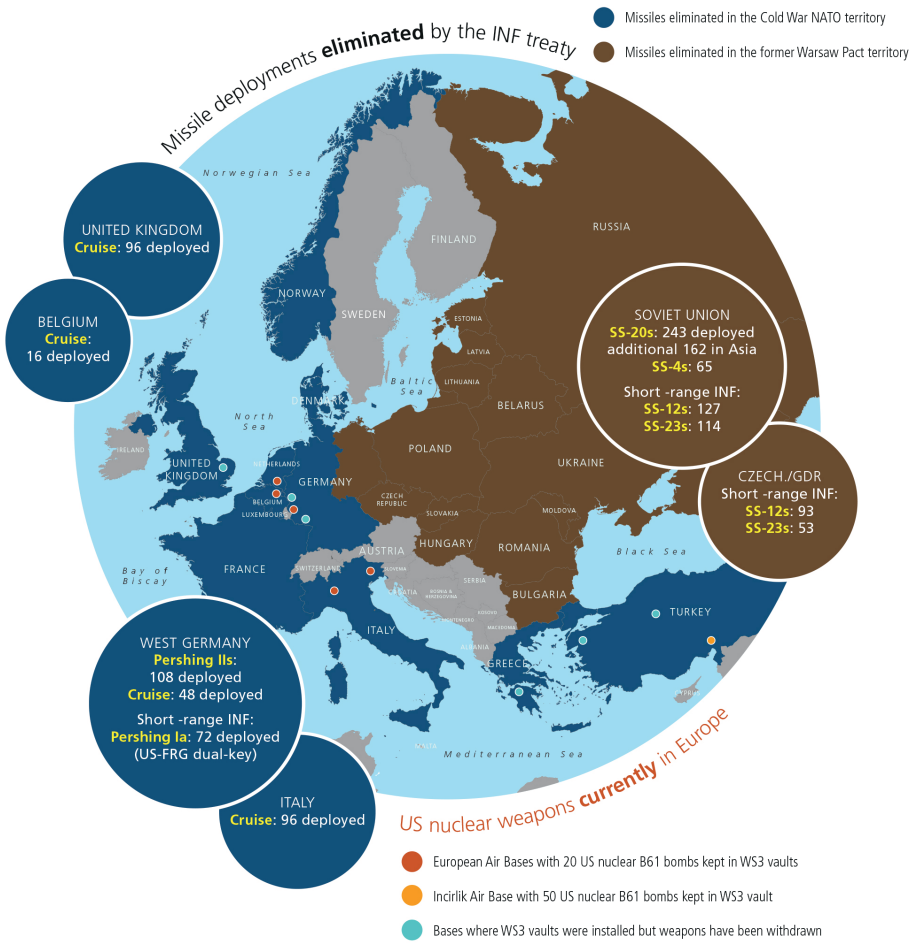
Since World War II, the United States has been playing a crucial role in providing security in Europe. Signed by the Americans and Soviets in 1987, the INF Treaty was considered a cornerstone of European security architecture. The INF Treaty was unique because it banned a whole class of weapons designed specifically to target Europe: it eliminated all ground-based missiles with a range of 500-5,500 km, both conventional and nuclear, and prevented the two superpowers from launching attacks from European sites. This ultimately improved the strategic stability in the region and made it more secure from the missile threat.

The conclusion of the treaty resulted in the destruction of 2,692 Soviet and U.S. ground-launched ballistic and cruise missiles, mostly mobile Russian SS-20s and American Pershings.[16] Interestingly, the treaty targeted only ground-launched missiles, not air- or sea-launched ones, and had no geographical limitations, which in effect limited Russia more than the United States (the USA is a naval power and relies on air- and sea-launched missile systems, whereas Russia is a land power). Although the INF Treaty was a bilateral arms control agreement between the United States and the Soviet Union, other European states in possession of intermediate-range missiles pledged to destroy them between 1991-2002, such as Czechoslovakia, East Germany, and Bulgaria on the Eastern side, and the United Kingdom, Belgium, and Italy on the Western side.[17]

In 2019, the United States withdrew from the INF Treaty due to repeated Russian non-compliance. At the heart of the 'official' argument are two new Russian missiles, the SSC-8 cruise missile and RS26 ballistic missile (see details below), which Russia denied.[18] The United States raised its concerns about Russian violations already in 2012. In October 2018, in reaction to the continued Russian non-compliance, President Trump decided that the United States would be withdrawing from the

16. Hans M. Kristensen and Matt Korda, "The INF Treaty Officially Died Today," *Federation of American Scientists*, August 2, 2019, https://fas.org/blogs/security/2019/08/inf-treaty-died-today/.
17. Youliana Ivanova, "Bulgaria Reaffirms Plan to Destroy SS-23 Missiles," *James Martin Center for Nonproliferation Studies*, May 6, 2002, https://www.nonproliferation.org/bulgaria-reaffirms-plan-to-destroy-ss-23-missiles/.
18. Steve Pifer, "Russia Denies It Violates the INF Treaty. OK, Show It," *Brookings*, January 22, 2018, https://www.brookings.edu/blog/order-from-chaos/2018/01/22/russia-denies-it-violates-the-inf-treaty-ok-show-it/.

Figure 1: The INF Treaty effect and U.S. Nuclear Weapons in Europe 2019[19]



INF Treaty: it notified Russia that it was ending its compliance with the Treaty on 1 February 2019, and the United States withdrew altogether on 1 August 2019.

19. Data from "The Intermediate-Range Nuclear Forces (INF) Treaty at a Glance," *Arms Control Association*, August 2019, https://www.armscontrol.org/factsheets/INFtreaty; and http://www.fas.org.

Other (probably more powerful) arguments for ending the INF Treaty also resonated in Washington, including the US-China rivalry in the Asia-Pacific region. This represents a major shift, since the Atlantic side is no longer at the heart of the strategic stability debate on these IRMs. According to this line of reasoning, the INF Treaty was defeated largely by the new geopolitical dynamics in the Asia-Pacific region.

Both Russia and the United States are keeping a close eye on the rising ambitions of China. With a large arsenal of over 1,000 ground-launched intermediate-range missiles, China would lose some 95 per cent of its ballistic and cruise missiles under an INF-like treaty.[20] The trilateralization of the INF Treaty was therefore unlikely, as China would never agree to eliminating these missiles, which play a crucial role in enforcing its regional superiority and in pressuring Taiwan. However, this reasoning has multiple shortcomings. Although the improving Chinese missile capabilities endanger the U.S. extended deterrence in the Asia Pacific as well as the American airbases in Japan, Guam, and U.S. aircraft carriers, the United States maintains its posture in the Asia Pacific through its sea-launched Tomahawk missiles. In order to deploy ground-launched missiles, it would have to first find the land from which to deploy them and the allies willing to host them without fearing Chinese retaliation. Furthermore, the U.S. Asia-Pacific allies could have procured IRMs themselves, as they were not limited by any treaty (e.g. South Korea is already testing ballistic missiles of some 800 km range.[21] But this would have gone against the spirit of the INF-like treaty: although the INF Treaty was a bilateral agreement, the American and Soviet allies also destroyed the prohibited missiles.

As for Russia, Moscow already began questioning the purpose of the INF Treaty in 2007 and raised national security concerns, especially by pointing to other countries (China, India, Iran, North Korea, and Pakistan) that were developing and/or deploying cruise and ballistic missiles

20. Mike Yeo, "China Could Lose 95% of Ballistic, Cruise Missiles under Strategic Arms Control Pact, Says New Analysis," *Defense News*, June 5, 2020, https://www.defensenews.com/global/asia-pacific/2020/06/05/china-could-lose-95-of-ballistic-cruise-missiles-under-strategic-arms-control-pact-says-new-analysis/#:~:text=China%20could%20lose%2095%20percent,of%20the%20Non%2DProliferation%20and.
21. "South Korea Conducts First Test Launch of Hyunmoo-4 Ballistic Missile," *Janes*, May 11, 2020, https://www.janes.com/defence-news/news-detail/2020/05/12/57d11d03-e8ca-432b-a3f4-23d5d491648f.

of intermediate range without being constrained by the INF Treaty.[22] China therefore might have played some role in the Russian decision to develop the SSC-8 in violation of the INF Treaty.[23] The U.S. withdrawal from the ABM treaty in 2002, which eliminated the deployment of interceptor missiles able to shoot down all intermediate-range and ICBMs, however, has had even more important and long-term consequences on Russian strategic thinking.[24] In the post-9/11 environment, the United States needed to build a robust layered missile defence against the threat from the Middle East, which later became a network of air defence sites in Europe and the Ground-Based Interceptor on U.S. soil. Russia worried this could limit its ability to hit targets and eliminate its own nuclear deterrent, especially the fear that the American defence systems in Romania and Poland can fire not only interceptors, but also offensive missiles to attack Moscow.[25] The demise of the ABM Treaty triggered a spiral of mistrust in Moscow about the American air defence systems deployed in Europe and changed Moscow's perception of mutual vulnerability. This has resulted in the development and deployment of new Russian INF Treaty-violating missiles some 15 years later. Lastly, some experts in Moscow offered a far-fetched argument accusing the United States of violating the INF Treaty in the first place: by operating ground-launched armed drones.[26]

22. Jacek Durkalec, "European Security without the INF Treaty," *NATO*, September 30, 2019, https://www.nato.int/docu/review/articles/2019/09/30/european-security-without-the-inf-treaty/index.html.
23. Tong Zhao, "Opportunities for Nuclear Arms Control Engagement with China," *Arms Control Association*, February 2020, https://www.armscontrol.org/act/2020-01/features/opportunities-nuclear-arms-control-engagement-china.
24. The ABM Treaty aimed to break the measures-countermeasures dynamics that characterized the development and deployment of offensive and defensive missile systems, which had been undermining the MAD logic between the USA and the USSR/Russia by limiting the strategic offensive competition.
25. This is technically possible: the air defence system Aegis Ashore uses the land-based launching system Mark 41 that can also hold Tomahawk cruise missiles.
26. "Russian Compliance with the Intermediate-Range Nuclear Forces (INF) Treaty: Background and Issues for Congress" (CRS Report, Congressional Research Service, 2019), 27.

What Has Changed: The New Parameters of Strategic Stability in the Euro-Atlantic Area

The unhealthy post-INF Treaty security environment is characterized by a dangerous practice of abandoning treaty commitments instead of addressing the violations within the scope of the treaties. This is linked to two other worrisome tendencies in the arms control area, as the United States, which has guaranteed security for its European allies for more than 75 years, has been changing gears. Although these foreign policy views are not shared by the incoming US President Joe Biden, it will be challenging to reverse the tide and return to enduring US security interests. First, under President Donald Trump, the United States was acting unilaterally without coordinating with its allies, which signalled a weakening of its commitment to European security. Second, President Trump saw no value in strategic arms control and did not consider it beneficial to his interpretation of American interests. Consequently, the United States withdrew from some of the arms control treaties and undermined the transparency norms that were central to CBMs: in 2018, Trump abandoned the Iran nuclear accord; in 2019, the INF Treaty; and in May 2020, to the surprise and regret of its NATO Allies, he announced that the United States would be withdrawing from the OST as a third major arms control treaty in November that year.[27]

Signed in 1992 between the former enemies from the Western and Eastern blocs, OST aims at improving CBMs after the Cold War. Entering into force in 2002, it has created a legally binding regime of unarmed aerial observation flights over the territory of its 34 signatories.[28] This means that all OST countries have yearly quotas on overflights and must make the information they acquire available to all treaty parties. The host country cannot place caveats or restrictions on any area or mili-

27. "Communiqué des ministères des Affaires étrangères de la France, de l'Allemagne, de la Belgique, de l'Espagne, de la Finlande, de la Grèce, de l'Italie, du Luxembourg, des Pays-Bas, du Portugal, de la République Tchèque et de la Suède," *France Diplomatie*, May 22, 2020, https://www.diplomatie.gouv.fr/fr/politique-etrangere-de-la-france/securite-desarmement-et-non-proliferation/actualites/actualites-et-evenements-lies-a-la-defense-et-la-securite/2020/article/communique-des-ministeres-des-affaires-etrangeres-de-la-france-de-l-allemagne.
28. "Open Skies Consultative Commission," Organization for Security and Co-operation in Europe, accessed September 11, 2020, https://www.osce.org/oscc.

tary installation. The United States is quoting Russian non-compliance[29] with the spirit of the treaty (not a direct violation) as the reason for its withdrawal, such as restrictions on flights over Kaliningrad[30] and proximity restrictions near South Ossetia and Abkhazia,[31] as well as accusing Russia of spying on the U.S. critical infrastructure.[32] Yet Moscow, too, has its own misgivings, such as the United States trying to prevent a new Russian observation plane from getting certified under the OST regime in 2018, or noticing the disproportionality as the United States had conducted three times more overflights over the Russian territory than Russia over the United States since the OST entered into force.

Nevertheless, OST is one of the most important CBMs: it is designed to enhance transparency and dialogue between Russia and the United States, facilitate the monitoring of compliance with existing arms control agreements, reduce the risk of escalation, and improve predictability and stability. Specifically, OST creates a pool of verified information to support military-to-military cooperation and diplomatic dialogue. In 2018, U.S. Defense Secretary James Mattis appreciated the operational value of the treaty as 'a military-to-military engagement tool' and highlighted that the 'treaty imagery was a key visual aid during U.S. engagement with allies and Russia regarding the military crisis in Ukraine' in 2014.[33] This is because the data collected through overflights represent valuable unclassified intelligence in a sharable format with all of the treaty signatories; that is, including allies who do not have satellite imagery technology. OST is a key source of intelligence for many

29. U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments" (Compliance Report, Bureau of Arms Control, Verification and Compliance, 2019).
30. Although Russia allowed Estonian, Lithuanian, and American observers to conduct flyovers in February 2020: "Estonia and Others Observe Russian, Belarusian Military Sites," *ERR: uudised*, February 26, 2020, https://news.err.ee/1056953/estonia-and-others-observe-russian-belarusian-military-sites.
31. Alexandra Bell, Wolfgang Richter, and Andrei Zagorski, "How to Fix, Preserve and Strengthen the Open Skies Treaty" (Issue Brief #9, Deep Cuts, 2020), 2.
32. David E. Sanger, "Trump Will Withdraw from Open Skies Arms Control Treaty," *The New York Times*, May 21, 2020, https://www.nytimes.com/2020/05/21/us/politics/trump-open-skies-treaty-arms-control.html.
33. Secretary of Defense Mattis' response to Senator Fischer, May 22, 2018, https://www.fischer.senate.gov/public/_cache/files/b2df2cf7-3828-4d81-aa57-2963ce8d70b0/sd-response-to-senator-fischer-regarding-the-open-skies-treaty-osd070739-18.pdf.

NATO allies and is especially important for the Baltic states, which use it to hold Russia accountable.

The U.S. withdrawal from OST is dangerous and destabilizing America's relationships with its European allies and might further isolate the United States should the treaty otherwise survive. Russia may indeed ultimately remain interested in keeping the OST alive, as it could conduct overflights over the U.S. military bases in Europe. However, Russia might believe that the United States would still get access to the OST data through its NATO allies. Russia can also have an interest in killing the treaty in as much as Moscow has no allies with whom to share the imagery. The operational value and relevance of OST will diminish if both the United States and Russia withdraw from it, as there would be no great powers between whom to build confidence.[34] Moscow suspended its participation in the Conventional Forces in Europe Treaty back in 2007 (whereas all NATO Allies continue to comply with this treaty) and has a long record of circumventing the Vienna Document, which provides the framework for the inspection of military activities and exercises. While Trump rather unrealistically conditioned the U.S. withdrawal by asking Russia to return to full compliance with the treaty, the Biden Administration has already signalled its interest in re-joining the OST regime. Russia has a poor reputation with respect to adhering to its treaty-based responsibilities.

In the long term, if the great powers have no plan to compensate for the eroding arms control regime, as John Wolfstahl of the Nuclear Crisis Group argues, the demise of the INF Treaty could potentially preconize a 'downward spiral into nuclear chaos and potential catastrophe'.[35] After the expiration of START I in 2009, which rendered the Strategic Offensive Reductions Treaty (SORT) ineffective, as the latter was using the START I verification mechanisms to assess compliance, the last treaty limiting strategic nuclear weapons is New START, signed in 2010. Both Russia and the United States completed the reduction of their strategic nuclear forces by 2018, and their arsenals have remained below the

34. Névine Schepers, "Keeping the Skies Open over Europe," *CSS Policy Perspective* 8, no. 8 (2020): 1-4.
35. Ben Wolfgang, "Demise of INF Treaty, Increase in Hypersonic Missiles Sparks Fear of New Arms Race, The Washington Post," *The Washington Times*, August 1, 2019, https://m.washingtontimes.com/news/2019/aug/1/inf-missile-treaty-demise-hypersonic-technology-in/.

treaty limits since then: 1,550 deployed warheads each. Nevertheless, there are significant differences regarding the levels of transparency in reporting on the status and capabilities of nuclear weapons between the two countries.[36] Despite some imperfections, New START has been a success. If the United States and Russia do not manage to agree on the extension of New START, as of February 2021 for the first time in nearly 50 years there will be no legally binding treaty that would set verifiable limits on the two largest nuclear arsenals in the world. The extension of New START has been in peril ever since the relations between the United States and Russia went sour over the INF Treaty and when China entered the U.S. strategic calculus in 2018.

Lastly, the grim outlook for strategic stability has been further weakened by the efforts to expand the role of nuclear weapons in military doctrines and a possible return of nuclear testing. Russia's new nuclear doctrine, published in June 2020, confirms the Russian ongoing quest for nuclear superiority and signals Russia's greater reliance on nuclear weapons (including in regional conflicts).[37] This document gives the impression that Moscow has enlarged the list of possible circumstances under which Russia would deploy nuclear weapons. Some observers believe that in doing so, Russia 'officialized' the escalate-to-de-escalate concept and encouraged the already-existing Western/U.S. perception that the Russian nuclear strategy allows for nuclear 'de-escalation' strikes early in a conventional conflict. This opening for the possibility to conduct limited nuclear strikes in regional conflicts can be seen as a sensible policy given the fact that Russia is weaker than both the United States and China.[38] Central to this escalate-to-de-escalate concept is the option to deploy small, low-yield nuclear weapons as a warning to an adversary in order to change the tide in a larger conventional conflict, thereby

36. "Nuclear Weapon Modernization Continues But the Outlook for Arms Control Is Bleak: New SIPRI Yearbook Out Now," *SIPRI,* June 15, 2020, https://www.sipri.org/media/press-release/2020/nuclear-weapon-modernization-continues-outlook-arms-control-bleak-new-sipri-yearbook-out-now.
37. "Russia's Nuclear Weapons: Doctrine, Forces, and Modernization" (CRS Report, Congressional Research Service, 2020).
38. Vladimir Isachenkov, "New Russian Policy Allows Use of Atomic Weapons against Non-nuclear Strike," *Defense News*, June 2, 2020, https://www.defensenews.com/global/europe/2020/06/02/new-russian-policy-allows-use-of-atomic-weapons-against-non-nuclear-strike/.

favouring limited nuclear war (which itself sounds like an oxymoron). Although some observers downplay these concerns,[39] other prominent experts, including Oliker and Tertrais, strongly doubt the existence of the Russian escalation doctrine allowing for limited nuclear first use.[40] Whether this nuclear strategy exists or not, the new Russian nuclear guidelines introduce an even more worrisome 'launch on warning' strategy to further improve its deterrence posture,[41] which could have even more destabilizing effects when hypersonic missiles become a standard element in missile arsenals.

Nuclear weapons have been recently 'mobilized' in yet another alarming way: as a bargaining chip in potential future arms control negotiations. Although the United States (and China) has not ratified the Comprehensive Test Ban Treaty (CTBT),[42] it has observed the moratorium on nuclear testing since 1992 together with four other officially recognized nuclear countries. This unofficial compliance policy seems to be about to change, and some observers even believe that had the United States ratified the CTBT, President Trump would have already withdrawn from it.[43] In the context of the current great power competition

39. However, others claim that Russia relies on nuclear deterrence (i.e. the threat to use the nuclear weapons), and not their actual use. Russia would resort to nuclear weapons in a conventional conflict only in case when a conventional strike would target country's critical national and military infrastructure; see Dmitri Trenin, "Decoding Russia's Official Nuclear Deterrence Paper" (Carnegie Moscow Center, 2020); Cynthia Roberts, "Revelations about Russia's Nuclear Deterrence Policy," *War on the Rocks*, June 19, 2020, https://warontherocks.com/2020/06/revelations-about-russias-nuclear-deterrence-policy/.
40. Olga Oliker and Andrey Baklitskiy, "The Nuclear Posture Review and Russian 'De-Escalation:' A Dangerous Solution to a Nonexistent Problem," *War on the Rocks*, February 20, 2018, https://warontherocks.com/2018/02/nuclear-posture-review-russian-de-escalation-dangerous-solution-nonexistent-problem/.
41. Launch on warning, defined as "a strategy in which a retaliatory attack is launched before incoming missiles have reached their targets," increases the risk of false alerts and accidental launch, instead of delaying retaliatory action. Richard H. Speier, George Nacouzi, Carrie Lee, and Richard M. Moore, *Hypersonic Missile Nonproliferation: Hindering the Spread of a New Class of Weapons*. Santa Monica: CA: RAND, 2017. https://www.rand.org/pubs/research_reports/RR2137.html, xi.
42. The CTBT was negotiated by the Conference on Disarmament in Geneva 1994-1996. It has been signed by 184 countries and ratified by 168. While it has been signed by all of the P-5 countries and ratified by Russia, the UK, and France, eight more countries must ratify for it to enter into force: the US, China, Egypt, Israel, Iran, India, Pakistan, and North Korea. The Comprehensive Nuclear Test Ban Treaty Organization Preparatory Commission in Vienna monitors compliance.
43. Michael Krepon, "Could Trump Trash The Nuclear Test Ban Treaty?," *Forbes*, June 3, 2019, https://www.forbes.com/sites/michaelkrepon/2019/06/03/could-trump-trash-the-nuclear-test-ban-treaty/.

and rapidly disappearing arms control norms, some U.S. officials suggested that nuclear testing could persuade Russia and China into negotiating a trilateral arms control treaty.[44] Even the U.S. 2020 Compliance Report states that both Russia and China violated the treaty by conducting low-yield nuclear tests and experiments.[45] However, a return to testing is a pure hazard and would not incentivize China to join any arms control negotiations; if the United States resumes testing, other countries will only follow.[46] Under normal circumstances, nuclear testing is conducted for scientific and technical reasons to ensure that the nuclear stockpiles have not eroded. In the U.S. case, the Pentagon has powerful computers and a large set of data from past explosions to simply run computer diagnostics to verify the state of its warheads. In contrast, Chinese nuclear experts only have powerful computers, so they would presumably want to resume testing to gather data. As of July 2020, the Congress stepped in and stopped all funding to explosive nuclear testing due to, among other things, the environmental impact and inconsistency with the U.S. nuclear non-proliferation policy.[47] The problem with the CTBT is that it does not specify what a nuclear explosion is: the treaty prohibits any 'nuclear explosion' but does not explicitly define the term and allows for only scientific zero-yield tests.[48]

44. Aaron Mehta, "Live Nuclear Testing Could Resume in 'Months' If Needed, Official Says," *Defense* News, May 26, 2020, https://www.defensenews.com/smr/nuclear-arsenal/2020/05/26/live-nuclear-testing-could-resume-in-months-if-needed-official-says/.
45. U.S. Department of State, "Executive Summary of Findings on Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments" (Compliance Report, Bureau of Arms Control, Verification and Compliance, 2020).
46. Matt Korda and Hans M. Kristensen, "The State Department's Compliance Report Plays the Blame Game, Despite Offering Little Evidence," *Federation of American Scientists*, June 24, 2020, https://fas.org/blogs/security/2020/06/the-state-departments-compliance-report-plays-the-blame-game-despite-offering-little-evidence/.
47. Joe Gould, "House Democrats Vote to Block Funding for Nuclear Weapons Tests," *Defense News*, July 20, 2020, https://www.defensenews.com/congress/2020/07/20/house-democrats-block-funding-for-nuclear-weapons-tests/?utm_source=Sailthru&utm_medium=email&utm_campaign=EBB%2007.21.20&utm_term=Editorial%20-%20Early%20Bird%20Brief.
48. Obviously, defining what a nuclear explosion means would reveal the nuclear recipe to non-nuclear parties to the treaty. This opens room for interpretation; for instance, the USA would be willing to accept a yield below 2 kilotons, while non-nuclear states are more strict about sticking to the zero-yield level; see Edward Ifft, "An Assessment of Obligations under the Comprehensive Nuclear Test-Ban-Treaty (CTBT)," *European Leadership Network,* June 2, 2020: https://www.europeanleadershipnetwork.org/commentary/an-assessment-of-obligations-under-the-comprehensive-nuclear-ztest-ban-treaty-ctbt/.

Returning to the conceptual understanding of strategic stability, this report observes a dangerous imbalance in the three main dimensions of strategic stability: 1) horizontal: the geographic scope spans beyond the Euro-Atlantic region, the Asia-Pacific is now at the fore of strategic stability considerations; 2) vertical: new classes of weapons outside the strategic nuclear category can impact strategic stability; and 3) political: great power leaders undermine arms control norms and abandon treaties without replacing them with new ones. Even though the INF Treaty might have become a Cold War relic and its demise may not be strategically consequential for European allies in the short term, the INF Treaty had an immense symbolic value. Its termination represents yet another piece of the puzzle as it confirms a troubling general pattern: the European security architecture is disintegrating. This lack of appreciation for having arms control norms to regulate behaviour and make state interactions more predictable becomes even more dangerous at a time when new weapons with the potential to further disrupt strategic stability are entering the missile technology landscape.

2.2. Trends in the Missile Technology Landscape

This section identifies five major trends based on recent developments in the missile technology field, as reported through the open-source information about offensive and defensive systems and procurement programmes in the United States, Russia, China, major European powers (France, Germany, Italy, Poland, Spain, United Kingdom), and their defence cooperation in the NATO and EU structures. Table 1 summarizes five key trends, four in terms of quality and one in terms of quantity, that keep shaping the current missile landscape relevant for the Euro-Atlantic region, together with their effects and impacts on strategic stability.

Table 1: Five key trends that shape the current missile landscape relevant for the Euro-Atlantic region

	Trend	Effects	Impact on strategic stability
Quality	Range and mobility	Testing and production of ground-launched missiles previously illegal under the INF Treaty by both the USA and Russia. Russian missiles deployed on mobile launch systems render detection more difficult.	Mostly political signalling that can aggravate tensions
	Speed and manoeuvrability	Development of new classes of weapons based on the hypersonic technology that significantly shortens the Observe, Orient, Decide, Act (OODA) loop;[49] introduces target ambiguity; some missiles are dual-capable.	New missile technology increases uncertainty
	Nuclear comeback	Growing popularity of low-yield and tactical nuclear missiles can lower the threshold for use in conventional conflict. New-generation nuclear weapons (e.g. nuclear-powered missiles). Continued use of nuclear interceptors (Russia).	Mistrust and uncertainty due to transparency problems; increased reliance on nuclear weapons in military doctrine
	Air defence systems	European NATO allies boosting their national air defence capabilities, upgrading the NATO Integrated Air and Missile Defence. Lack of national medium- and long-range modern air defence systems in Europe. European countries rely on U.S. technology and U.S. commitment to the extended deterrence.	Security dilemma aggravated by the offense-defence dynamic and asymmetric perceptions of vulnerability
Quantity	Cost and availability	Proliferation of INF-range missiles in large numbers in Europe is unlikely: no national programmes to acquire intermediate-range missiles in European countries (procure defence systems). Rather than restarting the production of Cold War intermediate-range missiles, the USA may augment its INF0range arsenal by developing low-cost advanced missile technologies.	Limited arms race No tit-for-tat dynamic

49. The OODA loop concept was developed by an American fighter pilot, Colonel John Boyd. It stands for observation, orientation, decision, action.

I. Range and Mobility

With the end of the INF Treaty, the development and deployment of land-based missiles (500-5,500 km range) is again legal. While Russia has already built and deployed operational ground-launched, INF Treaty-violating missiles, the United States has made clear that it intends to return to developing new missiles with previously prohibited range and already resumed intermediate-range systems testing.

In recent years, Russian actions have undermined the INF Treaty in two ways. First, Russia's 9M729 missile (the SSC-8 Screwdriver in NATO/US parlance) has been in direct violation of the INF Treaty. This cruise missile is ground-launched from the road-mobile SS-26 Stone Iskander system and within the (previously) prohibited range of around maximum 2-2,500 km. It is based either on a Navy cruise missile Kalibr (NATO codename SS-N-27 Sizzler) or a modified version of the Iskander-K (a version that launches the earlier 9M728 cruise missiles).[50] In January 2019, Russia publicly presented the SSC-8 missile for the first time.[51] There are already four battalions deployed with the SSC-8/9M729 system: estimates mention at least 16 launchers with 64 missiles at Elanskiy, Kapustin Yar, Mozdok, and Shuya.[52] Russia moved forward with this deployment following the annexation of Crimea in 2014.[53] Despite repeated calls from the United States and its allies, Russia could not return to compliance with the INF Treaty, since the SSC-8 launchers are the same as for the Iskander system, meaning that Russia would have to eliminate missile launchers as well. Destroying Iskander is clearly out of the question, as it is crucial to the Russian A2/AD in the Kaliningrad oblast.

The second Russian missile, the RS-26 ballistic missile, represents a circumvention of the INF Treaty. Although it has been classified as an ICBM, Russia deliberately test-launched this missile with a small warhead so that it would fly far enough to be classified as an ICBM. This was also made possible by the fact that New START sets the ceiling for

50. "SS-26 Iskander," Missile Defense Project, accessed September 11, 2020, https://missilethreat.csis.org/missile/ss-26-2/.
51. "SSC-8," Missile Defense Project, 2020, accessed September 11, 2020, https://missilethreat.csis.org/missile/ssc-8-novator-9m729/.
52. Kristensen and Korda, "The INF Treaty."
53. Durkalec, "European Security."

strategic warheads relatively high. This 'fake ICBM RS26 missile' is thus in fact a new nuclear-armed IRBM; while not in direct violation of the INF Treaty, Russia has exploited the loophole and circumvented the arms control agreement. This situation involving a disguised IRBM is eerie déjà vu, harkening back to the 1970s, when the Soviet SS-20 caused a missile crisis as Moscow was able to smoothly turn this ICBM into an IRBM. Although Russians declared the RS-26 an ICBM strategic weapon under New START, without the INF Treaty Moscow can now legally modify the RS-26 into an IRBM and free a slot for more future ICBMs.

Why is this particular missile so worrisome compared to other Russian missiles? In general, ground-launched cruise missiles are better at avoiding detection and tracking compared to sea- or air-launched missiles. Their mobile launch site is difficult to spot and therefore more difficult to disable. This new Russian cruise missile is also nuclear-capable, which provides Russia with options other than strategic ICBMs for the nuclear coercion of the United States.[54] The intermediate-range, ground-launched cruise missiles also improve Russia's A2/AD capabilities in Europe.

As to the United States, curiously, the 2018 U.S. Nuclear Posture Review mentioned that the United States started conducting the research and development of INF Treaty missiles, which in contrast to testing and deployment is allowed under the INF provisions.[55] The projects involved the development of a cruise missile with a range of 1,000 km and a non-nuclear ballistic missile with a 3,000-4,000 km range.[56]

Since August 2019, when the INF Treaty was officially terminated, the United States has tested both ballistic and cruise INF-range ground-launch missiles. First, already in mid-August 2019, the Pentagon conducted a simple test: it put together the already existing Tomahawk (a sea-launched cruise missile) and the Mark-41 system (used on-board U.S. destroyers and cruisers) to launch an IRCM from a mobile trailer on the ground. This test was a proof of concept: adapting the sea-based missile and launcher for land. In addition, as the United States is de-

54. Durkalec, "European Security."
55. "SS-26 Iskander."
56. Robert Burns, "US Plans Tests This Year of Long-Banned Types of Missiles," *AP News*, March 23, 2019, https://apnews.com/ea243a96bc254378ba92f1e3e8761389.

veloping a new air-launched AGM183A missile, it could also pursue its land-based version as well.

Second, on 12 December 2019, the U.S. Air Force conducted a demonstration flight test of a ground-launched, conventional, ballistic missile prototype with an inter-mediate range. The missile was launched from Vandenberg Air Force Base in California, and the collected data are supposed to contribute to the development of future intermediate-range capabilities.[57]

Given their timing, these tests were mostly about political signalling to Russia and demonstrating capabilities in response to the Russian violations. Nonetheless, the United States remains undecided on whether it would mirror Russia in developing new missiles, which might prove too expensive (see Trend no. 5). Although the INF Treaty abolished a whole class of land-based weapons, the United States has maintained a large arsenal of air- and sea-launched IRMs; ground-launched missiles are not as important for the United States as for Russia due to simple geographic realities (Russia is a land power, whereas the United States is naval power). From the U.S. perspective, however, the post-INF Treaty arms control situation will be different than the pre-INF one: its new cruise and ballistic missiles will not have nuclear warheads, only conventional ones (in contrast to the Russian SSC-8), and might well be in the form of more stealthy, less observable missiles.[58]

II. Speed and Manoeuvrability

Hypersonic technology is nothing new. The first experimental testing of hypersonic speeds occurred in 1949 at White Sands, New Mexico, when a Project Bumper rocket exceeded Mach 5.[59] Most contemporary missiles are supersonic, travelling between Mach 1 and Mach 5.[60] As the

57. "Northrop Grumman Supports Critical Demonstration Launch for Department of Defense," Defense Aerospace, accessed September 11, 2020, https://www.defense-aerospace.com/articles-view/release/3/208285/northrop-details-role-in-conventional-ballistic-missile-launch.html.
58. Sydney J. Freedberg Jr., "What Weapons Will the US Build after the INF Treaty?," *Breaking Defense*, October 22, 2018, https://breakingdefense.com/2018/10/what-weapons-will-the-us-build-after-the-inf/.
59. Richard Stone, "'National Pride Is at Stake.' Russia, China, United States Race to Build Hypersonic Weapons," *Science Mag*, January 8, 2020, https://www.sciencemag.org/news/2020/01/national-pride-stake-russia-china-united-states-race-build-hypersonic-weapons.
60. The speed of sound, or Mach 1, is approximately equal to 1,225 km per hour.

name indicates, hypersonic missiles travel at a speed of Mach 5 (6,200 km/hour) or greater, meaning that they can cross the North American continent East-West in 8 minutes. Technically, all intercontinental ballistic missiles (ICBMs) fly faster than Mach 5. What sets the new generation of hypersonic systems apart is that, in contrast to ICBMs, which travel along a predictable ballistic trajectory like a bullet, meaning that their route and the level of threat they pose can be calculated based on their trajectory and velocity, these new missiles bring an added element of surprise in terms of target ambiguity and the increased difficulty for ground-based early warning radars to detect them. So apart from the extreme speed, the other main qualitative difference from traditional missile technology concerns manoeuvrability and the altitude at which they fly (10-100 km).

Hypersonic weapons can be both nuclear and conventional. Regardless of the type of warhead, however, hypersonic missiles can rely only on their high speed and accuracy to destroy the target with the kinetic energy impact alone, which can correspond to several tons of TNT (a 500 kg missile flying at Mach 9 can equal 3 tonnes of TNT). However, the extremely high speed would be of little use if the missile has troubles identifying its target: the accuracy of hypersonic weapons remains a major unknown. A trade-off between speed and manoeuvrability versus accuracy will influence the choice of warhead on the hypersonic weapon; a missile with a nuclear warhead does not need to be as accurate as those with conventional warheads. Moreover, one must also consider that hypersonic gliders would approach the target at lower speeds than a ballistic missile of same range.

Textbox 3: Main Types of Hypersonic Missiles

There are two main types of Hypersonic weapons: hypersonic cruise missiles (HCM) and hypersonic glide vehicles (HGV), using either air-breathing scramjet or rocket-boost glide technology, respectively. Both can be air- or surface-launched.

HCMs are vehicles constantly under propulsion from an engine. They travel horizontally at speeds of Mach 5-Mach 7 at altitudes of 20-30 km. HCMs are a faster version of existing cruise missiles, since they rely on air-breathing jet engines. These supersonic combustion

ramjet engines, also called scramjets, compress the incoming air in a short funnel before the combustion phase, allowing the engine to operate extremely efficiently at high speeds. They are smaller, as scramjets only need to carry fuel, as it gets the necessary oxygen directly from the atmosphere, which makes the whole weapon smaller and more manoeuvrable.

In contrast, HGVs rely on lifting services for their speed and altitude. They are boosted by a rocket into the upper atmosphere, released at high altitudes (50-100 km), and finally glide to strike targets. These vehicles lose energy and speed as they glide towards their target on the ground, even more so if they manoeuvre, so the actual speed of impact is much lower. But their ability to manoeuvre and to be released from the rocket booster at different altitudes makes their trajectory very unpredictable and difficult to calculate.

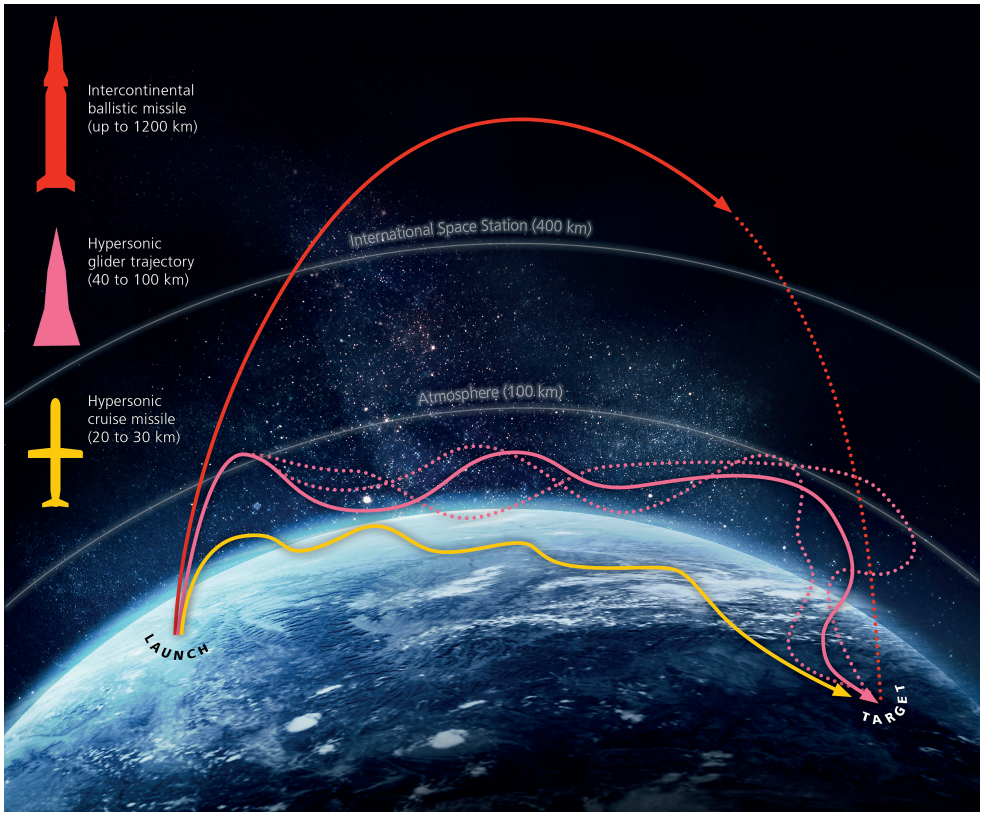
National Hypersonic Technology Programs

Three nuclear-armed countries have the most advanced hypersonic weapons programmes. While the United States has the most experience with this technology historically, China and Russia appear to have made substantial progress in recent years, even taking the lead in weaponizing the hypersonic technology.

Since 2018, the development of hypersonic weapons and the hypersonic industrial base has become a top priority for the Pentagon after the U.S. Congress agreed that the United States should have these weapons operational by October 2022.[61] In 2020, the U.S. budget for hypersonic technology jumped to $2.6 billion (from $800 million in 2017) and is expected to grow to $5 billion by 2025, with a primary focus on developing offensive weapons systems.[62] Yet while Russia and China are ready to develop nuclear-capable hypersonic weapons, the U.S. hypersonic pro-

61. Lockheed Martin conducts hypersonic capability development projects for the U.S. Navy, Air Force, Army, and DARPA. R. Jeffrey Smith, "Hypersonic Missiles Are Unstoppable. And They're Starting a New Global Arms Race," *The New York Times*, June 19, 2019, https://www.nytimes.com/2019/06/19/magazine/hypersonic-missiles.html.
62. "Hypersonic Weapons: Background and Issues for Congress" (CRS Report, Congressional Research Service, 2020).

Figure 2: Hypersonic Technology vs Traditional Cruise and Ballistic Missiles[63]



gramme is officially limited to conventional weapons. The major hypersonic weapons development programmes include the following systems. The U.S. Army's mobile, ground-launched, rocket-powered Long-Range Hypersonic Weapon is an HGV with a classified range and is expected to enter service in 2023.[64] The joint U.S. Navy-U.S. Army's Common Hypersonic Glide Body represents a major milestone towards fielding

63. "Gliding Missiles That Fly Faster Than Mach 5 Are Coming," *The Economist*, April 6, 2019, https://www.economist.com/science-and-technology/2019/04/06/gliding-missiles-that-fly-faster-than-mach-5-are-coming.
64. Sydney J. Freedberg Jr., "Army Tests New A2/AD Tools: Howitzers, Missiles & 1,000-Mile Supergun," *Breaking Defense*, May 1, 2020, https://breakingdefense.com/2020/05/army-tests-new-a2-ad-tools-howitzers-missiles-1000-mile-supergun/.

hypersonic weapons by the mid-2020s.[65] The U.S. Navy hypersonic development programmes aim to field these new weapon systems by 2024: the anti-air Hypervelocity Projectile, the intermediate-range Conventional Prompt Strike glider programme, and the modified SM-6 Block 1B missile adapted to reach hypersonic speeds.[66] The US Air Force is working to have its AGM-183 Air-Launched Rapid Response Weapon programme operational in 2022, and it is also exploring HCM technology.[67] In addition, together with DARPA, the US Air Force is developing a Tactical Boost Glide, a shorter, tactical-range hypersonic weapon capable of travelling at Mach 7,[68] and a highly classified Hypersonic Strike, Weapon-Air Breathing concept. Lastly, DARPA is also developing a ground-launched system under the Operational Fires Program.[69]

In his State-of-the-Nation addresses in March 2018 and February 2019, Russian President Vladimir Putin presented three new weapons systems based on hypersonic technology. First, the 3M-22 Zircon (or Tsirkon; NATO designation as SS-N-33) is a ship-launched HCM that, according to Russia, can fly at Mach 9 and has a range of 1,000 km, capable of hitting both ground and sea targets.[70] Intelligence estimates indicate that this weapon can become operational in 2023.[71] Second, the Avangard is a ground-launched HGV boosted to hypersonic speeds by an ICBM to then glide at speeds exceeding Mach 20 towards its target. In development since 2004, Russia has successfully tested this system several times. In December 2018, for instance, the Avangard was

65. Sydney J. Freedberg Jr., "Hypersonics: 5 More Army-Navy Flight Tests By 2023," *Breaking Defense*, April 15, 2020, https://breakingdefense.com/2020/04/hypersonics-5-more-army-navy-flight-tests-by-2023/.
66. Steve Trimble, "Document Likely Shows SM-6 Hypersonic Speed, Anti-Surface Role," *Aviation Week*, March 12, 2020, https://aviationweek.com/defense-space/missile-defense-weapons/document-likely-shows-sm-6-hypersonic-speed-anti-surface-role.
67. Valerie Insinna, "The US Air Force Wants to Develop a Hypersonic Cruise Missile," *Defense News*, April 30, 2020, https://www.defensenews.com/industry/techwatch/2020/04/30/the-air-force-wants-to-develop-a-hypersonic-cruise-missile/.
68. Theresa Hitchens, "Lockheed Martin, Air Force Press Ahead on Air-Launched Hypersonic Missile," *Breaking Defense*, February 27, 2020, https://breakingdefense.com/2020/02/lockheed-martin-air-force-press-ahead-on-air-launched-hypersonic-missile/.
69. "Hypersonic Weapons," 5.
70. Yet it is more probable that it has a smaller range of 400-500 km and speed of Mach 5 or 6; see: Jean-Jacques Mercier, "Le boom de l'hypersonique," *Areion 24 News*, January 21, 2020, https://www.areion24.news/2020/01/21/le-boom-de-lhypersonique/.
71. "Emerging Military Technologies: Background and Issues for Congress" (CRS Report, Congressional Research Service, 2020), 13.

launched using a ballistic missile from the Dombarovsky Air Base in the southern Urals and travelled 6,000 km across Siberia to hit a target on the Kamchatka Peninsula. The Russian authorities claim that the Avangard system is operational and that it has been put on duty in the Orenburg region in the southern Ural Mountains.[72] The Avangard is a nuclear-capable weapon with a strategic range and is therefore covered under New START. A U.S. inspector team was already invited to Russia to examine the Avangard system as part of transparency measures under this strategic nuclear arms treaty.[73] Third, the Kh47M2 Kinzhal ('the Dagger') is an air-launched, manoeuvrable ballistic missile, similar to the ground-based Iskander. Although neither HGV nor HCM, it has been included in the Russian hypersonic weapons programme. Its range is estimated to be up to 2,000 km with speeds of Mach 5-10.[74]

The Chinese hypersonic programme reportedly has both conventional and nuclear roles. China has already successfully tested a medium-range ballistic missile, the DF-17, specifically designed to launch up to eight independently guided HGVs.[75] It has an estimated range of 1,600-2,400 km and could be deployed already this year.[76] In addition, China has tested the DF-41, a dual-capable ICBM capable of reaching North America. The Chinese HGV, DF-ZF (previously known as the WU-14) is reportedly extremely manoeuvrable, speeding up to Mach 25, has a range of 2,000 km, and can become operational this year.[77] China is also working on an HCM that will probably be operational by 2025. In 2018, it tested the Starry Sky-2 (or Xing Kong-2), a nuclear-capable hypersonic vehicle prototype.[78]

72. "Avangard: Russia Deploys Hypersonic Nuclear-Capable Missiles," *Al Jazeera*, December 27, 2019, https://www.aljazeera.com/news/2019/12/avangard-russia-commissions-intercontinental-hypersonic-weapon-191227142922561.html.
73. Vladimir Isachenkov, "Russia: New Weapon Can Travel 27 Times the Speed of Sound," *Defense News*, December 27, 2019, https://www.navytimes.com/news/your-navy/2019/12/28/russia-new-weapon-can-travel-27-times-the-speed-of-sound/.
74. Matthew Kroenig, Mark Massa, and Christian Trotti, "Russia's Exotic Nuclear Weapons and Implications for the United States and NATO" (Issue Brief, Atlantic Council, 2020), 7.
75. Joseph Henrotin, "La mutation hypersonique et ses défis," *Areion 24 News*, December 3, 2019, https://www.areion24.news/2019/12/03/la-mutation-hypersonique-et-ses-defis/.
76. "Hypersonic Weapons," 13.
77. Henrotin, "La mutation."
78. "Hypersonic Weapons," 14.

As of 2020, France, Germany, India, Japan, and Australia are also developing hypersonic weapons. The French V-MaX (Experimental Maneuvering Vehicle), launched in 2019, aims to create a hypersonic glider capable of flying at Mach 5 by 2021.[79] While this project is meant to improve mainly the French nuclear deterrent by modifying its ASN4G supersonic missile for hypersonic speeds, it can eventually enhance the French arsenal of conventional air-to-surface cruise missiles.[80] Germany started its hypersonic project in 2018, aimed at developing hypersonic anti-tank weapons to improve its defence against the Russian threat. This new German air defence system equipped with hypersonic interceptors will eventually replace Patriot systems.[81] Other countries also investing in research on hypersonic technology include the United Kingdom, Norway, Iran, Israel, and South Korea. In Europe, the British Ministry of Defence tapped Rolls-Royce in July 2019 to develop hypersonic propulsion systems,[82] and Norway has been developing advanced solid-fuel ramjet technology together with the United States since 2019.[83] Lastly, civilian hypersonic projects (e.g. the EU-funded LAPCAT and ATLLAS, conducted in 2005-2008) aimed to contribute to future air transport, focusing on high-speed propulsion, aerothermodynamics, and lightweight and high-temperature resistant materials.[84]

79. Michael Peck, "Now France Wants Hypersonic Missiles by 2021," *The National Interest*, February 4, 2019, https://nationalinterest.org/blog/buzz/now-france-wants-hypersonic-missiles-2021-43202.
80. Mercier, "Le boom."
81. Gerhard Hegmann, "Deutsche Hyperschallwaffen gegen 'Bedrohungen der konkreten Art'" *Welt*, June 6, 2019, https://www.welt.de/wirtschaft/plus194794397/Verteidigung-Deutschland-entwickelt-Hyperschallwaffen.html.
82. "Rolls-Royce to Develop Hypersonic Technology with UK MOD," *Rolls-Royce*, July 17, 2019, https://www.rolls-royce.com/media/press-releases/2019/17-07-2019-rr-to-develop-hypersonic-technology-with-uk-mod.aspx.
83. "DOD Announces New Allied Prototyping Initiative Effort with Norway to Continue Partnership in Advancing Solid Fuel Ramjet Technologies," *U.S. Department of Defense*, April 20, 2020, https://www.defense.gov/Newsroom/Releases/Release/Article/2156251/dod-announces-new-allied-prototyping-initiative-effort-with-norway-to-continue/.
84. "Long-Term Advanced Propulsion Concepts and Technologies LAPCAT," *European Commission*, 2008, https://cordis.europa.eu/docs/results/12/12282/120142511-6_en.pdf.

III. Nuclear Comeback

Both Russia and the United States, which together possess over 90 per cent of the nuclear weapons in the world, have been modernizing their respective nuclear arsenals.[85] However, two new aspects have come to define the current dynamic more specifically: i) the increasing popularity and production of new tactical nuclear weapons; and ii) Russian next-generation nuclear weapons programmes using hypersonic technology and experimenting with a new nuclear-powered propulsion system.

Tactical Nuclear Weapons

Although some argue that any use of nuclear weapons in any form is strategic, everything not formally designated as a 'strategic nuclear weapon' by strategic arms limitation treaties is de facto a 'nonstrategic' nuclear weapon.[86] Yet nuclear weapons *can* be strategic, such as ICBMs, and tactical in terms of range. Alternatively, a tactical nuclear weapon can be determined by the strategic importance of the target in a given conflict. In this vein, non-strategic nuclear weapons tend to include short-range delivery systems with low-yield warheads, and target troops directly on the battlefield.[87] Confusingly, the definition of 'low yield' is open to interpretation.[88] Since 'yield' indicates how powerful the warhead is, even a low-yield nuclear weapon can arguably be strategic. Low-yield nuclear weapons have never been limited by arms control agreements.

85. According to a projection by the Arms Control Association, the U.S. 30-year nuclear modernization programme that started under the Obama Presidency would cost $1.7 trillion, when adjusted to inflation, or 6% of all spending on national defense, "U.S. Nuclear and Modernization Programs," *Arms Control Association*, August, 2018, https://www.armscontrol.org/factsheets/USNuclearModernization; SIPRI estimates that Russia has spent between 15-17% of its national defence expenditures on its nuclear weapons each year over the past decade; Julian Cooper, "How Much Does Russia Spend on Nuclear Weapons?," *SIPRI*, October 1, 2018, https://www.sipri.org/commentary/topical-backgrounder/2018/how-much-does-russia-spend-nuclear-weapons.
86. Hans M. Kristensen and Matt Korda, "Tactical Nuclear Weapons," *Bulletin of the Atomic Scientists* 75, no. 5 (2019): 252-61, 254.
87. To illustrate this debate further, France considers all of its nuclear weapons to be strategic. In contrast, if the USA or Russia fired the French short-range ASMPA cruise missile with a range of 500 km, it would be described as tactical. Kristensen and Korda, "Tactical Nuclear Weapons," 260.
88. Yield, measured in kilotons, represents the amount of energy released when a nuclear device is detonated; one kiloton is the explosive force of 1,000 tons of TNT; see "Missiles of North Korea," *Missile Defense Project*, June 14, 2018, https://missilethreat.csis.org/country/dprk/.

While non-strategic or short-range, low-yield nuclear weapons featured prominently in national defence plans during the Cold War, their number fell dramatically from 20,000-30,000 in the late-1980s to a total of less than 2,500 today.[89] Because there is almost no verifiable, publicly available information, it can only be estimated that the United States currently possesses some 500-1,000 tactical nuclear weapons (200 of which are deployed by the US Air Force as nuclear cruise missiles and gravity bombs),[90] while Russia has a larger inventory of some 2,000 tactical nuclear weapons distributed across all of its armed services in different forms (bombs, missiles, torpedoes).[91]

The United States already has tactical nuclear weapons deployed in five European countries as part of nuclear sharing within the NATO framework (see Figure 1). This is an important feature of NATO solidarity: nuclear deterrence is the cornerstone of NATO's security strategy, where nuclear sharing signals the credibility of NATO's extended deterrence, and host nations demonstrate their commitment to the Alliance. While only Belgium, Germany, Italy, and the Netherlands operate nuclear-capable aircraft, non-nuclear aircraft from other allied countries provide tactical conventional air support. For some European diplomats, 'nuclear sharing and the availability of low-yield nuclear weapons prevent Russia from achieving strategic dominance and escalation control'.[92] Yet while there are only 180 American tactical nuclear weapons deployed in Europe, the Russian figure is at least ten times greater.[93] Indeed, the 2018 Nuclear Posture Review determined that the U.S. tactical weapons in Europe were insufficient to deter Russia from using its tactical nuclear weapons there.

89. William M. Arkin and Hans M. Kristensen, "US Deploys New Low-Yield Nuclear Submarine Warhead," *Federation of American Scientists*, January 29, 2020, https://fas.org/blogs/security/2020/01/w76-2deployed/.
90. They have been completely eliminated from the Army, Marine Corps, and Navy; Kristensen and Korda, "Tactical Nuclear Weapons," 252.
91. "Nuclear Posture Review," Department of Defense, 2018, https://dod.defense.gov/News/SpecialReports/2018NuclearPostureReview.aspx.
92. Sophia Becker and Christian Mölling, "(Nuclear) Sharing Is Caring" (DGAP Report, German Council on Foreign Relations, 2020), 4.
93. Piotr Buras, "State of Disunion: Europe, NATO, and Disintegrating Arms Control," *European Council on Foreign Affairs*, February 28, 2019, https://www.ecfr.eu/article/commentary_state_of_disunion_europe_nato_and_disintegrating_arms_control.

As the Trump Administration continued to believe the escalate-to-deescalate concept presumably exists in the Russian military doctrine, the notion of a limited use of tactical nuclear weapons to 'restore strategic stability' and even to deter conventional war has become popular under President Trump and made it into the 2018 Nuclear Posture Review.[94] Consequently, for the first time since the end of the Cold War, the United States is manufacturing and deploying low-yield nuclear weapons. The United States will acquire two new types of tactical weapons in the form of a low-yield warhead for the Trident II D5LE submarine-launched ballistic missile (SLBM) and a new nuclear sea-launched cruise missile (SLCM) explicitly for the purpose of 'enhancing deterrence with non-strategic nuclear capabilities'.[95] This low-yield warhead, known as the W76-2, with an estimated yield of 5 kilotons and first announced in the 2018 Nuclear Posture Review, if deployed on submarine or sea-launched missiles, would not require host nation support to provide a deterrent effect, and it might be able to penetrate Russian air defences, which raises questions regarding the viability of the consultation process with NATO allies.[96] At least 50 W76-2s have already been produced.[97] Some argue that the continued deployment of low-yield nuclear weapons in the U.S. arsenal can be part of the policy response to Russia's new nuclear-capable systems.[98] In this context, deterrence is narrowed to the matching of the weapons and technology debate rather than political considerations.

Russia's New-Generation Nuclear Weapons Programmes

Russia has recently been working on five 'novel and exotic' strategic nuclear weapon systems: an HGV Avangard; a new ICBM RS-28, Sarmat (in NATO parlance: SS-18 Satan); the Poseidon unmanned underwater

94. Kristensen and Korda, "Tactical Nuclear Weapons," 253; yet many analysts remain sceptical regarding the utility of tactical low-yield nuclear weapons; see Cheryl Rofer, "Low-Yield Nukes Are a Danger, Not a Deterrent," *Foreign Policy,* February 11, 2020, https://foreignpolicy.com/2020/02/11/deterrence-nuclear-war-low-yield-nukes-danger-not-deterrent/.
95. "Nuclear Posture Review," XI.
96. "Nuclear Posture Review."
97. Shannon Bugos, "U.S. Deploys Low-Yield Nuclear Warhead," *Arms Control Association*, March, 2020, https://www.armscontrol.org/act/2020-03/news/us-deploys-low-yield-nuclear-warhead.
98. Kroenig, Massa, and Trotti, "Russia's Exotic Nuclear Weapons."

vehicle (designated by NATO as Status 6 or Kanyon); the Burevestnik cruise missile (a.k.a. the SSC-X-9 Skyfall); and the Kinzhal, an air-launched hypersonic ballistic missile.[99] Of these nuclear systems, Sarmat, Poseidon, and Kinzhal are all dual-capable weapons.

The novelty of these programmes is in their innovative delivery systems and propulsion. Apart from a new generation of ICBMs and delivery vehicles based on hypersonic technology,[100] Burevestnik and Poseidon are nuclear-powered and able to carry nuclear warheads. While using nuclear power for propulsion means that they are able to travel indefinitely and within an unlimited range, it also spreads radioactive particles, which renders testing and deploying them on and over one's own territory highly problematic.[101] Returning to the post-INF Treaty context, Putin has already threatened to deploy these weapons on ships and submarines close to U.S. territorial waters should Washington decide to deploy INF-range missiles to Europe.[102] Their current programme status is unclear, but there is speculation that these weapons could be fully operational within the next 5-7 years.

Why has Russia been devoting resources to new types of nuclear weapons? Quite simply, these programmes can bolster the Russian nuclear deterrent vis-à-vis U.S. technological advancements: overcoming and defeating missile defences (Avangard, Burevestnik, Sarmat) and increasing the Russian second-strike capacity to launch a retaliatory nuclear strike (Poseidon).[103] The quest for nuclear technological superiority also allows Moscow to display Russia's great-power status for foreign (especially American) and domestic audiences. Nevertheless, these new, exotic weapons may simply be overkill and would probably not improve the Russian deterrent meaningfully.[104]

99. Kroenig, Massa, and Trotti, "Russia's Exotic Nuclear Weapons."
100. The hypersonic weapons Avangard and Kinzhal are addressed in the previous section on hypersonic missiles.
101. Ezio Bonsignore, "Royal Flush or Desperate Bluff: Russia's New Strategic Weapons and Their Implications," *Military Technology* 44, no. 5 (2020): 45.
102. "Russian Navy to Get Hypersonic Nuclear Weapons: Putin," *Al Jazeera*, July 26, 2020, https://www.aljazeera.com/news/2020/07/russian-navy-hypersonic-nuclear-weapons-putin-200726160351237.html.
103. "Chapter Five: Russia and Eurasia," *The Military Balance* 119, no. 1 (2020): 166.
104. Kroenig, Massa, and Trotti, "Russia's Exotic Nuclear Weapons."

IV. Air Defence Systems

Air defence was long neglected in Europe. Today, only a limited number of modern systems are in service, because the INF Treaty has provided a sense of security for more than 30 years, during which time the Western allies have enjoyed comfortable air superiority in low-threat air campaigns.[105]

Due to the new security risk of peer-on-peer conflict and renewed focus on conventional territorial wars in Europe, European countries have been gradually increasing their investments in their limited air-defence inventories. The demise of the INF Treaty only heightened this trend. Yet Europe still relies on the United States for protection and technology. For instance, Poland, Romania, and Sweden have all signed contracts with the United States to acquire the Raytheon's Patriot Configuration 3 (or PAC-3).[106]

In addition to the PAC-3, which intercepts tactical ballistic missiles, the U.S. multi-layered air defence system inventory also includes a land-based THAAD for high-flying objects and ship-based SM-3 Block II interceptors to detect short- to intermediate-range missiles. Both systems use hit-to-kill technology, meaning that the interceptor missiles destroy their target by direct impact (instead of detonating a warhead). For its own protection, the United States has ground-based interceptors in Alaska and California to counter Russian and North Korean ICBMs.

The only European equivalent to the Patriot system is the land-based SAMP/T, operated in France and Italy.[107] Eurosam plans to develop an Aster Block 2, a European THAAD with 360-degree radar coverage, which will be able fire hit-to-kill exo-atmospheric interceptors, which will also be able to destroy medium- and intermediate-range hypersonic ballistic missiles at an altitude of 7 km.[108]

105. Michael Tong, "The Challenge of Defending European Airspace," *The International Institute for Strategic Studies,* February 12, 2020, https://www.iiss.org/blogs/military-balance/2020/02/defending-european-airspace.
106. Tong, "The Challenge."
107. Sebastian Roblin, "Europe Has Its Very Own Missile Defense System," *The National Interest*, September 21, 2019, https://nationalinterest.org/blog/buzz/europe-has-its-very-own-missile-defense-system-82486.
108. "European Nations Renew Support Contract with Eurosam," *Eurosam*, accessed September 17, 2020, https://www.eurosam.com/european-nations-renew-support-contract-with-eurosam/; Pierre Tran, "France Launches Aster Upgrade," *Defense News*, January 13, 2016, https://www.defensenews.com/land/2016/01/13/france-launches-aster-upgrade/.

Table 2: Long- and medium-range air defence systems operated by European countries

Origin	Long Range (> 75 km)	Operating countries	Medium Range (< 75 km)	Operating countries
United States	Patriot PAC-1, 2, 3 Hercules	Germany, Poland, Romania, Sweden, Greece, Netherlands, Spain, Turkey (Hercules)	MIM-23 Hawk	Greece, Romania Spain, Sweden, Turkey
Europe	SAMP/T (FR-IT)	France Italy	NASAMS (NO)	Norway Netherlands Finland
Russia	S-200 S-300 S-400 S-500	Bulgaria, Poland Greece, Slovakia Turkey	Buk Kub Volkhov	Cyprus Czech Republic Romania

Moreover, many of the former Warsaw Pact countries have been operating old Soviet systems. This is about to change, as the Central European and Baltic countries have launched major procurement projects to modernize their air defences.[109] For instance, Poland's WISLA project concerns medium-range air defence systems (e.g. two Patriot PDB-8 batteries and integrated air- and missile-defence battle command systems from Northrop Grumman), and the NAREW project focuses on a lower-tier system (below the Patriot) to replace the S-125 NEWA-SC Soviet surface-to-air missile launcher system and 2K12 KUB, a Soviet low- to medium-level mobile system. Lithuania is procuring two Norwegian Advanced Surface-to-Air Missile System (NASAMS) batteries by 2021. Hungary will enhance its medium-range defence by choosing between the MBDA (Aster), IAI (Arrow), MEADS, and Kongsberg-Raytheon (NASAMS). Romania will be getting the new Patriot system. Estonia, Latvia, and Lithuania will soon conclude the joint acquisition of mid-range air defence systems in order to close this capability gap in the Baltic region.[110] On the other hand, to increase its national autonomy,

109. Robert Czulda, "Major European Procurement Programmes," *Military Technology* (2020): 4, 12-16.

110. Hanna Croft, "Eastern Europe's Air Defence Capability Gaps," *Defence iQ,* August 29, 2019, https://www.defenceiq.com/air-land-and-sea-defence-services/articles/addressing-natos-air-defence-capability-gaps.

Germany plans to replace the PAC-3 it acquired from the United States. The Taktisches Luftverteidigungssystem programme is intended to ensure that Germany would not have to consult with the United States every time it needs to employ or modify the weapon.[111]

Turkey has caused extensive problems for itself and the NATO alliance by deciding to acquire the S-400 air defence system from Russia. In response, the United States kicked Turkey out of the multinational F-35 Joint Strike Fighter programme.[112] Russia uses the S-300 and S-400 long-range air defence systems (SA-10 Grumble and SA-21 Growler, respectively, in NATO parlance). For medium ranges, Russia mainly uses the family of Pantsir missile systems. Russia's next-generation air- and missile-defence system, the S-500, is meant to counter hypersonic and space targets and has allegedly entered into production.[113] The A-135 (in NATO language, the ABM-3 Gorgon), a Russian anti-ballistic missile system in operation since 1995, is causing major strategic-stability headaches, as its interceptor missiles protecting Moscow are armed with nuclear warheads: any interception of an incoming threat would spread radiation over a massive area surrounding the Russian capital.[114]

European collaborative efforts to defend their territory from aerial threats have also taken shape within the NATO and EU frameworks. NATO's Integrated Air and Missile Defence (IAMD) consists of two main elements: air policing and ballistic missile defence. With the original concept dating back to 1961, NATO has been building a network of interconnected sensors, command-and-control facilities, and weapons systems. The NATO Ballistic Missile Defence (BMD) is part of the alliance's core task of collective defence, aiming to protect the entire territo-

111. Sebastian Sprenger, "German Government Asks Lockheed, MBDA to Rebid on Missile Defense System," *Defense News,* May 6, 2020, https://www.defensenews.com/global/europe/2020/05/06/german-government-asks-lockheed-mbda-to-re-bid-on-missile-defense-system/.
112. Joe Gould, "US Could Buy Turkey's Russian-Made S-400 under Senate Proposal," *Defense News,* June 29, 2020, https://www.defensenews.com/congress/2020/06/29/us-could-buy-turkeys-russia-made-s-400-under-senate-proposal/?utm_source=Sailthru&utm_medium=email&utm_campaign=EBB%2006.30.20&utm_term=Editorial%20-%20Early%20Bird%20Brief.
113. "Chapter Five: Russia and Eurasia," 217.
114. Jim Garamone, "Missile Defense Becomes Part of Great Power Competition," *U.S. Dept Of Defense,* July 28, 2020, https://www.defense.gov/Explore/News/Article/Article/2291331/missile-defense-becomes-part-of-great-power-competition/.

ry of NATO Europe from the threat of proliferated ballistic missiles.[115] Funded by all allied countries in addition to national voluntary contributions, it reached its initial operational capability in 2016.

The United States contributes to NATO BMD through its European Phased Adaptive Approach (EPAA), launched under President Obama in 2009. It consists of the Aegis missile defence system with SM-3 interceptors, both sea- and land-based configurations, and was to be installed in 2011-20 to protect the European allies against short-, medium-, and intermediate-range ballistic missiles (mainly from the Middle East at the time of its inception).[116] Turkey is currently hosting a forward-based TPY-2 radar at Kürecik, Romania is hosting a U.S. Aegis Ashore site at Deveselu Air Base, Germany is hosting the command centre at Ramstein Air Base, and Spain is hosting four multi-mission BMD-capable Aegis ships at its naval base in Rota (upgraded in May 2020[117]). Poland will be hosting an Aegis Ashore site at the Redzikowo Military Base in 2020-22, missing the original 2018 target due to contractor performance issues.[118] The Phase 3 of EPAA, now scheduled for 2020-22, will bring the Airborne Infrared sensor platform to improve the overall warning mechanisms of the entire air defence network. When it comes to the Russian position, even though EPAA has no offensive capabilities, Moscow considers any NATO missile defence system on the territory of former Warsaw Pact countries (e.g. Aegis Ashore in Romania and Poland) a direct threat.[119]

As to the EU, since November 2019, Finland, France, Italy, the Netherlands, and Spain have launched the Timely Warning and Interception

115. "Ballistic Missile Defence," *North Atlantic Treaty Organization*, October 9, 2020, https://www.nato.int/cps/en/natohq/topics_49635.htm.
116. "The European Phased Adaptive Approach at a Glance," *Arms Control Association*, January 2019, armscontrol.org/factsheets/Phasedadaptiveapproach.
117. John Vandiver, "Destroyer USS Roosevelt Brings Upgraded Missile Defense to Rota," *Stars and Stripes,* May 19, 2020, https://www.stripes.com/news/europe/destroyer-uss-roosevelt-brings-upgraded-missile-defense-to-rota-1.630298#:~:text=STUTTGART%2C%20Germany%20%E2%80%94%20The%20destroyer%20USS,helicopters%2C%20the%20U.S.%20Navy%20said.
118. Paul McLeary, "Stalled Polish Missile Defense Site Needs Extra $96M, 2 Years," *Breaking Defense,* February 12, 2020, https://breakingdefense.com/2020/02/stalled-polish-missile-defense-site-needs-extra-96-million-two-years/.
119. Andrew E. Kramer, "Russia Calls New U.S. Missile Defense System a 'Direct Threat'," *The New York Times,* May 12, 2016, https://www.nytimes.com/2016/05/13/world/europe/russia-nato-us-romania-missile-defense.html.

with Space-based TheatER surveillance, the so-called TWISTER project under the EU's Permanent Structured Cooperation framework. TWISTER aims to develop endo-atmospheric interceptor capability to counter advanced ballistic and hypersonic cruise missiles as well as to build a space-based early-warning system by 2030. This project will ultimately provide a pure European contribution to the NATO Ballistic Missile Defence.[120]

Despite these efforts, countries are defenceless against hypersonic weapons at least until the mid-2020s.[121] Space-based sensor systems are capable of detecting ballistic missile launches but cannot capture the trajectory of hypersonic gliders. Many countries rely on ground-based radar for early warning, which are not equipped for defending against hypersonic missiles flying at lower altitudes (below the altitude of ballistic missile interceptors but higher than aircraft).[122]

V. Costs and Availability of Missiles

The Cold War was the golden age of missiles, with the introduction of ICBMs representing the pinnacle of development. On the one hand, ballistic missiles have again become popular among countries like China, Iran, North Korea, and Russia, as the precision of modern guidance systems allows them to destroy valuable targets far away from their territory without exposing fighter aircraft to danger. As of 2017, 31 states had some measure of capability to field ballistic missiles of different ranges, only nine of which have nuclear-capable missiles (China,

120. "Timely Warning and Interception with Space-based Theater Surveillance (Twister)," *PESCO,* accessed September 17, 2020, https://pesco.europa.eu/project/timely-warning-and-interception-with-space-based-theater-surveillance-twister/.
121. "Media Availability with Deputy Secretary Shanahan and Under Secretary of Defense Griffin at NDIA Hypersonics Senior Executive Series," *U.S. Dept of Defense*, December 13, 2018, https://dod.defense.gov/News/Transcripts/Transcript-View/Article/1713396/media-availability-with-deputy-secretary-shanahan-and-under-secretary-of-defens/.
122. The U.S. Missile Defence Agency is currently developing defence capabilities to track and destroy hypersonic weapons by using hundreds of small satellites in the low-Earth orbit and fielding a Hypersonic Defense Regional Glide Phase Weapons System interceptor; see Richard Stone, 2020; Theresa Hitchens, "MDA: All-Domain C2 Key to Countering Hypersonic Missiles," *Breaking Defense*, May 14, 2020, https://breakingdefense.com/2020/05/mda-all-domain-c2-key-to-countering-hypersonic-missiles/; Jen Judson, "MDA Taps Industry to Build Interceptor to Defend against Hypersonic Threats," *Defense News*, February 5, 2020, https://www.defensenews.com/land/2020/02/05/mda-taps-industry-to-build-interceptor-to-defend-against-hypersonic-threats/.

France, India, Israel, North Korea, Pakistan, Russia, the UK, and the US). Nevertheless, traditional ballistic missile technology may become obsolete, as their predictable ballistic trajectory renders them vulnerable to constantly improving modern missile defence systems.[123] Countering missile strikes is even more expensive than offensive missiles themselves, however, as one usually needs more interceptors to ensure the destruction of the incoming missile. It is believed that the capabilities and cost-effectiveness of missile technologies will outpace missile defence technologies.[124]

As argued, the deployment of INF-range land-based missiles risks upsetting strategic stability and triggering an arms race. In any case, such deployment would be preceded by numerous financial and military considerations. Already in August 2019, U.S. Defense Secretary Mark Esper announced his intention to deploy medium-range conventional missiles in the Asia-Pacific 'within months'.[125] However, the development and deployment of new missiles would require funding over multiple budget cycles. For the United States to resume the production of ground-launched missiles, it would have to spend some $96 million on research and testing alone. The Pentagon would also need to prove that land-based missiles have an added value in comparison to the already deployed and operational sea- and air-launched missiles. In addition, especially true for the Asia-Pacific theatre, the United States would need to find the actual territory upon which to deploy such land-based missiles and to negotiate agreement with potential host countries who would be willing to risk an economic and diplomatic crisis with China.[126] Impor-

123. Freedberg Jr, "What Weapons?"
124. Eugene Saad and Adam Mount, "Air-Launched Ballistic Missiles" (Federation of American Scientists, 2019), 30.
125. Christopher Bodeen, "China Vows to Counter US Deployment of Midrange Arms in Asia," *Military Times*, August 6, 2019, https://www.militarytimes.com/news/pentagon-congress/2019/08/06/china-vows-to-counter-us-deployment-of-midrange-arms-in-asia/.
126. Joe Gould, "With INF Treaty Dead, Esper Seeks New Missiles in the Pacific. Is Capitol Hill on Board?," *Defense News*, August 7, 2019, https://www.defensenews.com/congress/2019/08/06/new-pentagon-chief-reveals-plans-for-pacific-based-missiles-is-capitol-hill-on-board/#:~:text=With%20INF%20Treaty%20dead%2C%20Esper%20seeks%20new%20missiles%20in%20the%20Pacific.,-Is%20Capitol%20Hill&text=On%20Capitol%20Hill%2C%20a%20flashpoint,within%20the%20agreement's%20prohibited%20range.

tantly, apart from the political and strategic risks, deploying INF Treaty-range missiles is 'militarily unnecessary'.[127]

According to the U.S. Defense Department 2013 Report, there are four possibilities for acquiring capabilities previously prohibited by the INF Treaty:[128] 1) to modify existing ground-launched, short-range, or tactical weapons systems to extend range; 2) to repackage existing sea- and air-launched cruise missiles for ground launch;[129] 3) to build new ground-launched IRBMs; 4) and/or to use a vehicle that combines ballistic missile boost launch with a re-entry gliding and highly manoeuvrable vehicle. The basic ballistic missile technology is dated, however, and the re-entry vehicle follows a very predictable parabolic trajectory, offering little military advantage. It is unlikely that the United States would re-start the production of the Cold War Pershing II or Gryphon, which are now 30 years old. Apparently, the most cost-effective option is to update and/or modify the existing missile arsenal. Cost-wise, the strategy based on a symmetric response and traditional missile technology would be a losing game for the United States, as the new IRMs would be more expensive than Russian or Chinese ones.[130] Instead, according to some experts, the United States may focus on a future advanced aerospace strike capability based on reusable boosters and work on developing a unique American technological advantage.[131]

127. Gould, "With INF Treaty Dead."
128. Freedberg Jr, "What Weapons?"
129. As mentioned earlier, Tomahawk sea-based cruise missiles can be launched from the Aegis Ashore system, which uses the multi-purpose Mk 41 Vertical Launch System and can fire both offensive and defensive missiles. Yet the new modernized Tomahawk Block V missiles will cost around US$ 1 million each; see Loren Thompson, "The Navy's Tomahawk Cruise Missile Is Becoming More Lethal, More Versatile," *Forbes,* October 23, 2019, https://www.forbes.com/sites/lorenthompson/2019/10/23/the-navys-tomahawk-cruise-missile-is-becoming-more-lethal-more-versatile/.
130. If the USA wanted to develop an equivalent to China's DF-26, such a missile can cost US $21 million per unit, and $1.1 billion to develop; see Jacob Cohn et al., "Leveling the Playing Field: Reintroducing U.S. Theater-Range Missiles in a Post-INF World," *Center for Strategic and Budgetary Assesments,* May 21, 2019, https://csbaonline.org/research/publications/leveling-the-playing-field-reintroducing-us-theater-range-missiles-in-a-post-INF-world.
131. Jeff Becker, "When It Comes to Missiles, Don't Copy Russia and China – Leapfrog Them," *War On The Rocks,* June 30, 2020, https://warontherocks.com/2020/06/when-it-comes-to-missiles-dont-copy-russia-and-china-leapfrog-them/.

Guided-missile technologies represent one of the most expensive weapon categories.[132] However, while military-grade hypersonic technology was considered complex and expensive just a few years ago, it might soon be possible to reduce the costs of missile-based weapons systems using cheaper, off-the-shelf materials. These scramjet-powered missiles can eventually become cheaper than the traditional rocket boosters.[133] One way of making missiles cheaper is to capitalize on innovations in the commercial sphere, such as flight-proven reusable rockets (e.g. Elon Musk's SpaceX). One U.S. Joint Staff consultant argues that 'the convergence of reusable rocket technology and additive manufacturing for hypersonic engines may mean that intermediate-range strike may no longer be too expensive and too difficult'.[134] Along these lines, using scramjets only at operational speed, which means employing reusable boosters for the first stage, could reduce the cost of hypersonic strikes, as engines generally make up 65 per cent of the cost of the first stage of an orbital vehicle.

2.3. Missile Technology Impingements on Strategic Stability

- *Mobility enhances uncertainty*. Both the Russian and American (tested-only) land-based intermediate-range missiles are mobile (i.e. transported on the back of a vehicle). Mobile missile launchers made them harder to detect and eliminate.
- *Hypersonics enhance uncertainty*. Higher speeds reduce the time for decision-making. Incoming ICBMs and hypersonic missiles abbreviate the government's OODA loop to a few minutes to react, decide on the target, identify the type of warhead, and assess the potential damage.

132. "Rockets Galore," *The Economist*, September 29, 2012, https://www.economist.com/science-and-technology/2012/09/29/rockets-galore.
133. Sydney J. Freedberg Jr., 2020, "Hypersonics: DoD Wants 'Hundreds of Weapons' ASAP" *Breaking* Defense, April 24, 2020, https://breakingdefense.com/2020/04/hypersonics-dod-wants-hundreds-of-weapons-asap/.
134. Jeff Becker, "When It Comes to Missiles."

- *Manoeuvrability enhances uncertainty*. The manoeuvrability of the missile can deceive the defender as to which target the missile will strike.
- *Dual-capable missiles enhance uncertainty*. Hypersonic delivery vehicles that can carry either conventional or nuclear warheads, compounded by launch-on-warning procedures, are a new strategic stability nightmare.
- *New low-yield nuclear weapons increase uncertainty*. Producing and deploying low-yield nuclear weapons lowers the threshold for using nuclear weapons in conventional conflict. The new ways of deploying them can blur the lines between tactical and strategic warfare. Compounded by the lack of transparency about their numbers, this trend increases uncertainty and the risk of escalation.
- *Decreasing costs of some systems can increase uncertainty through proliferation*. While the advanced missile technology remains complex and expensive, the falling costs of some of its commercially available components can change and even accelerate the proliferation of missiles in the future.

3

Strategic Implications – Towards a New Arms Race?

Chapter 3 moves from the analysis of technological developments up to the challenges to strategic stability. It discusses the strategic implications of missile technology trends on the European security architecture and outlines the prospects for strategic stability in terms of crisis stability and arms race stability at a time of great power competition.

3.1. Post-INF Treaty Europe

The INF Treaty fell victim to shifting geopolitical dynamics. Although the Treaty was of great symbolic value for Europeans, neither the United States nor Russia were interested in preserving this Cold War arms control agreement. The U.S. withdrawal from the INF Treaty eliminated legal and political tools to pressure Russia back to compliance and in fact gave Moscow a free path to building more nuclear weapons.[135] Ultimately, the Russian assault on the INF Treaty aimed to improve the Russian advantage in its strategy for victory over NATO in terms of both 'winning short of war' (fracturing NATO solidarity) and 'winning in a short war' (building credible war-fighting options).[136]

There is little evidence to support the claim that the demise of the INF Treaty will spark a new arms race in Cold War-like tit-for-tat fash-

135. Kristensen and Korda, "The INF Treaty."
136. Durkalec, "European Security."

ion in the short term. The United States has no intermediate-range ground-launched missiles, nor is it planning any big-scale rearmament programmes for building and deploying them in Europe any time soon. Washington has been committed to finishing EAPP, the missile defence system in Europe, centred on the network of Aegis Ashore, by 2022. However, this report warns that although European security concerns remain lower than during the Cold War confrontations despite the absence of the INF Treaty, these concerns should be above the level of complacency due to the ongoing qualitative arms race which, if left unchecked, can spiral out of control in the context of a weakening arms control and CBMs architecture.

The demise of the INF Treaty presented new opportunities to test intermediate-range, ground-launched missiles, yet mostly for political signalling in the U.S. case. The U.S. Congress does not seem to be willing to approve any substantial funding for new IRMs unless proven that the existing sea- and air-launched missiles are insufficient. It remains true, however, that no new arms control treaty is likely to be signed to replace the abandoned INF Treaty. While Moscow has already proposed a freeze on IRMs, Washington refused to allow Russia to preserve its already deployed non-INF Treaty compliant missiles.[137] There is an asymmetry of interests in their respective reactions to the end of the INF Treaty: while Russia wants to build more nuclear weapons, the United States emphasizes the need for longer-range conventional air defence systems in Europe.

There may be a historical precedent for this grim situation: the Euromissile crisis in the late 1970s. Are there any parallels with the NATO dual-track decision? Considering the evidence, it is less probable for Europe to be a likely location for deploying more American weapons to counter Russia in 2020. There is no strong strategic rationale for returning American theatre-range missiles to Europe, partly because doing so would most likely trigger a new arms race and further destabilize the region, feeding a spiral of mistrust. Reintroducing nuclear warheads on Tomahawk cruise missiles and placing them in Europe within the range of Moscow would be a significant step backwards and would prevent any prospects for improving NATO-Russia relations and reduce strate-

137. Cynthia Roberts, "Revelations about Russia's Deterrence Policy."

gic stability to the old quantitative matching of weapons practiced in the last century.

Textbox 4: 1977-87 Euromissile Crisis and the NATO Dual-Track Approach

The INF Treaty was signed in 1987 after the so-called Euromissile crisis, which was sparked in the 1970s, when the USSR began deploying a new, mobile road intermediate-range ballistic missile, the SS-20, a predecessor of the current 9M729/SSC-8. Although the Soviet/Russian intermediate-range missiles could not reach U.S. soil, NATO allies considered this Soviet move as an attempt at destabilizing Europe. After the European allies called for a new long-range U.S. capability based in Europe, in December 1979, NATO adopted a 'dual-track' decision that combined modernizing American nuclear weapons and deploying them in Europe (first track) with an effort to reach out to Moscow for dialogue to negotiate arms reductions (second track).[138] This dual-track decision prepared the ground for the INF Treaty, signed 8 years later, and was considered a triumph for NATO solidarity. The resulting Treaty institutionalized no freeze, no reduction, but a complete elimination of all American and Soviet land-based, intermediate-range missiles.

This would also be more politically complicated, as most Europeans simply do not want to let Europe again become a battlefield for the great power rivalry.[139] Although the NATO allies backed Washington's decision to withdraw from the INF Treaty and called on Russia to return to dialogue on compliance, the European populations seem apprehensive about hosting American offensive weapons. Even though there were also mass protests in 1983 across the Western European countries against the deployment of new American missiles,[140] it would be even harder today

138. "Russian Compliance with the Intermediate-Range Nuclear Forces (INF) Treaty," 12.
139. Shervin Taheran, "Select Reactions to the INF Treaty Crisis," *Arms Control Association,* February 1, 2019, https://www.armscontrol.org/blog/2018/select-reactions-inf-treaty-crisis.
140. William Drozdiak, "More Than a Million Protest Missiles in Western Europe," *The Washington Post,* October 23, 1983, https://www.washingtonpost.com/archive/poli-

for political leaders to gain public support to allow any new American missiles on their soil. Moreover, many European leaders have doubts that the already forward-deployed U.S. nuclear weapons in Europe would actually be used in a conflict with Russia; some even question whether the nuclear status quo should be maintained in Europe.[141]

Although the future deployment of more American missiles to Europe would further destabilize the region, some hawks suggest introducing ground-based, theatre-range missiles to the Baltic region in order to strengthen NATO's deterrence; they hope this might eventually bring Russia back to the negotiation table for a new arms control treaty.[142] However, NATO is facing the divide among European countries regarding the eventual deployment of new American offensive missiles, as epitomized by the contrasting positions of Poland and Germany. While Warsaw would be willing to host more American forces and missile shield on its soil, Berlin is far more sceptical.[143] Yet even Poland, instead of buying its own INF-range missile capabilities, is procuring the PAC-3 missile defence system.

However, one should not forget that land-based intermediate-range missiles play a more prominent role in the Russian military doctrine than in America, which makes it harder for the former to agree on their limitations. Lastly and most distinctively, Europe is no longer at the centre of the strategic stability debate regarding the IRMs. The 2018 U.S. Nuclear Posture Review has already shifted focus from counterterrorism to the return of great power competition with Russia and China[144] and initi-

tics/1983/10/23/more-than-a-million-protest-missiles-in-western-europe/9d703245-36fa-40ce-8714-e281f796a472/.

141. Jon B. Wolfsthal, "America Should Welcome a Discussion about NATO's Nuclear Strategy," *Bulletin of the Atomic Scientists*, June 29, 2020, https://thebulletin.org/2020/06/america-should-welcome-a-discussion-about-natos-nuclear-strategy/?utm_source=Newsletter&utm_medium=Email&utm_campaign=ThursdayNewsletter07022020&utm_content=NuclearRisk_NATOnuclear_06292020.
142. Luis Simón and Alexander Lanoszka, "The Post-INF European Missile Balance: Thinking about NATO's Deterrence Strategy," *Texas National Security Review* 3, no. 3 (2020), https://tnsr.org/2020/05/the-post-inf-european-missile-balance-thinking-about-natos-deterrence-strategy/?fbclid=IwAR1NZ4Mhy0SmoR9Kood3wHGtRMVKthlVaa0xan-r2i-9QJJzew1PYhtYFw7k#article.
143. Piotr Buras, "State of Disintegrating Arms Control," *European Council on Foreign Relations,* February 28, 2019, https://www.ecfr.eu/article/commentary_state_of_disunion_europe_nato_and_disintegrating_arms_control.
144. "Nuclear Posture Review."

ated a review process of the American military presence in Europe.[145] This dovetails with the White House decision to withdraw some 12,000 U.S. troops from Germany, yet this step does not reduce the overall U.S. commitment to Europe.[146]

The unfolding post-INF Treaty security dynamics have revealed the interdependencies between the European and Asia-Pacific regions: deployment of American intermediate-range systems in one region would affect security and stability in the other. The United States now focuses on the Asia-Pacific region, where China has a significant dominance in land-based systems. Some observers believe that the United States can repeat the dual-track game from the late 1970s in the region in three different ways (each with its own shortcomings) in order to compel both Russia and China to accept a new arms control agreement: 1) deploying more sea- and air-based missiles would incentivize Russia and China to start negotiating limits on land-based missiles; 2) encouraging allies to pursue their own intermediate-range forces as a counterweight to rival capabilities; and 3) developing and deploying own intermediate-range missiles to pressure its rivals directly (e.g. re-purposing Tomahawks for ground launch).[147] Yet given how limiting such a new treaty would be for China, deployment of more American IRMs in the Asia-Pacific region would only spur an arms race and foment crisis instability instead of compelling China to accept arms control negotiations; especially when the United States has nothing to offer China (or Russia) in exchange. In addition, placing the new type of low-yield nuclear weapons on submarines and moving them closer to Russia has a potential of a dangerous long-term spiralling into escalatory tensions.[148]

145. Lara Seligman, "Trump's Defense Secretary Moves to Shed His 'Yes Man' Reputation," *Politico,* July 20, 2020, https://www.politico.com/news/magazine/2020/07/20/esper-defense-yes-man-reputation-370248?utm_source=Sailthru&utm_medium=email&utm_campaign=EBB%2007.21.20&utm_term=Editorial%20-%20Early%20Bird%20Brief.
146. Some will return to the USA, others relocated to Poland, Belgium, and Italy; see Paul McLeary, "Trump Contradicts SecDef on Germany Withdrawal," *Breaking Defense,* July 29, 2020, https://breakingdefense.com/2020/07/trump-contradicts-secdef-on-germany-withdrawal-money-trumps-strategy/.
147. John D. Maurer, "The Dual-Track Approach: A Long-Term Strategy for a Post-INF Treaty World," *War on the Rocks*, April 10, 2019, https://warontherocks.com/2019/04/the-dual-track-approach-a-long-term-strategy-for-a-post-inf-treaty-world/.
148. Dmitri Trenin, "Decoding Russia's Official Nuclear Deterrence Paper."

Was the INF Treaty merely a Cold War relic? The findings indicate that its demise was part of the processes that started back in the early 2000s, when the United States abandoned the ABM treaty, which Russia, for its part, considered the cornerstone of the arms control regime. For instance, the development of the Avangard HGV already started in 2004.[149] The termination of the ABM treaty seems to be more consequential for strategic stability than the end of the INF Treaty. At least for now.

The INF Treaty also largely fell victim to the important doctrinal and technological changes. The United States-Russia competition we are currently witnessing is a technological race as they 'seek to increase their relative power by prioritizing weapons systems "that are critical for the distribution of power"'.[150] Regardless of the existence (or not) of the INF Treaty, this qualitative race for technological domination reflects the great power competition among the United States, China, and Russia for future military advantage in the 21st century warfare. But it is more than that: a 'race-to-the-Moon sort of thing [...] national pride is stake'.[151] Mastering hypersonic weapons has become a particular source of prestige. The INF Treaty would not make the race for the hypersonic technological edge illegal: most of hypersonic missiles are air- and ship-launched and can travel more than 5,500 km when ground-launched. Yet a pessimistic scenario outlines that although the weaponization of hypersonic technology might be overkill, the technological arms race may potentially lead to further nuclear build-up.[152]

Russia has been building nuclear-capable hypersonic weapons because the Russian military stratagem is centred around the unsubstantiated belief that the interceptors in the American air defence systems are armed with nuclear warheads that can reach Moscow and therefore undermining its nuclear deterrent and altering mutual vulnerability. By investing in the development of new classes of weapons (hypersonic, even

149. "Chapter Five: Russia and Eurasia," 167.
150. Vally Koubi, "Military Technology Races," *International Organization* 53, no. 3 (1999): 556.
151. Stone, "'National Pride Is at Stake;" Robert Burns, "Quest for 'Super-duper' Missiles Pits US against Key Rivals," *The Diplomat*, May 20, 2020, https://thediplomat.com/2020/05/quest-for-super-duper-missiles-pits-us-against-key-rivals/.
152. The United Nations Office for Disarmament Affairs, "Hypersonic Weapons: A Challenge and Opportunity for Strategic Arms Control" (United Nations Publications, 2019), X.

nuclear-powered nuclear weapons), Russia is trying to come up with a qualitatively different way of overcoming the U.S. air defences. Suffice it to say that Moscow also uses these programmes to clarify for the audiences at home and abroad that Russia must be treated as a great power.[153] In contrast, China is developing hypersonic weapons to gain a qualitative advantage in the Pacific region; for instance, using conventional hypersonic weapons against the United States is meant to solve the tensions over Taiwan or the South China Sea.[154] This reflects the Chinese fear of the United States being able to conduct a decisive strike against China and eliminate its ability to retaliate. The Pentagon's intensified work on a hypersonic weapons programme reflects the efforts to catch up with Russia and China and the realization that the United States does not have effective air defence systems against the new Russian and Chinese weapons. As a Pentagon research and engineering official explains, 'by almost any metric that I can construct, China is certainly moving out ahead of us'.[155] However, in both Russia and China, hypersonics are not only about the nuclear deterrence; hypersonic weapons are also to have a more tactical application, especially in the form of anti-ship missiles able to sink aircraft carriers.[156]

The European security dilemma has worsened since August 2019 due to the increased missile threat in an accident-prone security environment and the unpredictable behaviour of the great powers in terms of new doctrines, rules of engagement, and military capability acquisition plans. European leaders came to realize that even though the Euro-Atlantic region is no longer at the centre of the great power competition, the security of the region still depends on the state of relations between the United States and Russia, and increasingly China. Regardless of the currently absent arms race in Europe, the biggest challenge for NATO allies is to maintain a credible nuclear deterrence posture in the post-INF Treaty world, as the new Russian missile capabilities can seriously impede the military mobility of Allied forces 'into and across' Europe.[157]

153. Kroenig, Massa, and Trotti, "Russia's Exotic Nuclear Weapons."
154. Stone, "National Pride Is at Stake."
155. Burns, "'Super-duper' Missiles."
156. Joseph Henrotin, "La mutation hypersonique et ses défis," *Areion 24 news,* December 3, 2019, https://www.areion24.news/2019/12/03/la-mutation-hypersonique-et-ses-defis/.
157. Durkalec, "European Security."

3.2. Strategic Stability in the Post-INF Treaty World

The longer-term outlook for strategic stability includes four major challenges: i) uninterested great powers undermining the value and the role of arms control, ii) complacency with arms race and military technological competition, iii) a nonchalant attitude towards nuclear weapons, and iv) lacking political will of the great powers to agree on a new practice of engaging in arms control.

None of the major players (the US, China, Russia) is interested in regulating former INF Treaty missile systems, and they rather often simply partake in the public blaming and shaming of other countries about breaching norms instead of promoting transparency measures. The most worrisome aspect of this situation is the United States moving towards the same 'club' as China and Russia, who observe their international obligations only when it is in their national interest. For instance, the U.S. Missile Defense Review in 2019 did not contain any arms control initiatives.[158] The lack of expertise in the State Department on arms control and the 'brain drain of nuclear and proliferation experts'[159] is yet another symptom of this increasingly neglected policy area. The lack of appetite for arms control is combined with a general sense of contentment on the part of great powers with military technology competition. This can potentially escalate into a full-fledged arms race.[160] In addition to the deteriorating action-reaction dynamic between the United States and Russia, the competition between the United States and China in the trade and technology domains has already mutated into an open rivalry and even geopolitical hostility; some experts are announcing a new Sino-American edition of the second Cold War.[161]

Hypersonic weapons represent a case in point. Regulating hypersonics is not on the policy agenda of any of the great powers. While they invest a lot of money into fielding operational hypersonic missiles by the

158. Oliver Thränert, "Trump's Missile Defense: Challenges for Europe," *CSS Policy Perspectives* 7:1 (2019).
159. Jesse Johnson, "Trump Envisions a Three-Way Nuclear Pact: China Has Other Ideas," *The Japan Times,* June 2, 2020, https://www.japantimes.co.jp/news/2020/06/02/asia-pacific/us-donald-trump-nuclear-weapons-arms-control-china/.
160. Kristensen and Korda, "The State Department's Compliance Report."
161. Alan Dupont, "The US-China Cold War Has Already Started," *The Diplomat,* July 8, 2020, https://thediplomat.com/2020/07/the-us-china-cold-war-has-already-started/.

mid-2020s, they pay no policy attention to how to minimize the danger of their proliferation.[162] Now it seems politically unrealistic to expect any developments in this regard, since hypersonic weapons are at the centre of the great-powers' quest for a technological edge. In general, 'it's very unusual at the front end of an emerging technology that has a competitive advantage for people to jump into an arms-control agreement'.[163] Yet hypersonic missiles are a new class of weapons and appear to be a game-changer in the not-too-distant future. They may represent a transformational warfighting capability in terms of a qualitatively new way to overcome missile defences, introducing an element of surprise and compressing response times, getting the defender stuck in his OODA loop.

To what extent will weaponized hypersonic technology affect strategic stability? The Strategic Studies community remains divided. On the one hand, for emerging technologies to be seriously destabilizing, they must cause strategic effects that are qualitatively distinct from existing systems.[164] New hypersonic missiles can become a 'game-changing capability',[165] since they can erode the nuclear deterrent and the MAD logic that maintains strategic stability due to their high speed, unpredictability of targets, and uncertainty about warheads.[166] If hypersonic missiles are not revolutionary in terms of offence, they might be more important in terms of defence thanks to their ability to manoeuvre and avoid missile defences, reducing the role of interceptors.[167] In other words, they can change the perception of vulnerability. Along this line of reasoning, hypersonic weapons will undermine the existing norms of deterrence, introduce more insecurity and uncertainty, and be extremely difficult to intercept and destroy. Lastly, this qualitatively new class of weapons can

162. R. Jeffrey Smith, "Hypersonic Missiles Are Unstoppable. And They're Starting a New Global Arms Race," *The New York Times Magazine,* June 19, 2019, https://www.nytimes.com/2019/06/19/magazine/hypersonic-missiles.html.
163. Ben Wolfgang, "Demise of INF Treaty, Increase in Hypersonic Missiles Sparks Fear of New Arms Race," *The Washington Times*, August 1, 2019, https://m.washingtontimes.com/news/2019/aug/1/inf-missile-treaty-demise-hypersonic-technology-in/.
164. Eugene Saad and Adam Mount, "Air Launched Ballistic Missiles" (Federation of American Scientists, 2019), 7.
165. Richard H. Speier et al., "Hypersonic Missile Nonproliferation," xiii.
166. "Hypersonic Weapons," United Nations Office of Disarmament Affairs (2019), viii.
167. Emmanuelle Maitre, "Vecteurs hypersoniques et armes nucléaires: évolution ou révolution?" (Observatoire de la Dissuasion, FRStrategie, 2020), 13.

give lesser powers a strategic advantage to allow them to claim air superiority and even change the balance of power.

On the other hand, the strategic implications of hypersonic weapons can be next to nil.[168] The Russian systems do not represent a new threat to the United States, since Russia already possesses the means to reach U.S. territory with its ICBMs and to render the United States vulnerable to a nuclear attack. In this sense, hypersonic missiles like the Kinzhal are a waste of money, as they do not change the strategic balance. Flying faster, striking the target harder, and from farther away can also be seen as evolutionary (not revolutionary) characteristics of missile technology. Their speed and range are comparable to ICBMs and SLBMs, and even if equipped with nuclear warheads, their strategic advantage remains limited if compared to traditional ICBMs.[169]

Textbox 5: Strategic Stability: Known Unknowns

- While the election of U.S. President Joe Biden may restore some measure of predictability to U.S. Grand Strategy, including a possible return to observing its international obligations and reviving its alliances, it is not given that the U.S. will seamlessly reclaim its leadership position.
- The long-term socio-economic impact of the COVID-19 pandemic can make it difficult for NATO allies to at least maintain the level of military expenditures and continue acquiring modern capabilities to improve their air defences.
- The evolution of China-Russia and China-Iran 'friendships with benefits', pursuing long-term economic and security partnerships, may impact the robustness of future international arms control agreement.[170]

168. "Hypersonic Weapons," 18.
169. Nathan B. Terry and Paige Price Cone, "Hypersonic Technology," *Strategic Studies Quarterly* 14, no. 2 (2020): 74-99; James Acton, *Silver Bullet? Asking the Right Questions about Conventional Prompt Global Strike*, Washington, DC: Carnegie Endowment for International Peace, 2013; Ivan Oelrich, "Cool Your Jets: Some Perspective on the Hyping of Hypersonic Weapons," *Bulleting of the Atomic Scientists* 76, no. 1 (2020): 37-45.
170. Jonathan E. Hillman, "China and Russia: Economic Unequals" (Center for Strategic and International Studies, 2020); Philip H. Gordon, "Has Trump Driven China and

However, the development and weaponization of hypersonic technology cannot be treated in isolation from the eroding arms control architecture. A nuclear-capable hypersonic glider, launched by an ICBM (e.g. Avangard) may be counted within the limits under New START.[171] New START was extended for the full five-year period by the parties in late January 2021, as the Biden Administration accepted earlier Russian invitations.[172] Preliminary bilateral talks between Washington and Moscow began in May 2020 after some hesitation,[173] with the Trump Administration blocking the extension of New START until China joined the negotiations.

China, with its 200-300 nuclear warheads (almost the same number as France) has no intention of joining strategic arms control talks. As the Treaty now stands, China can easily even triple its arsenal and would still remain below the New START limits of 1,550 deployed strategic warheads.[174] Including China in a new arms control architecture will become even more important, however, as recent American intelligence indicates that China plans to double its nuclear arsenal over the next decade. While this might not seem particularly alarming in itself, since the number of Chinese nuclear warheads appears rather harmless compared to the American arsenal (estimated at some 3,800), Beijing is aiming to develop a proper nuclear triad to improve its ability to deliver those weapons, modernize and diversify its nuclear capabilities, and move towards a 'launch-on-warning' posture, all in order to replace

Iran Together?," *War on the Rocks*, July 21, 2020, https://warontherocks.com/2020/07/has-trump-driven-china-and-iran-together/.

171. Some experts claim that HGVs do not count towards the Treaty's limits, as the New START covers only missiles with a ballistic trajectory of more than 50% of their flight; see "Hypersonic Weapons," 19.
172. Kingston Reif and Shannon Bugos, "Putin Invites U.S. to Extend New Start," *Arms Control Association,* February 2020, https://www.armscontrol.org/act/2020-01/news/putin-invites-us-extend-new-start.
173. Joe Gould, "New Nuclear Talks Begin between US, Russia," *Defense News,* May 21, 2020, https://www.defensenews.com/2020/05/21/us-russia-new-start-talks-starting-says-envoy/.
174. Hans M. Kristensen, "DIA Estimates for Chinese Nuclear Warheads," *Federation of American Scientists,* May 31, 2019, https://fas.org/blogs/security/2019/05/chinese-nuclear-stockpile/; Associated Press, "Biden proposing 5-year extension of nuke treaty with Russia, says US official," *Defense News*, January 21, 2021, https://www.defensenews.com/smr/nuclear-arsenal/2021/01/21/biden-proposing-5-year-extension-of-nuke-treaty-with-russia-says-us-official/?utm_source=Sailthru&utm_medium=email&utm_campaign=EBB%2001.22.21&utm_term=Editorial%20-%20Early%20Bird%20Brief.

the United States as the dominant power in the Asia-Pacific region by 2049.[175] The United States is not ready to offer anything to China at this stage as it lacks expertise on the Chinese nuclear policy and its nuclear arsenal. There is not even a hotline between Washington and Beijing.

Amidst the renewed great power competition, the Trump Administration embraced confrontational rhetoric, claiming 'we know how to win these [arms] races. And we know how to spend the adversary into oblivion'.[176] However, the nuclear arms control history shows that one cannot simply 'win' an arms race: only mutual limitations through treaties can put the unconstraint competition and escalation dynamics on hold and restore strategic stability. Worse yet, the traditional institutional channels remain frozen. The NATO-Russia Council became dysfunctional as the political dialogue was downgraded to the ambassadorial level only in the wake of the 2014 Crimea annexation. The Organisation for Security and Cooperation in Europe (OSCE), which administrates the main CBMs (OST and the Vienna Document) has been paralysed by its identity crisis and its inability to reform due to geopolitical disagreements between the United States and Russia, both OSCE members, regarding the organization's goals and how it should accomplish them.

The increasingly alarming absence of arms control tools and CBMs, even if imperfect, compounded by the intensifying global military rivalry among the great powers disinterested in arms control and competing in the development of new classes of weapons, continues to feed uncertainty, nurture mistrust, and threaten to create a negative spiral of a renewed security dilemma. Figure 3 illustrates these challenges to strategic stability. If combined with a hostile and misleading political rhetoric, this situation can sooner rather than later lead to an actual arms race with unintended but nevertheless disastrous consequences.

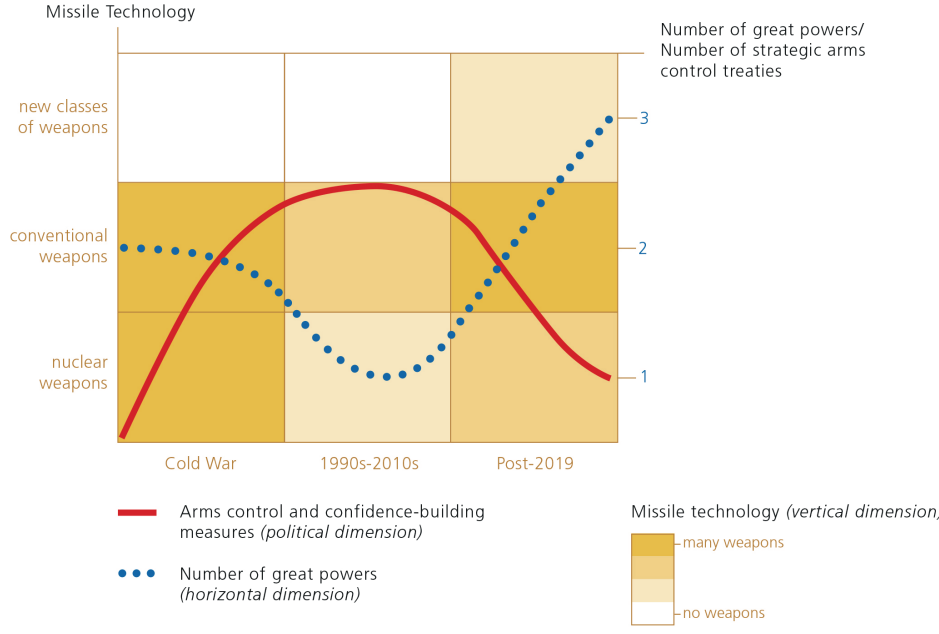
To prevent this, Russia and the United States must return to arms control dialogue and include China in new arms control practices. While

175. "Military and Security Developments Involving the People's Republic of China 2020" (Annual Report, U.S. Department of Defense, 2020).

176. Ankit Panda, "The U.S. Can't 'Win' an Arms Race with Russia and China," *The Soapbox,* May 27, 2020, https://newrepublic.com/article/157842/us-cant-win-arms-race-russia-china?utm_source=FAS%20General&utm_campaign=b53ae46679-EMAIL_CAMPAIGN_2019_12_12_02_16_COPY_01&utm_medium=email&utm_term=0_56a7496199-b53ae46679-222202357.

dialogue has its limitations, with a dose of realism, it is the fundamental step towards launching strategic stability talks in a trilateral setting for the first time. This is where European and Canadian leaders and experts can arguably make a difference: revive the dialogue on nuclear weapons and their control, support their American ally, and contribute to the shaping of the new arms control architecture and measures that can foster confidence and trust instead of seeding suspicion and alienation.

Figure 3: Challenges to Strategic Stability



Today strategic stability refers to more than a nuclear balance: it includes a wider concept of arms control, goes beyond U.S.-Russia relations, and is tied with doctrinal restraint and technological and organizational aspects in both nuclear and conventional terms. From the European perspective, the recent geopolitical shifts have created challenges along three main dimensions: 1) horizontal: more than the Euro-Atlantic region, the Asia-Pacific is now at the fore of strategic stability considerations, 2) vertical: new classes of weapons, the new generation of nuclear weapons, the return of low-yield nuclear weapons; and 3) political: great power leaders undermining arms control norms and abandoning treaties without replacing them with new ones. This report identifies a dangerous imbalance in the strategic stability parameters: more players, more diverse weaponry, yet fewer tools for political control.

4

Conclusion and Recommendations

Europeans find themselves in a difficult position: great powers are uninterested in arms control, they are too confident about competing with each other, lured by new futuristic technologies, and the traditional European ally, the United States, has been turning its attention from Europe farther East to the Asia Pacific region. Yet the election of U.S. President Joe Biden brings reasonable hope that the United States will pursue a more stable and predictable foreign policy together with less confrontational rhetoric to re-establish trust among its European allies and reiterate the strategic value of the Alliance for both sides of the Atlantic. European allies should take this opportunity to capitalize on their transatlantic partnership and get Washington to represent their interests in arms control negotiations. This can also open the door for a joint transatlantic approach to China and better distribution of labour in dialoguing and deterring Russia. In the longer term, crafting and establishing a new arms control architecture will involve fierce, competitive negotiations among great powers in which strong alliances with non-nuclear countries and the EU's decent diplomatic standing might prove crucial.

Unfortunately, European leaders must acknowledge that the European agency has limited options available to maintain strategic stability. The EU's ambition regarding its strategic autonomy is unattainable in the short and medium term; at least as long as the European countries depend on the American nuclear deterrence and the credibility of the transatlantic link for their protection. For reasons beyond the scope of this report, the Europeanization of the French nuclear deterrent (and

British, in case of further deterioration of transatlantic relations) remains an illusion, as neither NATO nor the EU could provide the necessary political and military framework for developing a purely European nuclear deterrence capability.[177]

This does not mean that European leaders should remain passive observers; they should actively assist the Biden Administration to reverse the worrisome tendencies in U.S. foreign policy under Trump and help patch the cracks in the strategic stability. Taking the changing geopolitical situation well into account and making a sober estimate of own abilities to affect great power competition dynamics should be a starting point for any European strategy in the post-INF Treaty world. Put simply, it requires a realistic expectation management instead of, for instance, proclaiming the European Commission 'geopolitical', while it does not have a real strategic role. For a long time, the EU countries have been unable to agree to a common security policy, which is why the EU lacks a proper Grand Strategy and the military capabilities to back it. Offering diplomatic services and expertise seems like a more feasible means of the EU contributing to the restoration of strategic stability.

In the short term, European leaders should work towards reinforcing deterrence and defence in Europe, and they should collaborate on modernizing confidence- and security-building measures to prevent misperceptions, incentives to escalate, and the risks of war in Europe. This could include: reinforcing transparency and limiting operational overlap, reducing the value and feasibility of surprise attacks, and alleviating concerns about the survivability of second-strike forces.[178] In the longer term, this means that European leaders must 're-engage with nuclear issues', 'relearn the grammar of deterrence', and practice strategic thinking themselves.[179]

The main condition for attaining these goals is incentivizing the United States to remain actively involved in European security, especially maintaining the American military presence in Europe. Europeans

177. Oliver Thränert, "No Shortcut to a European Deterrent," *CSS Policy Perspective* 5, no. 2 (2017).
178. Brustlein, "The Erosion," 59-68.
179. Nick Witney, "Building Europeans' Capacity to Defend Themselves," *European Council on Foreign Relations,* June 25, 2019, https://www.ecfr.eu/publications/summary/building_europeans_capacity_to_defend_themselves.

must prove their relevance to the United States, which is increasingly preoccupied with China. Without successfully engaging the nuclear-armed United States, the European efforts to restore strategic stability will be futile. This could be achieved by providing the United States with diplomatic backing and legitimacy vis-à-vis China, aligning their foreign policy tools with the United States, and stepping up their own defence capabilities so that Washington stops perceiving them as freeriding on American capabilities (especially, within NATO, spending at least 2 per cent of the Gross Domestic Product on national defence).

On the basis of the above analysis, three sets of recommendations to the Euro-Atlantic experts and policy-makers can be derived:

1) Strengthen national air defence systems and boost NATO IAMD (short term)
2) Modernize and globalize confidence-building measures (short to mid term)
3) Contribute to designing new strategic arms control architecture (long term).

4.1. Strengthen National Air Defence Systems and Boost NATO IAMD (Short Term)

NATO European allies should continue to boost their investments in early warning missile systems and medium- and long-range NATO compatible air defences, preferably not of Russian origin, and boost the NATO IAMD system to make it multi-layered and interoperable. European countries can also use the new EU cooperative defence funding schemes to develop their own air defence systems technologies in line with the strategic autonomy ambition, although this requires longer to accomplish. Importantly, the Alliance must regularly reassess the eventual utility of conventional ground-launched missiles for European security and stability. NATO should also improve its intelligence, surveillance, and reconnaissance capabilities to provide NATO allies with better situational awareness and more time for decision-making.[180]

180. Durkalec, "European Security."

At the same time, the 1979-87 Euromissile crisis offers several lessons that could guide the NATO allies in the current dynamic situation: i) launch a new NATO-wide nuclear debate to make high-level policy recommendations to national administrations, ii) develop consensus derived from the NATO deterrence posture review, iii) avoid blindly mimicking the Russians in the form of tit-for-tat deployment, iv) arms control must remain an integral part of Alliance nuclear policy, and v) elevate arms control policy agenda to the fore of NATO's strategic priorities.[181]

4.2. Modernize and Globalize Confidence-Building Measures (Short to Mid Term)

With the five-year extension of the New START treaty, there remains at least one milestone for the reduction of nuclear weapons and transparency. This should be a starting point for the further development and practice of transparency and informal mutual understanding. Confidence-building should include measures such as the exchange of weapons data, joint technical studies, advance test notices, and restraints on test locations.[182] More concretely, it will be of paramount importance to organize periodical strategic stability dialogues among representatives of Russia, the United States, and, importantly, China, to address the destabilizing potential of new weapons, to limit the proliferation of strategic nuclear and conventional weapons, and to identify and eliminate dangerous operating procedures.

NATO can try to become a platform for negotiations again, as it did in the past for the OSCE Vienna Document, the CFE Treaty, and the Open Skies Treaty. But the Alliance has been struggling, especially since the return of power politics in 2014, to create a constructive modus vivendi with Russia while respecting the vital interests of both sides.[183] NATO and Russia must therefore resume their over-due dialogue on

181. Simon Lunn and Nicholas Williams, "The Demise of the INF Treaty: What Are the Consequences for NATO?" (Policy Brief, European Leadership Network, 2019), 1-2.
182. Acton, "Silver Bullet?," 139.
183. Ann-Sofie Dahl, "Trends and Threats: NATO in the 21st Century" (CMS Report, Center for Military Studies, 2014), 7.

new confidence-building mechanisms, such as addressing Russia's paranoid fears dating back to the end of the ABM Treaty. Moreover, since banning nuclear-armed missile interceptors is next to impossible, as they are central to protecting Moscow, the United States could let the Russians inspect the Aegis Ashore sites in Romania and Poland to reassure them that they do not carry nuclear warheads. The United States should make greater efforts to convince Moscow that there is no good reason for the United States to use those sites for anything but defence. From a military perspective, it is not very likely that Aegis Ashore in Europe would be used to launch offensive weapons, since they are fixed and therefore vulnerable to a counterattack. At the same time, European leaders should coordinate their approach to the United States and promote a U.S. return to the Open Skies Treaty (OST).

Finally, European countries should work towards modernizing and potentially globalizing the Vienna Document to include the Asia-Pacific region, with China. The recent technological and doctrinal development, together with the increased military activity in Europe, must go hand in hand with increased transparency and verification procedures to avoid miscalculations and accidents. NATO allies should continue pushing forward a package of measures already proposed to the OSCE countries and modernize the crucial CBMs document by 2021 as planned. This will require agreeing to reach a shared technical understanding of these measures instead of politicizing them.

4.3. Contribute to Designing New Strategic Arms Control Architecture (Long Term)

The new arms control architecture must reflect the recent technological and doctrinal developments while at the same time also accommodating the shifting geopolitical dynamics. European leaders should help shape the parameters of the new arms control to cover the increased number of great power players and weapons other than strategic nuclear forces that can have a negative impact on strategic stability.

A – Multilateralize Strategic Arms Control

As the major-power competition between Washington and Beijing is going to be a long-term reality,[184] the nuclear strategic arms control regime must adapt to new realities and go beyond bilateral Russia-US agreements. If it is to be effective and promote transparency and predictability, any future arms control treaty will have to include the United States, Russia, and China. New arms control frameworks can take various forms, most of which include the following two concepts.[185] First, trilateral or multilateral arms control, where the main challenges are the differences in arsenal sizes that affect countries' respective deterrence postures and doctrines. This necessitates new rules for counting and verification methods.[186] In other words, some experts are adamant that a new arms control framework must be flexible to avoid authorizing significant arms build-ups towards a more symmetrical ceiling.[187] In order to address differences in systems and numbers, an arms control framework must therefore also include a well-defined room for asymmetric arms control. This would allow countries to incorporate dynamism into arms control design, which would reflect 'the cross-domain nature of international conflict';[188] for instance, equal ceilings for the combined stockpile of both intermediate- and long-range missiles, for a starter.[189]

European allies can help the United States address the challenge of getting China on board to design the future arms control architecture. This could take the form of socializing Chinese experts and leaders and bending Beijing's longstanding scepticism towards arms control, while promoting collaboration within the arms control expert community to alter secretive Chinese attitudes. Since China is unlikely to agree on any quantitative or qualitative limitations in the short term, the focus on improving transparency is the first fundamental step towards future arms

184. Tong Zhao, "Opportunities for Nuclear Arms."
185. Zhao, "Opportunities."
186. Névine Schepers, "The US-China Clash over Corona Has Implications for Nuclear Arms Control" *CSS ETH Zurich,* May 28, 2020, https://isnblog.ethz.ch/nuclear/the-us-china-clash-over-corona-has-implications-for-nuclear-arms-control.
187. Ulrich Kühn (ed.), "Trilateral Arms Control? Perspectives from Washington, Moscow, and Beijing" (Research Report, Institute for Peace Research and Security Policy, 2020), 6-7.
188. Heather Williams, "Asymmetric Arms Control and Strategic Stability: Scenarios for Limiting Hypersonic Glide Vehicles," *Journal of Strategic Studies* 42, no. 6 (2019): 789-813.
189. Zhao, "Opportunities."

control negotiations. Even dialogue and transparency might prove challenging, however, as some experts believe that the lack of transparency is part of the Chinese nuclear strategy and its 2049 ambition for parity with the United States. Therefore, cultivating greater appreciation of transparency, mutual restraint, and verification on the Chinese side will likely only be achieved in combination with persuasion, inducement, and coercion.

B – Include New Military Technology Other Than Strategic Nuclear Weapons

The Russian Avangard and Kinzal systems are nuclear-capable hypersonic weapons. China reportedly had not made a final determination as to whether its hypersonic weapons will be nuclear, conventional, or dual-capable.[190] Unlike China and Russia, the United States is not currently developing hypersonic weapons for use with a nuclear warhead.[191] What is particularly worrisome about Kinzhal is that since it can carry both conventional and nuclear low-/high-yield warheads, the deployment of this weapon is likely to further erode strategic stability due to uncertainty about – and an inability to distinguish – the type of warhead on dual capable missiles that can lead to unintended escalation.[192] Any new arms control agreements, aiming to restore strategic stability, will need to take into account hypersonic missiles and treat them as strategic regardless of warhead type, because 'even a limited deployment could seriously disrupt nuclear disarmament efforts. One particularly worrisome possibility is the resumption of nuclear testing to verify HGV warheads'.[193]

European countries should make clear that the future arms control regime must contain new rules and standards for technologies that can potentially disrupt strategic stability, such as hypersonic missiles, autonomous weapon systems, conventional precise munition, missile defenc-

190. "Hypersonic Weapons," 13.
191. "Hypersonic Weapons," 4. However, the USAF allegedly has plans to develop an intermediate-range HGV that could be nuclear-armed; see Steve Trimble, "USAF Errantly Reveals Research On ICBM-Range Hypersonic Glide Vehicle," *Aviation Week,* August 18, 2020, https://aviationweek.com/defense-space/missile-defense-weapons/usaf-errantly-reveals-research-icbm-range-hypersonic-glide.
192. "Hypersonic Weapons," 18.
193. "Hypersonic Weapons," x.

es, and cyber capabilities. Particular attention should be paid to dual use, mobility, speed, and yield to moderate the strategic effects of these weapons and limit their proliferation. For instance, in the case of hypersonic weapons, an international agreement will have to remove the ambiguity regarding the warheads via verification procedures, put geographic limits on their deployment, constrain speed of these weapons, and even ban the testing of hypersonic weapons. After the eventual renewal of New START, the next strategic arms reduction treaty should include all of the deployed strategic nuclear weapons, even those on new hypersonic and other new-generation systems.

Lastly, it remains unclear what role tactical, low-yield nuclear weapons play in the United States and Russian strategies and NATO's deterrence posture, and how they square with non-proliferation policy and safety concerns. Non-strategic nuclear weapons come with a whole list of problems that can contribute to worsening the European security dilemma: the lack of transparency about their numbers, using dual-capable delivery vehicles and different type of launchers, and blurring the line between strategic and non-strategic nuclear weapons. It would be prudent to make the eventual removal of tactical nuclear weapons from Europe part of broader arms control negotiations with Russia, as the notion of a limited use of tactical nuclear weapons to 'restore strategic stability' and even to deter conventional war has been gaining popularity.[194]

4.4. Danish Stakeholders: Alliance Security Dilemma of a Small State

What can Denmark do about these cracks in strategic stability and the worsening security dilemma in Europe? The Danish authorities recognize their lack of independent power position in the international system. As a small country, Denmark is a consumer of security provided by larger international actors and therefore it needs to cultivate good relations with its nuclear-armed great power ally. Even so, Denmark should aim to establish with its European allies a strong, legitimate Eu-

194. Sophia Becker and Christian Mölling, "(Nuclear) Sharing Is Caring," *German Council on Foreign Relations DGAP*, no. 10, June (Berlin, 2020), 5.

ropean voice that can be heard in the arms control debate among the great powers. Copenhagen may seek influence in NATO and the EU, as well as in bilateral settings with Germany, France, and the United Kingdom. Taking into account the Danish defence opt-out and Brexit, NATO looks like the best institutional setting to channel its efforts on both multilateral and bilateral levels. Denmark can make two types of contribution to support this process on the European level.

First, Denmark should create the capacity to support the arms control norm-setting process with its expertise and diplomatic efforts to help modernize CBMs and shape the future arms control architecture. This can include:

A. Preserving and implementing the objectives of the Nuclear Non-Proliferation Treaty.
B. Saving OSCE from oblivion – Denmark, cognizant of its limits as a small nation, should aim to revive the organization by increasing its diplomatic efforts to inspire European great powers to launch initiatives that would promote transparent measures, such as reviving the Open Skies Treaty and modernizing the Vienna Document.
C. Organizing an international conference, co-sponsored with European great powers, to promote CBMs on a global scale and launch a Global Vienna Document initiative.

Second, Denmark should continue contributing to NATO's defence and deterrence posture. Danish military authorities should ensure that:

A. The recently procured F-35s will remain active in NATO air policing missions.
B. Denmark will enhance its air defence and early warning capabilities in collaboration with countries in the Baltic region within the NATO framework, such as the recently concluded initiative for developing short and medium range Ground Based Air Defence capabilities together with 9 other NATO allies.

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ABOUT THE AUTHOR

Dominika Kunertova, PhD, is a Senior Researcher at the Center for Security Studies, ETH Zurich, where she researches military technology trends and transatlantic armaments co-operation. Her previous work experience includes strategic foresight at NATO ACT, capability development at NATO HQ, and unmanned systems at the Center for War Studies in Odense.

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