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DEFENCE AND SECURITY COMMITTEE (DSC)

ENSURING AN ALLIED DEFENCE INDUSTRIAL BASE FOR NATO'S NEW DETERRENCE AND DEFENCE BASELINE

Draft General Report
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Founded in 1955, the NATO Parliamentary Assembly acts as a consultative interparliamentary organisation which is institutionally separate from NATO. This general report was adopted by the Defence and Security Committee at the 2023 NATO PA Annual Session in Copenhagen, Denmark. It is based on information from publicly available sources or NATO PA meetings – which are all unclassified.

EXECUTIVE SUMMARY

In the wake of Russia's illegal and unprovoked invasion, NATO Allies have surged aid to Ukraine – pouring in all forms of vital assistance, including military, economic, humanitarian, political and diplomatic believing that Ukraine's self-defence is legitimate and its sovereign rights worth defending. Yet, the military aid NATO Allies have provided has revealed a growing strategic challenge: the defence industrial bases of NATO countries cannot currently replace military equipment at the rate at which it is being consumed in Ukraine and, therefore, cannot resupply their own strategic NATO stockpiles. This situation threatens NATO's defence and deterrence posture as it lowers military readiness and calls into question NATO's ability to deter future aggression.

A clear lesson from Russia's war in Ukraine is that NATO Allies must rebuild their defence industrial bases. The challenge of doing so, however, is complicated by the transitional characteristics of warfare today: While Allies are working to remain at the *avantgarde* of the technological revolution impacting all aspects of modern life and war, they must also maintain legacy platforms and ammunitions to be able to defend and deter in technology-degraded environments. NATO Allies, therefore, must create new, dynamic and resilient defence bases capable of producing the military systems at the scales required by a more threatening strategic environment. Such a task requires significant long-term investments as well as changes to regulatory frameworks to underpin industrial support and unleash NATO's potential.

At the 11-12 July summit in Vilnius, Allies committed to fostering a stronger and more resilient environment for transatlantic defence-industrial trade and investment. The announced Defence Production Action plan seeks to underwrite Allied efforts to invest in the new capability requirements necessary to meet NATO's new baseline for defence and deterrence, replenish dwindling armour and ammunition stocks, as well as continue to support Ukraine over the long haul. As this draft report makes clear, implementing and achieving the plan's goals will be an enduring challenge requiring sustained political will and investment over the long term.

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I- DEFENCE INDUSTRIAL BASES IN THE AGE OF ADVANCING AUTHORITARIAN REVISIONISM

1. The strategic environment in which NATO operates has fundamentally shifted. Rising authoritarian powers are actively seeking to undermine the rules-based international order Allies helped build after World War II. While Russia's war of aggression against Ukraine is the most direct challenge today, China's increasingly aggressive foreign policy and stated global ambitions and Iran and North Korea's development of advanced missile technology are both examples of this phenomenon.

2. NATO Allies have responded vigorously to Russia's renewed aggression, pouring in all forms of vital assistance to Ukraine, including military, economic, humanitarian, political and diplomatic. As Allies have stated clearly on many occasions, Ukraine's self-defence is legitimate and its sovereign rights worth defending. Beyond the gruelling battlefields of eastern Ukraine, however, Allies have also stated they view Russia's invasion of Ukraine as a direct attempt to defy the international order and upend Euro-Atlantic consensus and, thereby, expand Russia's role in European and global security by creating a sphere of influence in the regions formerly controlled by the USSR. Further, Allies have noted a concern that a Russian victory could have a cascading effect, effectively galvanising other revisionist regional powers to push back further against the international system, in the belief they can use aggression to similar effect.

3. Perhaps no other assistance programme, however, has been as visible and significant as the efforts to support the Ukrainian Armed Forces. Acting in strong, coordinated unison, Allies have surged the arms and ammunition needed on the battlefield to halt Russia's advance and even regain its territory – each Ally individually via the Ramstein format for military equipment and ammunition, while NATO and the EU supply non-lethal aid. The combined efforts in support of the Ukrainian Armed Forces to date surpass USD 70 billion in direct military aid[1] alone.

4. Yet, arming Ukraine has revealed a growing strategic challenge for NATO Allies: the defence industrial bases of NATO countries—the underlying businesses that support the research, development, and production of military equipment—cannot currently replace military equipment at the rate at which it is being consumed in Ukraine's defence and, therefore, cannot resupply NATO stockpiles that are being depleted in aiding Ukraine. This situation threatens NATO's defence and deterrence posture as it lowers military readiness and calls into question NATO's ability to deter future aggression.

5. In an age defined by revisionist authoritarian powers probing the edges of the international system, a second crisis emerging beside Russia's invasion is possible and would require costly prioritisations by NATO Allies to respond. To avert such a scenario, NATO Allies must rebuild their defence industrial bases to match the more threatening strategic environment.

6. As this report demonstrates, however, the challenge of doing so is complicated by the transitional characteristics of warfare today: while Allies are working to remain at the *avantgarde* of the technological revolution impacting all aspects of modern life and war, they must also maintain legacy platforms and ammunitions to be able to defend and deter in technology-degraded environments. Such a task requires significant new, long-term investments as well as changes to regulatory frameworks to underpin industrial support and unleash NATO's potential.

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[1] Military support includes all types of weapons and military equipment as well as other items donated explicitly to the Ukrainian army (i.e., gasoline, foodstuffs, etc.).

II- LOOMING MILITARY SHORTAGES

7. Russia's invasion of Ukraine has not been the quick victory many analysts predicted nor that which the Russian military expected. Instead, Ukraine's defence and counter-offensives have proved remarkably effective and the war has transitioned to a grinding war of attrition, more reminiscent of the total industrial war efforts of World War I than other, more recent conflicts.

8. As in any war of attrition, both Russia and Ukraine are trying to break the other's ability to reconstitute their military forces—i.e., manpower and military equipment—to achieve victory. Such a dynamic poses risks for both, but particularly Ukraine. Many of its industrial factories are in eastern Ukraine—including in Donetsk and Luhansk—and the few factories located farther west have been a constant target of Russian missile barrages. As such, Ukraine has become almost entirely dependent upon external military assistance to sustain its war efforts.

9. Ukraine's allies and partners are, however, committed to its cause and, therefore, helping sustain its defence. NATO member states have repeatedly stressed that Ukraine must win this war to uphold the current rules-based international order. As such, NATO Allies and partners have transferred vast amounts of aid—including financial and humanitarian—and endeavoured to support them politically and diplomatically. But no aid has been more evident, or more immediately necessary, than the military assistance provided to keep Ukraine in the fight, shore up their defensive positions and allow them to launch counterattacks against Russia to reclaim territory in their self-defence. Western leaders have repeatedly stated they will maintain, if not increase, their levels of support to Kyiv until Ukrainian forces prevail.

10. Ukraine, however, is using military equipment and ammunition at a much faster rate than it is being produced. For example, on average, Ukraine fires between 5,000–6,000 artillery shells a day, equating to roughly 150,000–180,000 per month, which is equivalent to the amount the United States produces annually (*Economist*, 2023c). As such, NATO Allies have relied on weapons stockpiles to arm Ukraine. For example, since the beginning of the war, the United States has transferred well over one million rounds of 155-millimetre (mm) artillery shells to Ukraine, depleting their own stockpiles (Cancian, 2023). But such drawdowns and transfers are creating a secondary problem as NATO Allies currently cannot produce military equipment at the rate required to both arm Ukraine and maintain their reserves. Experts estimate that if the United States stopped transferring 155 mm artillery ammunition to Ukraine today, and surged its production capacity, it would still take approximately five years to replenish American reserves (Cancian, 2023).

11. While the United States and 155 mm artillery ammunition is just one example, this challenge exists across the NATO Alliance and across weapons systems. From combat-ready tanks to Stinger anti-aircraft and Javelin anti-armour systems to advanced radars, military shortages are materialising across a wide spectrum of systems and these shortages are unlikely to be limited to this war. The situation will only be exacerbated over time as military systems become more complex and costly, creating more production difficulties and increasingly straining government budgets.

12. Prior to the war, NATO's level of ambition was to support two major joint operations and six smaller operations per year. In line with this, NATO Allies agreed in 2004 at the CNAD level to maintain strategic weapons stockpiles for a minimum of 30 days' use in any potential contingency. Yet, such levels have never been maintained. The lack of available stocks has even been demonstrated during Allied operations: during the Operation Unified Protector in Libya in 2011, for example, several NATO Allies ran out of precision munitions relatively early into the operation (DeYoung and Jaffe, 2011). Furthermore, it is projected to cost Germany USD 21 billion to rebuild their stockpiles to have the ammunition necessary for one month—30-days—of high-intensity warfare (*The Economist*, 2023c). Still, despite the challenges, NATO Allies have agreed to increase their baseline ammunition stockpiles moving forward, in recognition of the changed strategic environment (Siebold and Gray, 2023). Such a shift in policy is necessary to combat Russian

aggression, while also deterring other authoritarian powers from further testing the international order.

III- THE AUTHORITARIAN CHALLENGE OF TODAY AND THE MILITARY REQUIREMENTS OF YESTERDAY

13. NATO's 2022 Strategic Concept describes a threat environment defined by rising strategic competition and advancing authoritarianism (NATO, 2022b). Increasingly authoritarian powers are challenging the rules-based international order—undermining multilateral norms and institutions—in the hopes of reshaping the international environment to benefit and promote authoritarian models of governance. Russia's invasion of Ukraine is the most striking example, however China's belligerence in the South China Sea, its intimidation of Taiwan and Iran's military support for Russia during its invasion of Ukraine are also examples of states probing for the soft spots of the international system.

14. The combination of rising autocratic states seeking to blunt and replace the current international system and a NATO Alliance already burdened by its support of Ukraine presents a strategic challenge for NATO. To date, NATO Allies have been able to supply Ukraine with the systems it needs to succeed on the battlefield, but strains on defence supply chains are clear and mounting. If a second crisis emerges alongside Russia's invasion of Ukraine, military stockpiles may be pushed beyond their limits. In such a scenario, NATO Allies will be forced to make potentially costly decisions about what to prioritise and where and how to respond. In an age of growing strategic competition, such a scenario is possible. Two long-term trends have led to this moment: an era of relative peace in the Euro-Atlantic area which encouraged policymakers to decrease defence spending and the Global War on Terror which necessitated investment in vastly different military capabilities than required today.

A. POST-COLD WAR PEACE AND ITS IMPACT ON DEFENCE INVESTMENTS

15. The end of the Cold War drastically reshaped the security environment in Europe. After the collapse of the Soviet Union, concerns over a land war in Europe became increasingly unimaginable, and therefore, European and American policymakers chose to decrease their defence spending, reaping the so-called Peace Dividend. For instance, American spending on defence fell from a high during the Cold War of 9.2 percent of GDP to approximately 3 percent of GDP today (World Bank, 2023b). Similarly, in Germany it fell from 4.9 percent during the Cold War to roughly 1.5 percent and in France, it fell from a high of approximately 5.4 percent in the 1960s to roughly 2 percent of GDP today (World Bank, 2023; World Bank, 2023c).

16. Such reductions were standard across NATO and these reductions led to the slow decline of Allied defence industrial bases. A lack of sustained demand for military equipment led the businesses underpinning the defence industrial bases to shrink and disappear as factories closed and highly skilled workers found new jobs in other industries. During the 1990s and 2000s, this was not viewed as a major problem as the economies of Europe and North America adjusted to the post-Cold War world.

B. POST-9/11: NEW INVESTMENTS FOR COUNTERTERRORISM OPERATIONS AND EXPEDITIONARY CAMPAIGNS

17. The Peace Dividend was shaken by the Global War on Terror after the attacks of 11 September 2001 on the United States. While defence spending increased as the United States and its Allies and partners waged war and launched expeditionary campaigns and counterterrorism operations in the Middle East, Afghanistan and across Africa, and lead to a reciprocal growth in defence industrial bases, the military demands of counterinsurgency and counterterrorism strategies differ vastly from

those of industrial, attrition warfare. Counterinsurgency and counterterrorism largely emphasised the role of smaller force structures, with a spotlight on special-forces units designed for rapid deployments; lighter-expeditionary style forces became the norm, investment in the maintenance of large-scale defence structures rare.

18. The United States and its Allies always maintained an upper hand in terms of military technology, firepower and intelligence in the global counterinsurgency era. Heavy armour, such as artillery infantry fighting vehicles, was rarely required – main battle tanks, never. In Afghanistan, for example, NATO Allies almost never fired more than 300 rounds of artillery in a day and never had to focus on air-defence systems (Erlanger and Jakes, 2022). Governments demanded the weapon systems needed to counter terrorism and the private sector responded, becoming adept at rapidly producing the systems needed in Iraq, Afghanistan and other counterinsurgency/counterterrorism missions. However, this meant that the factories producing artillery, battle-tanks and advanced air defence systems continued to shrink.

19. These trends were not unique to any one country, but, instead, were broadly seen across the NATO Alliance. NATO Allies and partners spent 20 years fighting in a style—and funding defence systems—incompatible with the industrialised warfare currently taking place in Ukraine. Allies recognise they must adapt their defence industries and supply chains rapidly to meet the new strategic environment facing them: simply rebuilding the defence industrial bases during the Cold War, however, is insufficient. Despite the trench warfare in Ukraine in some ways resembling 1914–1918 Europe, Russia's invasion has highlighted how the nature of warfare has advanced and what systems NATO Allies and partners will likely need in future conflicts.

IV- THE CHANGING CHARACTERISTICS OF WAR DEMONSTRATED IN UKRAINE TODAY

20. Russia's invasion of Ukraine has demonstrated the changing characteristics of warfare. The increasing availability of autonomous systems, integrated yet dispersed cyber communications networks, and robust — often even open-sourced — Intelligence, Surveillance, and Reconnaissance data collection aided by the proliferation of space assets and adapted civilian software applications has upended battlefield dynamics, making it increasingly difficult to hide forces and other military assets. Ukraine's forces, though at a numerical disadvantage, have been able to incorporate technological innovation to great effect, breaking down battlefield asymmetry and eliminating Russian numerical advantages across the land, air and sea domains. However, while the fast-paced technology-driven advances have changed tactics and theatre strategies, they have not eliminated the necessity of being able to wield kinetic strikes effectively.

21. As such, the ability to process information quickly, to locate enemy positions and strike them with precision at distance, remains a decisive factor. The changing characteristics, noted above, have simply made battlefield mistakes even more costly. Therefore, today we are at a hybrid moment: advanced technology-driven military systems are vital, but they are also increasingly vulnerable to a myriad of factors such as access to space and cyber networks, as well as supply-chain access to microprocessors and rocket motors.

22. As a result, there is a persistent reliance on heavy exchanges of artillery and long-range precision-strike fire to try and circumvent a possible technological advantage of the adversary – the gruelling nature of the trench-based attritional warfare in Ukraine, for example, as one NATO interlocutor noted at a recent NATO PA meeting, "is showing us that modern warfare is just as much about bits and bots as it is about mud and blood". Certainly, while Russia's war in Ukraine is highly context driven—both militaries are heavily reliant on artillery due to their histories and constructs—it

is clear the near-to-medium term will require significant amounts of precision firepower coupled with the censors necessary to track and locate an adversary anywhere on the battlefield, as well as the conventional systems capable of operating in a less technology-dependent, more analogue environment when those systems are forced off line.

23. Consequently, future defence bases face a two-pronged challenge. First, they must produce long-range precision weapons systems on an industrial scale with the ammunition and other support they require; and second, they must maintain the industrial capacity to make the conventional systems and their ammunition available at the scale required to operate in a technology-degraded environment. Further, future war fighters will be required to integrate intelligence, surveillance, and reconnaissance on a similar scale to wage war efficiently.

24. NATO Allies and partners must, therefore, rebuild their defence industrial bases to meet the strategic challenges posed by the hybrid challenge on display today, while positioning themselves for tomorrow. To get there, several significant hurdles are in the way, ranging from limited factory capacity and qualified workers, to input component shortages, to the blunting impact of inflation on defence spending. These challenges are clearly demonstrated by the requirements of two systems Ukraine has relied upon throughout its defence: artillery ammunition and Javelin anti-tank systems.

V- EARLY DEFENCE INDUSTRIAL LESSONS FROM UKRAINE

25. Individual NATO Allies began providing Ukraine with military hardware long before Russia launched its full-scale invasion in February 2022. However, the invasion required NATO Allies to more than redouble their commitment to Ukraine's defence efforts. This translated very quickly to coordinating the inflows of massive amounts of **armour, air defences, artillery** and **ammunition** to assist Ukraine with both the building out of modern armed forces and the reconstitution of its forces burned out, broken down, or destroyed in battle.

26. To help Ukraine achieve this, Allies and partners have been both depleting their own military stockpiles and attempting to ramp up industrial production to provide arms to Ukraine. To date, NATO Allies have donated over EUR 70 billion of military assistance to Ukraine since Russia began its invasion (Trebesch et al., 2023). As part of this aid, the United States and the European Union have donated well over EUR 10 billion worth of heavy weaponry—excluding ammunition—to Ukraine (Trebesch et al., 2023). Included in these transfers are 352 howitzer systems (Cancian and Anderson, 2023). The United States alone has provided Ukraine with over 1,000,000 rounds of artillery ammunition (Cancian 2023). Yet, these donations do not merely provide Ukraine with new NATO standard equipment. Allies have also donated the legacy Soviet systems that Ukraine has long relied upon. Currently, Ukraine is in the middle of a transition, driven in part by Russia's invasion, away from the Soviet-era systems it has long relied upon and towards modern NATO standard systems. But, as the transition remains incomplete, Ukraine still needs Soviet-era equipment to support its military.

27. For example, Ukraine relies on three different of artillery ammunition sizes: 122 mm shells, 152 mm shells, and 155 mm shells (*Economist*, 2023c). The 122 mm and 152 mm shells are compatible with the legacy Soviet-era systems Ukraine inherited when it became independent of the USSR in 1991, while the 155 mm shells are the NATO-standard size and compatible with the influx of Western systems Ukraine has received since the invasion began. In its arsenal, at the start of the war, Ukraine had roughly 750 152 mm howitzers—which use 152 mm ammunition—and since the invasion, the West has provided Ukraine with approximately 352 155 mm howitzers (Cancian and Anderson, 2023). 152 mm howitzers, thus, still represent the backbone of Ukraine's artillery. However, the shortage of 152 mm rounds has reduced the value of the Soviet-era artillery and contributed to the West's decision to provide Ukraine with more NATO-standard 155 mm howitzers. Russia and

China—the two main producers of 152 mm artillery ammunition today—are, for obvious reasons, unwilling to supply Ukraine (Cancian and Anderson, 2023). As such, as the war has continued, Ukraine has become more reliant on 155 mm artillery shells donated by NATO Allies and partners.

28. Currently, the United States has the production capacity to make roughly 180,000 rounds of 155 mm artillery ammunition per year (*Economist*, 2023c), and could potentially ramp up production to 240,000 per year by the Spring of 2023 and 480,000 per year by the Spring of 2025 (Cancian, 2023). Similarly, Europe produced approximately 300,000 rounds of 155 mm artillery in 2022 (*Economist*, 2023c). Weapons producers are confident they can increase their production of 155 mm artillery ammunition to match increased demand. For example, Rheinmetall, a German arms manufacturer, believes it can increase production from 70,000 per year to 450,000 per year or more after acquiring Expal Systems, a Spanish ammunition producer (*Economist*, 2023c). With Ukraine firing between 5,000–6,000 rounds of artillery on average per day, or approximately 150,000–180,000 per month, the increased production is required both for this war, but also to sustain the Alliance if it is ever pulled into a comparable conflict (*Economist*, 2023c).

VI- DEMAND DRIVES PRODUCTION

29. The main obstacle to increasing production, however, is industrial capacity, and, therefore, time. Companies must reinvest in existing supply lines and, if necessary, create new ones — most notably the machinery required to forge the shell casings and the workforce necessary to operate them (*Economist*, 2023c). A second constraining factor is limited input supplies. For 155 mm artillery ammunition, this means increasing the supply of the two explosives typically used within the shells: IMX-101—which is only produced at one factory in the United States—and TNT (*Economist*, 2023c). A final constraining factor, however, is a simple one of marketplace dynamics: arms producers only produce what they project their clients—principally governments—will buy, and, prior to Russia's invasion of Ukraine, that meant only producing at the levels required to replace what was used during training (*Economist*, 2023c).

30. Yet, even after Russia's invasion of Ukraine, many governments are still failing to send new demand signals to the private sector. Several main issues are driving this demand signal confusion. First, ammunition is often deprioritised – militaries prioritise buying platforms, like aircraft or tanks, over the munitions they require because, while it is impossible to purchase nine-tenths of an aircraft carrier, it is possible to purchase only nine-tenths of its required ammunition (*Economist*, 2023c). Second, and relatedly, governments have, thus far, failed to sign multi-year contracts to purchase ammunition, leaving some companies hesitant to invest in their supply chains and production lines for fear that increased demand will disappear. The European Union has recently moved to address these shortcomings by announcing joint funding for ammunition purchases (Erlanger, 2023). Their model, which mirrors how the EU purchased the COVID-19 vaccine—pooling resources to offer manufacturers more money and demand, up-front, to ensure they increase their production capacity—is a promising start but will not solve the issue on its own.

31. Increasing production of 155 mm shells is relatively straightforward and centred on increasing industrial capacity — reopening factories, investing in the necessary workforce and improving the supply of input components. This mirrors the problems the Alliance will face as it works to increase the stockpiles of a range of ammunition and weapons systems. The older, or less technologically advanced systems will require increased industrial capacity to increase production. However, with more advanced—and expensive—weapons, like the Javelin anti-tank systems that proved critical in the early months of Russia's invasion, increasing production is more complex. These systems—which include everything from precision guided missiles to air defence systems—have more complex, and usually international supply chains, and will require more time and investment to increase production.

VII- ADVANCED SYSTEMS REQUIRE ADVANCED, COMPLEX, AND VULNERABLE SUPPLY CHAINS

32. The more technologically advanced a system, whether military or civilian, the more complex its supply chain is likely to be. Lockheed Martin, which produces the Javelin system in conjunction with Raytheon, is working to increase production levels from 2,000 per year to 4,100 per year moving forward (Gould, 2022). Yet, production increases will be limited by the complexities of the Javelin's supply chain. First, each Javelin missile contains about 250 microprocessors, usually sourced from Intel (Gould, 2022). Such reliance makes increased production of Javelin systems reliant on Intel's supply chains which are currently experiencing shortages due to the constrained availability of the required manufacturing equipment, an issue that could extend into 2024 (Stankiewicz 2022).

33. A second limiting factor is the rocket's motor, which, like microprocessors, is complex enough to have its own supply chains and, therefore, supply chain issues (Cameron, 2023). For example, after the increase in air travel following the pandemic, defence contractors saw some of their suppliers of mechanical and electronic parts switch back to providing for Airbus and Boeing after supplying defence companies during the pandemic, limiting defence production as defence contractors sourced new suppliers of critical parts (Cameron, 2023).

34. The United States still orders the Javelin system, however, which will allow a more seamless production increase than, for example, the Stinger anti-air system. When the US attempted to order more Stinger missiles for Ukraine at the beginning of the war, it was the first time they had placed an order for Stingers in 18 years (Cameron, 2023). While working to jumpstart the supply line—Raytheon had produced a small number of Stingers for foreign clients every year—Raytheon discovered that some of their suppliers had gone out of business and they were forced to redesign parts to increase production (Cameron, 2023).

35. Despite the specificity of the challenges faced by increased artillery ammunition, Javelin and Stinger production, these systems are representative of a broader challenge across the NATO Alliance. High-intensity warfare uses military stockpiles at devastating rates. As a conflict extends past its first 30 days—NATO's current requirement for ammunition stockpiles—the Alliance will have to rely on its defence industrial bases for support. Similar, although unique, supply chain constraints are likely to appear no matter which systems NATO Allies are relying on in future conflicts. During the war in Ukraine, artillery ammunition, Javelins, and Stingers are in high demand. However, that is unlikely to be the exact case again. Nevertheless, there is one issue that cuts across NATO defence industrial bases that must be addressed before any future crisis: the lack of cooperation.

VIII- ALLIANCE-WIDE DEFENCE INDUSTRIAL COOPERATION STILL NOT STRONG ENOUGH

36. Broadly speaking, and despite past efforts to do so, NATO Allies do not work together across their defence industrial bases to build and procure military systems sufficiently. For example, European states rely on 29 different destroyers, 17 tanks or personnel carriers and 20 fighter planes, while the US uses four destroyers, one personnel carrier and six different fighter planes (Bergmann and Besch, 2023). National defence industries have not consolidated across Europe to create a more efficient European defence industry: instead, there are 25 different procurement processes and defence spending remains fragmented and aimed at supporting national military industrial complexes (Bergmann and Besch, 2023).

37. There are several reasons for this. First, despite the agreed upon Strategic Concept, NATO Allies largely do not view threats the same way and they build their defence policies nationally

(Monaghan, 2023). Further, they rely on their own domestic industries to meet their domestic demand for defence capabilities. However, this creates redundancies across the Alliance, as several partners develop comparable systems when cooperating would have saved time, funds and produced an indistinguishable result (Monaghan, 2023). The Conference of National Armaments Directors (CNAD) can (or should) play and important role as a coordination platform in this regard.

38. Second, NATO Allies tend to focus on short-term purchases versus long-term investments. For instance, they procure non-European equipment when they cannot produce it themselves, often choosing to purchase American equipment instead of cooperating transnationally to produce a European alternative (Monaghan, 2023). While such expenditures are justifiable in the current threat environment, when arming Ukraine is a top priority, it limits the ability of the Alliance to develop greater, more resilient cross-border supply chains. One important aspect of procurement and 'Europeanness' is the continued blocking of non-EU Allies by EU Allies. The irony of calling for increased cooperation with NATO on the one hand and choosing to ignore some NATO Allies, on the other, is stark. There is a search for a united single procurement market within the European Union. This must be implemented in cooperation and coordination with NATO, allowing the fullest involvement of non-EU Allies to prevent unnecessary duplications and to allow for increased benefits from economies of scale.

39. Third, Allied procurement cycles and military requirements rarely align, making joint procurements difficult. Furthermore, the more advanced—and therefore specific—a military platform is, the more difficult it is for such a system to fit the needs of multiple militaries (Monaghan, 2023). Finally, there are incentives for individual countries to have their own, national defence industrial bases to rely on. In sum, this leads to inefficiencies across NATO Allies' defence industrial bases, increasing the costs of military procurements.

IX- THE CHALLENGES

40. The supply chains for artillery ammunition, anti-tank munitions and the other defence systems Allies require cannot be rebuilt overnight. Investing in the defence industry today will not create noticeable effects for years to come as companies require time to increase investment, open new factories or reopen closed factories and recruit and train the workforce required to make new systems. However, while Russia has shattered the myth that war would not return to Europe and NATO states are now increasing their demand, it is not clear how long such high demand will last. If companies make investments to increase their production today, then the war ends and demand disappears, they are likely to go bankrupt (Langfitt, 2023). Therefore, it is imperative governments send long-term demand signals, preferably with multi-year contracts, to help support their defence industrial bases.

41. As NATO Allies agreed in the 2022 Strategic Concept, the Euro-Atlantic space is no longer at peace since Russia's renewed invasion of Ukraine, and the threat environment has worsened since (NATO, 2022b). To prepare Allies for the degraded threat environment post-Russia's full-scale invasion of Ukraine, Allies also endorsed a significant overhaul of their force structures and defence posture in Madrid; which included a call for Allies to adopt a new 'baseline' for deterrence and defence, undergirded by a new NATO Force Model calling for Allies to collectively have 100,000 troops ready to be deployed in less than ten days, and another 200,000 in a month. These 'readiness' expectations far surpassed any post-Cold War requirements.

42. Despite these agreed upon ambitions, many Allies have not yet made the necessary investments in their militaries to send long-term demand signals to the private sector in response to these changing dynamics. Governments throughout North America and Europe face several domestic and international challenges, including inflation, a potential global recession and climate

change which they must also prioritise. The long-term demand signals that the private sector require are likely to be accompanied by an overall increase in defence spending.

43. To both continue to arm Ukraine, rebuild military stockpiles, and meet NATO's new force structure requirements Allies will have to spend more than 2 percent of the gross domestic product (GDP) on their militaries. Encouragingly, NATO Allies took a significant step to achieve this at the Vilnius summit. Underscoring their commitments to Article 3 of the Washington Treaty, Allies made 'an enduring commitment to invest at least 2% of GDP on defence. Allies underscore why 2 percent (or more) of GDP must be dedicated to defence spending: 'We affirm that in many cases, expenditure beyond 2% of GDP will be needed in order to remedy existing shortfalls and meet the requirements across all domains arising from a more contested security order' (NATO, 2023c).

44. Also in Vilnius, Allies agreed to a trio of new regional defence plans signalling the largest overhaul of NATO's military structure and posture in the post-Cold War era. The new plans will not only allocate responsibilities for the higher number of ready forces, but it will also compel Allies to set new priorities for procurement and investment to fulfil their new responsibilities. Allies have identified five key immediate priorities: combat-capable ground forces; integrated air and missile-defence systems, long-range firepower, advanced digital networks, and logistics (NATO, 2023c).

45. Yet, the increase in defence spending required to meet the new strategic environment will demand political backing in each individual country. Politicians will have to expend political capital and convince their domestic populations that the new threat environment requires increased military spending; a task that will require asymmetrical efforts across the Alliance as some publics are more open to increased defence expenditures than others.

46. Finally, there are inter-Ally barriers limiting defence cooperation production including export controls, inter-ally sanctions and discrete national supply chains. These create inefficiencies among the Alliance, when effectiveness is most needed, if not indispensable, and increase the cost of defence production by limiting potential economies of scale. Blue-on-blue sanctions do not benefit Allies, nor do they help Alliance unity when solidarity is most required. Mitigating, or eliminating, these barriers will allow the Alliance to make more efficient—and stronger—defence supply chains allowing states to rebuild and remake their defence stockpiles more easily. Forums currently exist to increase cooperation within the defence industries of member states, like the NATO Defence Planning Process (NDPP), the NATO Industry Forum (NIF) and the Defence Innovation Accelerator for the North Atlantic (DIANA). However, finding the political will to lower intra-alliance barriers and more fully integrate defence industrial supply chains will be important moving forward. Encouragingly, Allies recognise this and expressed a clear political will to do so at the Vilnius Summit: '[…] consistent with our commitments, obligations and processes, we will reduce and eliminate, as appropriate, obstacles to defence trade and investment among Allies' (NATO, 2023c).

X- THE GOOD NEWS

47. Russia is suffering from similar problems as Ukraine and its western backers in sustaining its military hardware. For example, Russia has lost somewhere between 2,000–3,250 tanks since it launched its invasion (*Economist*, 2023a; Rathbone, 2023). Further, Russia has only one factory producing new tanks, and currently, due to financial mismanagement and debt, can only produce approximately 20 tanks per month (*Economist*, 2023a). This is a far cry from the required replacement rate of 150 the war has demanded so far, or from the 1,000 per month the Soviet Union could produce during the Second World War (*Economist*, 2023a). In response, Russia has turned to refurbishing older tanks with new armour, guns and improved technology—like night vision and digital communications equipment—to rebuild its tank fleet (*Economist*, 2023a). However, even after opening two new tank refurbishment plants to bring the total to five, Russia will only be able to

refurbish approximately 90 tanks per month, again leaving it below replacement levels (*Economist*, 2023a).

48. A similar situation extends to artillery. In the early stages of its invasion, Russia fired between 20,000–60,000 artillery shells per day, rapidly depleting stockpiles (Bertrand et al., 2023). As such, by January 2023, Russian artillery fire rates declined approximately 75 percent from their previous peak in a clear indication the armed forces need to conserve stocks (Bertrand et al., 2023).

49. Domestically, Russia is addressing military supply demands by transitioning to a war economy and redirecting supply chains and repurposing factories to support its military operations in Ukraine. By the end of 2022, Russian defence firms shifted to three eight-hour shifts, 24 hours a day, even relying on prison labour to fulfil orders (*Economist*, 2023b). The Kremlin has also established a new government council to coordinate government and industry in support of its war efforts (*Economist*, 2023b). Yet, even with a war economy, Russian industry cannot sustain high fire rates, so to refill their declining weapons reserves, it has sought external suppliers – for example, procuring 152 mm artillery shells from North Korea, drones from Iran, and, according to open-source reporting, it is actively seeking Chinese support as well (Barnes, 2022; *Economist*, 2023). China's production potential—driven by its state-led economy and its concept of civilian-military fusion—could pose a strategic challenge to the Alliance both in Ukraine and in the broader international environment should Beijing decide to support Russia via the provision of significant military aid. Allies made their position on this matter clear at the Vilnius Summit: 'We particularly call on the PRC to act responsibly and refrain from providing any lethal aid to Russia' (NATO, 2023c).

XI- OPTIMISM THROUGH ADAPTION

50. There are reasons to be optimistic about NATO's defence industrial bases. First, some experts believe the countries providing Ukraine with the equipment it requires to defend itself should be able to sustain the effort throughout the war (Cancian, 2022). While stockpiles of some systems are currently running low, there remain enough comparable systems in western artilleries to ensure Ukraine remains in the fight (Cancian, 2022). NATO Allies may have to court more risk for themselves, as they donate more of their stockpiles to Ukraine, however as new production capacity comes online, the situation will improve. Ukraine, itself, represents a prime example of this.

51. At the beginning of the war, Ukraine quickly depleted its pre-war supplies of 122 mm artillery ammunition and while Ukraine's partners tried to resupply it, global stocks of 122 mm ammunition were also quickly depleted. Yet, in response to war demands, Ukraine has again begun producing its own 152 mm and 122 mm artillery ammunition at home (Helfrich, 2023). It is unclear exactly how much Ukraine can produce domestically—Ukroboronprom, the Ukrainian manufacturer, has only stated they are making both 152 and 122 mm artillery ammunition at locations dispersed throughout the country—but it is unlikely they will become self-sufficient during the war (Helfrich, 2023).

52. After the war, however, Ukraine could come to replace Russia as a supplier of the Soviet-era systems upon which many countries—like other former CIS (Commonwealth of Independent States) countries, India and Egypt for example—still rely (Danylyuk, 2023). Working to replace Russia in the global arms market would help ensure Ukrainian defence capabilities, while limiting Russia's international finances and its influence in critical markets (Danylyuk, 2023). Similarly, in response to the newfound demand for Soviet-era equipment, new production plants are reopening in other eastern European countries. Specifically, Terem, an arms-manufacturer based in Bulgaria, has recently reopened an artillery production plant it had closed 25 years ago at the end of the Cold War to produce 122 mm artillery ammunition (Gibbon-Neff et al., 2023). Factory re-openings could be the beginning of a broader trend in the recreation of military industrial bases.

53. Finally, NATO Allies have identified a key challenge—the underinvestment in their defence industrial bases—before it became a glaring weakness. Investments in Allied militaries are already increasing and there are growing calls to strengthen defence industrial bases across the Alliance. Russia's invasion of Ukraine has acted as a clarion call for the Alliance and has galvanised it to prepare for a new threat environment before that environment generates a direct strategic crisis.

XII- DEFENCE COOPERATION WITHIN NATO, THE EUROPEAN UNION AND MULTINATIONAL ORGANISATIONS

54. Inter-Allied defence cooperation does, in fact, have a long history. Inter-Allied cooperation on larger platforms began in earnest in the 1960s and 1970s; the first large-scale project being the Tornado jet fighter, built in collaboration between Germany, Italy and the United Kingdom starting in the late 1960s (Fiott and Maulny, 2021). Larger transatlantic cooperation on defence platforms only really began in the late 1980s. Still, with a few notable exceptions, such as the recent F-35 Joint Strike Fighter or the MLRS, larger joint ventures have largely fallen apart before completion, due to recurring challenges limiting the size and scope of the full transatlantic potential. Experts note with regularity these are due to a lack of reciprocal opening of defence markets on both sides of the Atlantic, a fragmented European DTIB, a unified US market versus a non-unified European market, as well as overly restrictive export legislation and restrictions on technology sharing (Fiott and Maulny, 2021). They also note that successful cooperative development programmes often have few partners and a clear leader (Aries, et.al., 2023).

55. It is only relatively recently that NATO has tried to marshal forward the political will and practical means to help build Alliance-wide defence industry collaboration for a stronger joint future. Several important recent initiatives have emerged in recent few years; DIANA launched at the 2021 Brussels Summit and the Innovation Fund are the most salient examples. New initiatives, such as the European Sky Shied Initiative (ESSI) are also worth mentioning for their efforts to foster Alliance-wide procurement for large-scale platform acquisition. While these initiatives demonstrate it is possible to work across borders to develop a broader defence industrial base, they are not enough, and they highlight the challenge of greater defence industrial integration. To create the defence industries the Alliance needs, still greater investment and greater cooperation will be required.

A. THE NATO DEFENCE PLANNING PROCESS AND THE CONFERENCE OF NATIONAL ARMAMENTS DIRECTORS

56. NATO does have several existing mechanisms that can help facilitate inter-Allied and partner cooperation on armaments procurement. Key among them are the NATO Defence Planning Process (NDPP), the NATO Support and Procurement Agency (NSPA), and the Conference of National Armaments Directors (CNAD). Allies view the NDPP as a primary means for Allies to identify, develop, and integrate collectively the capability requirements needed across the Alliance to meet the deterrence and defence objectives of the Strategic Concept. The NDPP is flexible enough to respond to both the circumstances of individual Allies as well as the needs of the Alliance as a whole – it works across 14 different planning domains[2] (NATO, 2022c). At the Vilnius summit, Allies pledged to guarantee the NDPP is fit for purpose to ensure the Alliance maintains its technological edge, with an eye on the challenges presented by emerging and disruptive technologies, and 'ensure

[2] Specifically, they are: air and missile defence; aviation planning; armaments; civil preparedness consultation; command and control; cyber defence; force planning; intelligence; logistics; medical; nuclear deterrence; resources; science and technology; and standardization and interoperability.

timely integration' (NATO, 2023c). Allies also noted their intention 'to significantly increase' stockpiles of a number of 'battle-decisive munitions' (NATO, 2023c).

57. The NSPA is the Alliance's key platform supporting multinational acquisitions and collective logistics. The Agency plays, therefore, an essential role linking industry and NATO member states (and partners), thereby helping find cost-effective, efficient, and fit-for-purpose solutions to Allies' defence demands (NATO, 2023d). The NSPA will ultimately also play an important role in sending the sustained demand signals to Allies' defence industrial bases needed to implement the new baseline for defence and deterrence Allies outlined in the 2022 Strategic Concept. As NSPA General Manager, Stacy Cummings, told Defence and Security Committee members at the Spring Session in Luxembourg: 'To build and sustain stockpiles for high-intensity operations as rapidly as possible, it will be necessary to send a strong enduring multinational demand signal to industry, to encourage the generation of additional and enduring manufacturing capacity, with the supporting supply chains, so that stockpiles can be replenished where donations have been made to Ukraine' (NATO PA, 2023).

58. The NDPP and the NSPA are also key linking elements of NATO-assisted multinational cooperative projects. Seeking economies of scale, Allies work through NATO to identify multinational capability cooperation opportunities and develop High Visibility Projects areas essential to effective defence such as ammunition, air-to-air refuelling, and command and control (NATO, 2023e). NATO coordinates with the European Union to avoid duplication and ensure complementarity (NATO, 2023e). Currently, NATO is working on four multinational projects related to ammunition: Air Battle Decisive Munitions (ABDM), Land Battle Decisive Munitions (LBDM), Maritime Battle Decisive Munitions (MBDM), and Multinational Ammunition Warehousing Initiative (MAWI) (NATO, 2023e).

59. The CNAD is the senior NATO committee responsible for promoting inter-Allied (and partner) cooperation on armaments procurement (NATO, 2023b). The Conference brings together the top national officials responsible for defence procurement within NATO states and partners and is tasked with identifying collaborative opportunities in the research, development, and production of military equipment (NATO, 2023). As such, it should be the main forum for organising cross-border collaboration and addressing duplication as Allies rebuild their defence industrial bases.

60. In response to Russia's February 2022 full-scale invasion of Ukraine, the CNAD created a second group focused on providing for Ukraine's defence made up of the national armaments directors from the countries within the Ukraine Defence Contact Group (UDCG) (Ismay and Jakes, 2022). This group first met in September 2022 and has worked to provide long-term support to Ukraine, increase production of critical systems, and mitigate supply chain constraints moving forward (US DoD, 2022a). Specifically, the UDCG NAD meetings focus on increasing production in four key areas 1) ground-based, long-range fires, 2) air defence systems, 3) air-to-ground capabilities, and 4) sustainment support – all of which align with the immediate post-Vilnius priorities outlined above (US DoD, 2022a). Both the UDCG NAD and the CNAD group will be critical moving forward as NATO reacts to a changing world and NATO Allies increase their defence spending and military procurements. Together, the two groups can ensure that NATO Allies' efforts to increase defence procurements are efficient, additive, and interoperable; requirements to ensure Ukraine's defence but also improve NATO Allies' own force structure moving forward in response to the rapidly evolving security environment and in line with the Strategic Concept.

B. DIANA INITIATIVE AND INNOVATION FUND

61. The 2022 Strategic Concept adopted by NATO underlines the importance of disruptive and emerging technologies for the Alliance moving forward (NATO, 2022b). To help the Alliance develop and integrate these technologies—like artificial intelligence, big-date processing, quantum-enabled computing, and autonomous systems, among others—NATO launched DIANA (NATO, 2022). DIANA is designed to operate as a tech-financing hub, where public investment funds and private

venture capital can be matched with start-up or small-medium sized enterprises working on advanced defence technologies (NATO, 2023). DIANA, coupled with the most recently announced Innovation Fund, will allow companies to connect with investors that have been vetted by NATO advisors. The goal is to harness private-sector technological development to strengthen NATO by connecting defence personnel directly with the private sector. The initiative will have two regional offices, in the United Kingdom in Europe and Canada in North America, 63 test centres and 9 accelerators (NATO, 2022).

62. The Defence Innovation Fund is designed to complement DIANA. It is the first multi-sovereign venture capital fund and will invest in start-ups and venture funds developing dual use emerging and disruptive technologies deemed a priority by NATO. These include artificial intelligence, big-data processing, quantum-enabled technologies, autonomous systems, biotechnology and human enhancement, novel materials, energy, propulsion and space (NATO, 2022). Allies initially seeded the Fund with a EUR 1 billion investment (NATO, 2022a).

C. EUROPEAN SKY SHIELD INITIATIVE

63. Experts agree that years of underinvestment in European air and missile defences has led to serious gaps in ground-based air defence, command and control, and preparation for emerging threats (Monaghan and Christianson, 2023). In response to these gaps, and the clarity of the missile and drone threat demonstrated during Russia's invasion of Ukraine, a cohort of NATO European Allies launched the European Sky Shield Initiative (ESSI) on 13 October 2022 on the margins of a NATO defence ministerial meeting. ESSI is a German-led programme designed to strengthen NATO's Integrated Air and Missile Defence (IAMD) by facilitating the multi-national acquisition and integration of air defence capabilities by European nations, principally by relying on pre-existing NATO cooperation frameworks like the Rapid Acquisition Track within NATO's Modular Ground-Based Air Defence High Visibility Project (NATO, 2023a). The Initiative also hopes to develop new air and missile defence capabilities and, as a result, bolster the European technology and industrial base via support for common, joint, and national acquisitions (Monaghan and Christianson, 2023).

64. ESSI currently has 17 participants: 16 NATO Allies and Sweden. The 16 current NATO members of ESSI are: Germany, the United Kingdom, Belgium, the Netherlands, the Czech Republic, Slovakia, Hungary, Slovenia, Romania, Bulgaria, Lithuania, Latvia, Estonia, Denmark, Norway, and Finland. Notably, major European military powers—including France and Poland—are not currently involved with ESSI. Austria and Switzerland have also expressed their desire to join the initiative, which will bring the total number of participants to 19.

65. While the need for greater European air defence is clear and the European Sky Shield Initiative represents a sea change in how Europe views air defence, experts have highlighted several strategic challenges that must be overcome to be successful. First, the political, economic, and military challenges inherent to defence cooperation are already hindering the project (Monaghan and Christianson, 2023). This can clearly be seen in the refusal of several large European powers to join ESSI. For example, France and Italy have not signed up to ESSI as they argue it does not take into account the impact the programme will have on missile defence system producers in Europe, as the initiative relies heavily on non-EU systems, which not only undermines future potential for EU producers, but also subjects the EU to potential external constraints, which in turn presents potential future vulnerabilities (Vincent, 2023). Second, ESSI currently lacks clear goals and focus, and is potentially burdened by its large number of participants, emerging political disagreements over European air defence, and the rapidly evolving nature of the threat (Monaghan and Christianson, 2023). Greater joint-procurement among NATO Allies is a necessity moving forward, and the ESSI has potential - but, to succeed and help strengthen NATO, it must overcome these early challenges.

D. THE DEFENCE INDUSTRIAL BASE OF THE FUTURE

66. While DIANA and the Innovation Fund will provide NATO with a framework and the funds to foster the development of emerging and disruptive technologies, their successes are unlikely to solve Alliance issues within the defence industrial base highlighted by Russia's invasion of Ukraine. For that, the Alliance members must re-evaluate how they procure defence systems and support the defence industrial base. However, DIANA, the Innovation Fund and ESSI all demonstrate that Allies are willing—in certain circumstances—to work across borders to solve military challenges. Learning from these instances, and expanding them in the future, will allow NATO to ensure that it has the resources it needs to properly deter and defend the Alliance.

67. Rebuilding Allied weapons' stockpiles depleted by Russia's invasion of Ukraine will be increasingly expensive as NATO transitions to higher technology platforms and ammunition. However, multinational capability development will allow the Alliance to increase its collective purchasing power, increase interoperability and reduce costs. Investments in cross-border collaboration are necessary now to prepare for future conflicts and to ensure NATO can continue its deterrence and defence posture.

E. EUROPEAN DEFENCE PROCUREMENT AND THE EUROPEAN DEFENCE AGENCY

68. In recent years, the EU has launched several initiatives and instruments to facilitate better defence industrial cooperation. The European Defence Agency (EDA) is the most significant, but, as it focuses on engendering stronger research and development, it will take time to see the fruits of much of the EDA's current efforts given the significant time horizons to produce advanced modern defence systems. Two new instruments, however, encourage the procurement of EU-origin products and may deliver the faster and more tangible results: the European Defence Investment Programme (EDIP) and the European Defence Industry Reinforcement Through Common Procurement Act (EDIRPA). EDIRPA is designed to avoid competition between EU member states for the same products, thereby facilitate cost savings – the instrument was announced as a means to address urgent and critical needs for defence products by members states as a result of Russia's aggression against Ukraine (EC, 2022). Experts note, however, that the initial 500 million Euro fund for EDIRPA is likely far too small to have the desired impact, given the scale of spending on defence procurement annually by member states (Aries, et.al., 2023) Early evidence is that EU member states are in fact continuing to prefer off the shelf procurement (Aries, et.al., 2023).

69. The EDA launched its "Collaborative Procurement of Ammunition" project focused on joint ammunition procurement with the support of 24 member states and Norway (European Defence Agency, 2023). The project creates an opportunity for EU member states and Norway to proceed along two parallel paths in ammunition procurement. In the first, participating states will focus on the joint procurement of 155mm artillery rounds over a two-year period (European Defence Agency, 2023). In the second, participating states will collaborate over a seven-year period to procure a broader range of ammunition to ensure states have necessary stockpiles during crises (European Defence Agency, 2023). The project is designed to replenish member states' national stockpiles and/or aid Ukraine as the project does not preclude national decision making (European Defence Agency, 2023). The central focus is to provide the defence industry with a clear demand signal to increase production of ammunition and maintain higher levels of production over time, thereby strengthening the defence industrial base within Europe. All members of the European Defence Agency are allowed to participate (European Defence Agency, 2023). More broadly, the European Union has committed to spending EUR 1 billion on the joint procurement of ammunition over the next year—beginning in May 2023—in support of Ukraine (Brzozowski and Pugnet, 2023). The agreement allows for the joint procurement of artillery ammunition, and potentially missiles, "from economic operators established in the European Union or Norway producing these ammunitions and missiles in the European Union and Norway" (Brzozowksi and Pugnet, 2023).

Systems that have “undergone an important stage of manufacturing in the Union or Norway, which consists of final assembly, shall also be deemed eligible” (Brzozowski and Pugnet, 2023). The participating states can either procure the ammunition jointly or through the EDA to be eligible for reimbursement from the one billion Euro fund (Brzozowksi and Pugnet, 2023).

70. While the joint procurement of ammunition is a step in the right direction for joint procurement of military equipment within Europe, the EDA only supports its members. This means, NATO Allies who are not members of the European Union are barred from participating. This notably includes Türkiye, the United Kingdom, and the United States, among others. While Norway was able to join the “Collaborative Procurement of Ammunition” project given its relations with the European Union, opening the project to broader participation from states within the Alliance would increase its impact and efficiency.

XIII- THE LONG-TERM IMPLICATIONS OF THE NEW STRATEGIC ENVIRONMENT

71. The new strategic environment demands stronger defence industrial bases to maintain NATO's ability to deter and defend in the future. Russia's invasion of Ukraine is unlikely to be the last major challenge to the rules-based international order. The 2022 Strategic Concept states that “the deepening strategic partnership between the People's Republic of China and the Russian Federation and their mutually reinforcing attempts to undercut the rules-based international order run counter to our values and interests” (NATO 2022b). The PRC relies on its entire arsenal of state power—including economic, political, and military —to attempt to create a global order more welcoming to authoritarian governments, because it is clear the CCP views this as essential to its own survival. Furthermore, open-source reporting has stated that the PRC is considering providing lethal aid—namely artillery ammunition—to Russia in support of its invasion of Ukraine (*Economist*, 2023). The PRC views the invasion, and its eventual outcome, as a test of the international system and of the West's ability to defend it.

72. Russia is directly challenging key pillars of the post-Cold War international order, including norms against the might-makes-right foreign policies that defined earlier periods. A Russian victory—and thus a failure by NATO Allies and partners to sustain Ukraine's defence—would have dramatic consequences in the short-, medium- and long-term for the NATO Alliance and the international system more broadly. It would likely lead to increased Russian aggression against NATO throughout Eastern Europe.

73. Furthermore, Russia’s success would lead other authoritarian powers to reconsider the risks and costs associated with using force to change the international system. Such a scenario could lead directly to a crisis between a NATO Ally and an authoritarian power as authoritarian states would discount Western security guarantees to the point where military adventurism could appear rational. States throughout the international system would reconsider their own positions within the international community and question whether Allies can uphold their security commitments. Overall, and over time, the international system would become less stable and more open to authoritarian powers – decreasing global security, threatening the values and interests of NATO states and dramatically increasing the demands on NATO to provide security.

74. NATO is working to uphold the status quo and maintain the rules-based international order it has supported since its founding. However, without improved defence industrial bases, such a mission will be impossible. The defence industries are the backstop of national military power upon which NATO relies. Without a strong defence industrial base, national militaries will not have the supplies they need beyond what they have stockpiled in advance. As Russia's invasion of Ukraine has demonstrated, high-intensity warfare between near-peer adversaries uses ammunition stockpiles at alarming rates, almost immediately requiring defence manufactures to increase

production dramatically to keep militaries in the fight. But, as technology progresses and military systems become more complex, maintaining the supply chains that are the lifeblood of the defence industry will become more expensive and more difficult.

75. The growing complexity of defence supply chains will require greater intra-Alliance cooperation to produce defensive systems; requiring therefore the Alliance moves past domestic defence industrial bases to a more Alliance-wide defence industrial base. Such cross-border cooperation will help lower the costs placed on domestic governments while maintaining output and increasing the resilience of supply.

76. However, without investment in defence industries, such improvement is impossible and deterrence will collapse as adversaries believe they can succeed through aggression. In the end, investing in the defence industrial base today is the most cost-efficient option given the increased threat environment NATO articulated in the 2022 Strategic Concept. Investments now will help ensure that NATO Allies can continue to arm Ukraine, while also modernising defence industrial bases across the Alliance to ensure they can produce the required quantities of the systems and ammunition necessary to deter, and if need be succeed in, any future conflict.

XIV- CONCLUSION AND RECOMMENDATIONS

77. Russia's invasion of Ukraine has starkly demonstrated the new strategic environment NATO must operate within – one defined by rising revisionist powers looking to thwart the rules-based international order Allies have worked to strengthen and expand since the end of WWII and, particularly, since the end of Cold War. Allies have rushed military support to Ukraine to ensure it has the means to defend its sovereignty and territorial integrity, understanding the implications of a Russian victory. Such efforts, however, have highlighted the fragility within the defence industrial bases of NATO Allies as shortages of critical systems and their input parts have materialised.

78. Understanding the consequences of this challenge to the global rules-based international order is essential for NATO Parliamentarians. A more threatening strategic environment requires a greater investment in defence to ensure NATO can continue to fulfil its three core tasks of deterrence and defence, crisis prevention and management and cooperative security. The defence industrial bases of NATO Allies are the backstop to their national power and their ability to surge production is critical to maintaining NATO's posture.

79. To do so, however, Allied defence industries must be modernised and rebuilt to supply the systems NATO will need to deter any future war and, if need be, win it. Russia's invasion of Ukraine has underscored this reality and the issues within the supply chains of critical systems have highlighted a strategic challenge NATO must confront.

80. There are signals of resolve and determination by NATO to take on this challenge: At the July summit in Vilnius, Allies demonstrated the political will to revive their defence industrial bases and break down barriers to strong transatlantic defence trade and investment. The announced Defence Production Action Plan seeks to harness Allied potential to meet NATO capability targets, which in turn will underwrite the Alliance's new defence and deterrence baseline. Strong and resilient inter-Allied defence-industrial trade and investment is essential to maintaining the Alliance's leading edge in an era of growing great power competition.

81. Achieving the goals of the Defence Production Action Plan, however, will be an enduring challenge requiring sustained political will and investment over the long term. This draft report recommends Allied governments pursue the following key measures:

- **Increase defence spending.** The strategic environment NATO operates in has fundamentally changed as stated in the 2022 Strategic Concept. Rising authoritarian powers are now pushing back against the rules-based international order established after World War II and cemented after the Cold War. Yet, despite a shared recognition, Allied defence spending has not increased to levels commensurate with the new threat environment or the levels necessary to rebuild defence industrial bases. Currently, only nine Allies spend the required 2 percent of GDP on defence. Allies took the right step by committing to invest at least 2 percent of GDP on Defence in Vilnius. The defence investment needed to maintain the technological and qualitative edge, Allies noted in Vilnius, requires strong intra-Alliance defence cooperation and resilient supply chains.

- **Audit NATO Allies' military hardware.** After Germany approved the transfer of Leopard tanks to Ukraine, many countries discovered that their tank inventories required refurbishment—which could take months—before they would be battle-ready (Solomon, et al., 2023). Similar situations may exist with other military equipment within the Alliance. Therefore, NATO Allies should audit their military stockpiles to ensure their equipment is functioning, meets NATO standards and quantity requirements and is ready for rapid deployment in an emergency. In situations where equipment is not up to NATO standard, or cannot be deployed quickly, refurbishments should be completed now, before a crisis materialises.

- **Increase the supply of ammunition stockpiles throughout the Alliance.** NATO is already moving in this direction with its commitment in Vilnius to increase ammunition stockpile requirements. That is a step in the right direction. It is estimated that NATO's European members only have approximately 10 percent of the military stockpiles required for the initial stages of a European war (*Economist*, 2023c). This reality not only calls into question the military readiness of NATO countries, but also threatens NATO's deterrence capability. NATO cannot, however, simply re-stock the equipment that has been most useful during Russia's invasion of Ukraine. Russia's war against Ukraine is heavily context-dependent. Any potential future conflict will likely differ drastically. As such, NATO Allies should increase their ammunition stockpiles with an eye towards what will be most necessary for NATO's contingency planning and not what has been most demanded by Ukraine.

- **Purchase ammunition using multi-year contracts.** The private companies that constitute the defence industrial base respond to market incentives when determining their production capacity. As military suppliers, they have few customers – usually only their domestic government. As such, their production potential is geared to their perception of what their government will demand. For decades, with respect to ammunition, this has been defined by how much ammunition is required for training exercises. After Russia's invasion of Ukraine, this is no longer the case. Therefore, governments must send new demand signals to their defence industrial bases to increase production. However, increased production requires increased investment on the part of private companies – investments that could risk the health of these companies if demand is not sustained over time. Accordingly, governments should shift to multi-year contracts in their defence orders to provide the private sector the security it needs to make long-term investments to surge production during crises.

- **Lower inter-alliance barriers to cooperation on defence production.** Inter-alliance barriers to cooperation in defence production, as well as sanctions and obstacles to defence investment and trade between Allies, create more inefficient and less resilient supply chains, which increase the costs of military hardware, and undermines Alliance solidarity. NATO Allies, consequently, spend more money on fewer capabilities. In an era of increasing geopolitical competition that necessitates rebuilding Allied militaries, such inefficiencies are counterproductive. NATO Allies should work harder to lower, and ideally eliminate, inter-alliance sanctions and other barriers to cooperation. For example, by issuing more licencing agreements—approving foreign factories to produce military systems like the Javelin or

howitzer rounds—the defence industrial base can be internationalised and allow states to capitalise on their comparative advantages, lowering costs and increase resilience. Allies expressed a strong political will to do so at the Vilnius Summit, focused action must now follow.

- **Move towards European-wide purchases of key military equipment.** The European Union is moving in this direction with different proposals under consideration to pool resources and purchase 155 mm artillery shells in bulk for Ukraine (Erlanger, 2023). However, this is not enough and this effort should not be limited to artillery. It must also be implemented in cooperation. And coordination with NATO, allowing the fullest involvement of Non-EU Allies to prevent unnecessary duplications and benefit more effectively from economies of scale. Europe should act more concertedly as a whole, especially when purchasing military equipment that can be standardised across countries. The purchases would be similar to EU measures to acquire COVID-19 vaccines in bulk – pooling resources to offer manufacturers more money and demand, up-front, to ensure they increase their production capacity.

BIBLIOGRAPHY

Ackerman, Elliot, "The Arsenal of Democracy is Reopening for Business", The Atlantic, 9 March 2023. https://www.theatlantic.com/ideas/archive/2023/03/american-defense-manufacturing-ukraine-aid-arkansas/673327/

Aries, Hannah, Bastian Giegerich and Tim Lawrenson, "The Guns of Europe: Defence Industrial Challenges in a Time of War," *Survival*, vol. 65 no.3, June-July 2023.

Arnold, Sven and Torben Arnold, "The Need for Adjustments at All Levels of the European Sky Shield Initiative", German Institute for International and Security Affairs, 2 February 2023 https://www.swp-berlin.org/en/publication/germanys-fragile-leadership-role-in-european-air-defence

Barnes, Julian E., "Russia is Buying North Korean Artillery, According to U.S. Intelligence", The New York Times, 5 September 2022. https://www.nytimes.com/2022/09/05/us/politics/russia-north-korea-artillery.html

Bergmann, Max and Sophia Besch, "Why European Defense Still Depends on America", Foreign Affairs, 7 March 2023. https://www.foreignaffairs.com/ukraine/why-european-defense-still-depends-america

Bertrand, Natasha, Oren Libermann, and Alex Marquadt, "Russian Artillery Fire Down Nearly 75%, US Officials Say, in Latest Sign of Struggles for Moscow", CNN, 10 January 2023. https://edition.cnn.com/2023/01/10/politics/russian-artillery-fire-down-75- percent-ukraine/index.html

Bzozowski, Alexandra and Aurélie Pugnet, "EU Member States Reach Deal On Joint Ammunition Procurement for Ukraine", Euractive, 3 May 2023. https://www.euractiv.com/section/europe-s-east/news/eu-member-states-reach-deal-on-joint-ammunition-procurement-for-ukraine/

Cameron, Doug, "Why Ukraine Has Not Been a Boon to U.S. Defense Companies", The Wall Street Journal, 31 January 2023. https://www.wsj.com/articles/why-ukraine-hasnt-been-a-boon-to-u-s-defense-companies-11675176026

Cancian, Mark F., "Is the United States Running Out of Weapons to Send to Ukraine?" The Center for Strategic and International Studies, 16 September 2022. https://www.csis.org/analysis/united-states-running-out-weapons-send-ukraine

- (2023) "Rebuilding U.S. Inventories: Six Critical Systems", The Center for Strategic and International Studies, 9 January 2023. https://www.csis.org/analysis/rebuilding-us-inventories-six-critical-systems

Cancian, Mark F. and James Anderson, "Expanding Equipment Options for Ukraine: The Case of Artillery", Center for Strategic and International Study, 23 January 2023. https://www.csis.org/analysis/expanding-equipment-options-ukraine-case-artillery

Danylyuk, Oleksandr V., "How Ukraine's Defence Industry Can Reduce Russian Geopolitical Influence", The Royal United Services Institute for Defence and Security Studies, 23 February 2023. https://rusi.org/explore-our-research/publications/commentary/how-ukraines-defence-industry-can-reduce-russian-geopolitical-influence

DeYoung, Karen and Greg Jaffe, "NATO Runs Short on Some Munitions in Libya", The Washington Post, 15 April 2011.https://www.washingtonpost.com/world/nato-runs-short-on-some-munitions-in-libya/2011/04/15/AF3O7ElD_story.html

DeYoung, Karen, Dan Lamothe, and Isabelle Khurshudyan, "Inside the Monumental, Stop-Start Effort to Arm Ukraine", The Washington Post, 23 December 2022. https://www.washingtonpost.com/national-security/2022/12/23/ukraine-weapons- biden/

Economist (The), "China's Arms Could Revive Russia's Failing War", The Economist, 2 March 2023. https://www.economist.com/china/2023/03/02/chinese-arms-could-revive-russias-failing-war

- (2023a) "How Quickly Can Russia Rebuild its Tank Fleet?" The Economist, 27 February 2023, https://www.economist.com/the-economist-explains/2023/02/27/how-quickly-can-russia-rebuild-its-tank-fleet

- (2023b) “Russia’s Technocrats Keep Funds Flowing for Vladimir Putin’s War”, The Economist, 4 February 2023. https://www.economist.com/europe/2023/02/04/russias-technocrats-keep-funds- flowing-for-vladimir-putins-war
- (2023c) “The West is Struggling to Forge a New Arsenal of Democracy”, The Economist, 19 February 2023. https://www.economist.com/briefing/2023/02/19/the-west-is-struggling-to-forge-a-new-arsenal-of-democracy
- (2023d) “How to Defend Europe: Shaping Up and Tooling Up,” The Economist, 8 July 2023 (print edition).

Erlanger, Steven and Lara Jakes. “U.S and NATO Scramble to Arm Ukraine and refill Their Own Arsenals”, The New York Times, 26 November 2023. https://www.nytimes.com/2022/11/26/world/europe/nato-weapons-shortage-ukraine.html

Erlanger, Steven, “Ukraine Needs Shells, and Arms Makers Want Money. Enter the E.U.”, The New York Times, 8 March 2023. https://www.nytimes.com/2023/03/08/world/europe/ukraine-eu-shells-ammunition.html

European Commission (EC), “Defence Industry: EU to Reinforce the European Defence Industry Through Common Procurement with a 500 million Euro Instrument,” Press Release, 19 July 2022. https://ec.europa.eu/commission/presscorner/detail/en/IP_22_4491

European Defence Agency, “EDA Brings Together 25 Countries for Common Procurement of Ammunition”, European Defence Agency (EDA), 20 March 2023. https://eda.europa.eu/news-and-events/news/2023/03/20/eda-brings-together-18-countries-for-common-procurement-of-ammunition

Fiott, Daniel and Jean-Pierre Maulny, “What Scope for EU-US Defence Industrial Cooperation in the 2020s?” Armament Industry European Research Group, September 2021.

Gould, Joe, "Lockheed, Aiming to Double Javelin Production, Seeks Supply Chain ‘Crank Up,’" Defense News, 9 May 2022. https://www.defensenews.com/industry/2022/05/09/lockheed-aiming-to-double-javelin-production-seeks-supply-chain-crank-up/

Gibbons-Neff, Thomas, Justin Scheck, and Boryana Dzhambzaova, “Bulgarian Factories and Secret Task Forces: How the West Hunts for Soviet Arms", The New York Times, 23 February 2023. https://www.nytimes.com/2023/02/23/world/europe/ukraine-weapons-ammunition-bulgaria.html

Gotkowska, Justyna, “Germany’s European Sky Shield Initiative”, Centre for Eastern Studies, 14 October 2022. https://www.osw.waw.pl/en/publikacje/analyses/2022-10-14/germanys-european-sky-shield-initiative

Helfrich, Emma, “Ukraine's Locally Produced Artillery Shells Have Reached the Front”, The War Zone, 3 January 2023. https://www.thedrive.com/the-war-zone/ukraines-locally-produced-artillery-shells-have-reached-the-front

Ismay, John and Lara Jakes, “Meeting in Brussels Signifies a Turning Point for Allies Arming Ukraine”, The New York Times, 28 September 2022. https://www.nytimes.com/2022/09/28/us/politics/ukraine-weapons-nato.html

Jakes, Lara, “How a Tiny NATO Nation Tackled a Big Problem: Arming Ukraine”, The New York Times, 17 February 2023. https://www.nytimes.com/2023/02/17/world/europe/luxembourg-weapons-ukraine-nato.html

Langfitt, Frank, "As Ukraine Uses Up Ammunition Quickly, Allies Scramble to Restock Warehouse", National Public Radio, 9 February 2023. https://www.npr.org/2023/02/09/1155632125/as-ukraine-uses-up-ammunition-quickly-allies-scramble-to-restock-warehouses

Masters, Jonathan and Will Merrow, “How Much Aid has the U.S. Sent to Ukraine? Here are Six Charts,” Council on Foreign Relations, update 10 July 2023. https://www.cfr.org/article/how-much-aid-has-us-sent-ukraine-here-are-six-charts

Monaghan, Sean, "Solving Europe's Defense Dilemma: Overcoming the Challenges to European Defense Cooperation", Center for Strategic and International Studies, 1 March 2023. https://www.csis.org/analysis/solving-europes-defense-dilemma-overcoming-challenges-european-defense-cooperation

Monaghan, Sean and John Christianson, "Making the Most of the European Sky Shield Initiative", Center for Strategic and International Studies (CSIS), May 2023. https://csis-website-prod.s3.amazonaws.com/s3fs-public/2023-05/230519_Monaghan_European_SkyShield.pdf?VersionId=lqRTBNFTvHja1Qc3ThfdCfvL5B0GSChA

NATO, "About DIANA", North Atlantic Treaty Organization (NATO), 2023. https://www.diana.nato.int/about-diana.html

- (2023a) "European Sky Shield Initiative Gains Two More Participants", North Atlantic Treaty Organization (NATO), 15 February 2023. https://www.nato.int/cps/en/natohq/news_211687.htm#:~:text=Among%20other%20things%2C%20the%20initiative,defence%20capabilities%20by%20European%20countries
- (2023b) "Conference of National Armaments Directors (CNAD)", North Atlantic Treaty Organization (NATO), 17 January 2023. https://www.nato.int/cps/en/natolive/topics_49160.htm
- (2023c) Vilnius Summit Communiqué, issued 11 July 2023 (updated 19 July 2023). https://www.nato.int/cps/en/natohq/official_texts_217320.htm
- (2023d) NATO Support and Procurement Agency. https://www.nspa.nato.int/default
- (2023e) NATO: Multinational Capability Cooperation. https://www.nato.int/cps/en/natohq/topics_163289.htm
- (2022) "NATO Launches Innovation Fund", North Atlantic Treaty Organization (NATO), 30 June 2022. https://www.nato.int/cps/en/natohq/news_197494.htm
- (2022a) "NATO Sharpens Technological Edge with Innovation Initiative", North Atlantic Treaty Organization (NATO), 7 April 2022. https://www.nato.int/cps/en/natohq/news_194587.htm
- (2022b) "Strategic Concept", North Atlantic Treaty Organization (NATO), 29-30 June 2022. https://www.nato.int/strategic-concept/
- (2022c) NATO Defence Planning Process, updated 31 March 2022. https://www.nato.int/cps/en/natohq/topics_49202.htm

NATO PA, Spring Session (Luxembourg 19-22 May), Defence and Security Committee Meeting, 20 May 2023.

Rathbone, John Paul, "Russia Has Lost Half Its Combat Capability in Ukraine, Says UK Armed Forces Chief," *Financial Times*, 4 July 2023. https://www.ft.com/content/8cd1c388-6fb9-497b-a8a9-14b6ea21ede2

Ryan, Missy, "In Race to Arm Ukraine, US Faces Cracks in its Manufacturing Might", The Washington Post, 8 March 2023. https://www.washingtonpost.com/national-security/2023/03/08/us-weapons-manufacturing-ukraine/

Seibold, Sabine and Andrew Gray, "NATO to Increase Targets for Ammunition Stockpiles as War Depletes Reserves", Reuters, 14 February 2023. https://www.reuters.com/world/europe/natos-stoltenberg-we-plan-increase-targets-ammunition-stockpiles-2023-02-13/

Solomon, Erika, Steven Erlanger, and Christopher F. Schuetze, "Scrounging for Tanks for Ukraine, Europe's Armies Come Up Short", The New York Times, 28 February 2023. https://www.nytimes.com/2023/02/28/world/europe/ukraine-tanks.html

Stankiewicz, Kevin, "Intel CEO Now Expects Chip Shortage to Last into 2024", CNBC, 29 April 2022. https://www.cnbc.com/2022/04/29/semiconductor-shortage-intel-ceo-says- chip-crunch-to-last-into-2024.html

Stoltenberg, Jens, "Doorstep Statement by NATO Secretary General Jens Stoltenberg Ahead of the Meetings of NATO Defence Ministers in Brussels", North Atlantic Treaty Organization, 14 February 2023.

https://www.nato.int/cps/en/natohq/opinions_211698.htm?selectedLocale=en
Stoltenberg, Jens, “Pre-Summit Press Conference”, North Atlantic Treaty Organization (NATO), 27 June 2022. https://www.nato.int/cps/en/natohq/opinions_197080.htm?selectedLocale=en
Trebesch, Christoph, Arianna Antezza, Katelyn Bushnell, Andre Frank, Pascal Frank, Lukas Franz, Ivan Kharitonov, Bharath Kumar, Ekaterina Rebinskaya & Stefan Schramm (2023), "The Ukraine Support Tracker: Which countries help Ukraine and how?" Kiel Working Paper, No. 2218, 1-65. https://www.ifw-kiel.de/publications/data-sets/ukraine-support-tracker-data-17410/
U.S. Department of Defense, “Readout of National Armaments Directors Meeting Under the Auspices of the Ukraine Defence Contact Group”, U.S. Department of Defence, 28 September 2022. https://www.defense.gov/News/Releases/Release/Article/3173568/readout-of-national-armaments-directors-meeting-under-the-auspices-of-the-ukrai/
- (2022a) “Readout of National Armaments Directors Meeting Under the Auspices of the Ukraine Defense Contact Group”, U.S. Department of Defense, 18 November 2022. https://www.defense.gov/News/Releases/Release/Article/3223273/readout-of-national-armaments-directors-meeting-under-the-auspices-of-the-ukrai/
Vincent, Elise, “Macron Says European Missile Shield Project ‘Prepares for Tomorrow’s Problems’”, *Le Monde*, 20 June 2023. https://www.lemonde.fr/en/europe/article/2023/06/20/macron-says-european-missile-shield-project-prepares-for-tomorrow-s-problems_6034371_143.html
World Bank (The), “Military Expenditure (% of GDP) - Frane”, The World Bank, 14 March 2023. https://data.worldbank.org/indicator/MS.MIL.XPND.GD.ZS?locations=FR
- (2023a) “Military Expenditure (% of GDP) - Germany”, The World Bank, 14 March 2023. https://data.worldbank.org/indicator/MS.MIL.XPND.GD.ZS?locations=DE
- (2023b) “Military Expenditure (% of GDP) - The United States”, The World Bank, 14 March 2023. https://data.worldbank.org/indicator/MS.MIL.XPND.GD.ZS?locations=US