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The Role of Interoperability in the Russian Invasion of Ukraine

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This Food for Thought paper is a document that gives an initial reflection on the theme. The content is not reflecting the positions of the member states but consists of elements that can initiate and feed the discussions and analyses in the domain of the theme. All our studies are available on www.finabel.org

DIRECTOR'S EDITORIAL

The future of NATO is set to be guided by the ability of its Member States to cooperate and develop an interoperability capacity, within the Alliance but also beyond it. An example of this has been the military cooperation between Ukraine, which goes back to the early nineties, and it underwent an intensification process after the Crimea crisis in 2014. Following the 2022 invasion, Western support took the form of economic assistance, weapons supply, and training of troops. Yet, the aid given was not nearly as successful as some might have thought. The war in Ukraine actually exposed a number of issues that NATO is still facing. Most of all, asynchronous planning and decision-making, as well as the lacking standardization of weapon systems, are evidently still plaguing the Alliance.

NATO Chiefs of Staff need to identify and address these issues so as to be able to steer the conflict in Kyiv's favour and avoid the re-emergence of these issues in the future. As a result, this Food for Thought examines the manner in which cooperation and interoperability were developed, both before, and after, the invasion of Ukraine. This being said, the main aim of this paper is to outline the way in which NATO members are to address the persistent challenges exposed by the military cooperation with Ukraine. Put simply, the suggestion made here is that the need for further cooperation in the defence industry is vital in order to improve interoperability, but that this cannot be seen to be achieved without policy level coordination.



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ABSTRACT

Following the Russian aggression against Ukraine in February 2022, Kyiv's Government received unprecedented military support from NATO members. The military cooperation between Ukraine and the Atlantic Alliance goes back to the early nineties, and it underwent an intensification process after the Crimea in 2014. The Western support during the 2022 conflict took the form of economic assistance, weapons supply, and training of troops. Despite NATO's military aid cer-

tainly played a role in Ukraine being able to resist Moscow's aggression, problems on and off the battlefield raised concerns about the Alliance's interoperability capacity, not only with respect to its partners but also between its Member States. Therefore, NATO Chiefs of Staff need to identify and address these issues to steer the conflict in Kyiv's favour and to avoid the re-emergence of these issues in the future.

INTRODUCTION

On 24th of February 2022, Russian Federation's President Vladimir Putin announced a "special military operation" in Ukraine, officially sanctioning the hostilities between the two countries. Almost eight years after the Minsk Protocols and announced by a Russian military build-up near the border with Ukraine and in Belarus during the previous months, the invasion marked a new chapter in the turbulent history of Russo-Ukrainian relations. Despite a more than significant gap between the two countries regarding troop numbers, weaponry, and technology at the start of the conflict, the operations prolonged clearly more than the Kremlin expected, resulting in almost five months of warfare. Particularly during the first weeks of clashes, the Ukrainian forces were able to exploit the logistic weaknesses of the Russian army to slow

down its advance. This was partly possible due to the support received by NATO and the EU, whose assistance mainly consisted of weaponry supply, intelligence cooperation, information sharing and military training. Nevertheless, a series of factors now hinder additional and consistent help from the Atlantic allies, with the risk of further prolonging the conflict to the benefit of Russia. This paper attempts to answer three fundamental questions: How did interoperability measures contribute to Ukraine's effective response during the first phases of the war? To what extent did further cooperation determine the outcome of the conflict? What lessons could the NATO Chief of Staff learn from the efficient exchange of information, practices and technology on display during the conflict?

a. From 1991 to 2014: The birth and development of NATO-Ukraine Relations

On 24th of August 1991, shortly after the unsuccessful Moscow *putsch*, the Supreme Soviet of the Ukrainian SSR adopted the Act of Declaration of Independence of Ukraine. Less than four months later, on the 1st of December, a referendum sanctioned the popular approval of the independence act, with more than 90 percent of voters in favour (Magocsi, 2010). On the same day, Leonid Kravčuk was elected as the Country's first President. In doing so, Ukraine emerged from the turmoil that was the dissolution of the Soviet Union as an independent nation. Its strategic importance soon became apparent, finding itself between NATO, EU and the Russian border, its 1720km of coastline on the Black Sea and its access to a wide range of natural resources and raw materials.

However, Ukraine's relations with NATO and the US in particular did not flourish immediately, mostly due to Kyiv inheriting a formidable defence apparatus from the Soviet Union. Indeed, amongst the defensive inheritance was around 40 percent of the USSR's military personnel and equipment and a large part of the soviet nuclear arsenal, including 146 intercontinental ballistic missiles (IBMs) pointed towards the USA (Polyakov, 2004). Therefore, Washington viewed the newborn State with suspicion. Nevertheless, Ukraine underwent an intense, reduction-oriented restructuring of its armed forces driven by the necessity of relieving NATO from its

concerns combined with the requirement to equip itself with a manageable and affordable military structure that would best reflect Ukraine's economic possibilities. Nuclear weapons were the most prominent target of such a reduction programme. This process began right away with an agreement concluded on 30 December 1991 between eleven of the twelve leaders of the Commonwealth of Independent States (CIS), stipulating that nuclear weapons in Ukraine should be "...dismantled by the end of 1994, including tactical weapons by 1 July 1992 (Agreement on Strategic Forces Concluded between the eleven members of the Commonwealth of Independent States of 30 December 1991). In early 1992, Kravčuk stated that half of the tactical nuclear warheads had already been transferred to the CIS Combined Strategic Forces Command, in accordance with the Minsk Declaration (Pifer, 2011). In May, another step forward was made through the conclusion of the Lisbon Protocol, through which four post-Soviet States (Ukraine, Russia, Belarus, and Kazakhstan) fulfilled the Soviet Union's obligations to respect the Strategic Arms Reduction Treaty (START I) and would have accessed the Treaty of Non-Proliferation of nuclear weapons (NPT). The Ukrainian concerns about having to bear the burden of their denuclearisation alone was quelled through the signing of the Trilateral Agreement between Ukraine, the US and Russia, which reaffirmed Ukraine's commitment to eliminate its nuclear armaments in exchange for security assurances by Washington and Moscow (Pifer, 2011).

The denuclearisation process was the cor-

nerstone of cooperation with NATO, which had already begun in the early nineties, with Ukraine's participation in the North Atlantic Cooperation Council (1991) and the Partnership for Peace Program (PfP) (1994). The following year, Ukraine joined the Planning and Review Process (PARP), a voluntary evaluation system organised into two-year cycles. At the end of its second PARP cycle, Ukraine achieved eleven out of twenty-seven interoperability goals (Polyakov, 2004).

Relations with the Atlantic Alliance then further developed to the point of establishing the NATO-Ukraine Commission (NUC) in 1997, to oversee the Ukrainian Euro-Atlantic integration process through cooperation in different areas: defence planning, budgeting, policy, strategy and national security concepts, defence conversion, NATO-Ukraine military cooperation and interoperability.¹

As the new millennium approached, Ukraine significantly reduced its military arsenal and personnel numbers. However, Kyiv felt that it still needed a serious reform of the entire armed forces as they were affected, according to the Secretary of the National Security and Defence Council Volodymyr Horbulin, by a lack of experience and mechanisms for developing and implementing integration programs as well as by incomplete structures for coordinating participation. To this end, a NATO-Ukraine Action Plan was signed in November 2002, one month after the “Cooperative Adventure Exchange”, a large-scale exercise program involving three thousand military personnel from twelve NATO Members, six partner countries and Ukraine, aimed at strengthening cooperation and interoperabil-

ity between NATO and its partners (Karns, 2000).

The strategic objectives set in the Action Plan concerned the achievement of common standards of military equipment, language, doctrine, and training. Regarding defining the objectives to be achieved and their implementation, the Action Plan framework required Ukraine to set the targets to pursue internally and in cooperation with NATO, with the NUC overseeing their implementation. A monitoring system consisting of assessment meetings (two per year) and an annual report was established. In the years following the adoption of the Action Plan, reforms of the Ukrainian defence framework proceeded steadily, both through participation in PfP programs, which allowed Ukraine to develop structures and capabilities necessary for the interoperability with its Atlantic Partners, including in demilitarisation operations carried out with the support of the NATO Maintenance and Supply Agency (NAMSA). Such operations resulted in the destruction of 400 thousand landmines and the launch of a twelve-year program in 2005 for the destruction of 133 thousand tons of conventional munitions and 1.5 million small arms and other weapons (NATO Handbook, 2006).

In 2005 the success of the “Orange Revolution” paved the way for Viktor Yuschchenko's presidency, revitalising Ukraine's cooperation with NATO, a priority of the new President's foreign policy strategy. This point of view was expressed during Yuschchenko's first official meeting with NATO leaders on 22 February in Bruxelles of the same year, where he stated he would have liked to have seen Ukraine

1. Charter on a Distinctive Partnership between the North Atlantic Treaty Organization and Ukraine (9 July 1997), para III.

“integrated into the European Union and the Atlantic Alliance” (NATO, 2005, NATO-Ukraine Summit, p. 2). Two months later, the NUC foreign ministers meeting in Vilnius, Lithuania, hosted a discussion on Ukraine’s membership aspirations in which Kyiv’s officials had the opportunity to potential duties as a NATO Member, whereas the Atlantic Partners had the chance to review Ukraine’s reform progress (Perepelytsia, 2007).

The most significant result of the renewed Ukrainian commitment to cooperate with NATO was the adoption of the State Programmes for the Development of Ukraine’s Armed Forces 2006-2011. Amongst other measures, the Programmes promoted additional synergy with NATO partners and strived towards further reduction of military

personnel (NATO-Ukraine Annual Target Plan for 2006 in the Framework of NATO-Ukraine Action Plan. Executive Summary, 2006). The Programmes sought the adaptation of C2 systems to NATO standards, the simplification of military services through the merging of the Air Forces and Air Defence Forces and implementation of Western standards with regard to military doctrine (Ministry of Defence of Ukraine, 2011). The Programme also aimed to increase training and personnel management, the modernisation of armaments and military equipment to accompany the transition to a fully professional military service (Ministry of Defence of Ukraine, 2011). The results of the programs can be observed in the table below.

Table 1: Results of the State Programmes for the Development of Ukraine’s Armed Forces 2006-2011

Source: The Ukrainian Ministry of Defence White Book, 2011

Directions	Measures taken
Control system	
Reform of military command and control bodies	<p>The Land Forces Rapid Reaction Corps has been formed. The Army Corps was subordinated to the Land Forces Command. Operational control functions of the troops (forces) are placed under the control of the Land Forces Command.</p> <p>The Combined Flotilla Command has been reorganised into the Maritime Operations Centre.</p>
Improvement of the support and supply system	The vertical chain of command has been formed in the new supply command and control bodies – the Armaments and the Logistics.
Structure and strength of the Armed Forces	
Reduction of personnel	The Armed Forces’ strength has been downsized from 245,000 to 192,000 persons. Altogether there was a reduction of 53,000 people, including 36,000 military personnel.

Streamlining of the Armed Forces' functional structures

The number of combat units, formations and military units has been brought to 47%, and support (logistics) units, military educational establishments, institutions and organisations to 53%. The division of combat strength of the Armed Forces has been specified according to its functional structures.

Creation of multifunctional mobile formations and military units

The organisational and staff structure of mechanised and armoured brigades has been improved. The organisational and staff structure of all combat brigades allows for the creation of tactical battle groups of module, battalion and brigade type.

Training, placement and employment of personnel

Military education system reform

The number of military higher educational establishments and military educational units of civilian higher educational establishments has been reduced from 60 to 31.

Improving the system of officers' certification, and implementation of a targeted promotion mechanism

The Personnel Policy concept was implemented in the Armed Forces. An improved system of certifying the service of military personnel, based upon the results of their personal training and the training of their subordinate units has been introduced.

The Personnel Centre of the Armed Forces of Ukraine and Personnel Centres of Armed Forces Services were formed.

Rotation schemes to form a personnel military reserve for promotion were developed.

Military Posts' Billets (passports) were introduced to ensure transparency and objectivity in selecting and appointing personnel to corresponding posts.

Reorganising the structure of local military command and control bodies (military commissariats) and creating the system of territorial recruitment centres and their branches

25 territorial contract personnel recruitment centres have been created and currently function. To optimise their work and facilitate the selection of candidates for contract military service, a new recruitment system of the Armed Forces has been introduced based on the following scheme: Territorial recruitment centre - training unit (centre) - military unit. District military commissariats, the military commissariat of the Autonomous Republic of Crimea, regional and Kyiv City military commissariats were reorganised according to their tasks.

Training of troops (forces)

Increasing the intensity and ensuring the scheduling of training of the troops (forces)

Plans and programmes of combat training of the Armed Forces from 2006 to 2011 academic years; (the key subjects were met) with the rest accomplished by approximately 83%.

The scope of exercises with military command and control bodies and troops (forces) has increased. Seven large-scale exercises have been carried out: "Chyste Nebo ("Clear Skies") - 2006", "Arteriya ("Artery") - 2007", "Mors'ky Vuzol ("Marine Bend") - 2008", "Rishucha Diya" ("Decisive Action"), "Vzayemodiya ("Cooperation") - 2010", "Spryyannya ("Assistance") - 2011" and "Adekvatne Reaguvannya ("Adequate Response") - 2011."

The number of personnel involved in the active phase of the exercise reached 10% of the total number of the Armed Forces' service personnel.

Introduction of the reserve service

The reserve service has been standardised. In total, 36 military organisational structures of the Armed Forces comprise approximately 1,700 reservists, which accounts for 21% of the total number under the State Programme.

Conduction of training of passive reserveservice

The drill (check-up) meetings for training people subject to the draft have been renewed. Over 16,000 draftees were trained by 245 military organisational structures.

Achieving interoperability with the Armed Forces units of NATO states

The Armed Forces continued the implementation of measures aimed at participation in the Planning and Review Process (PARP) under the Partnership for Peace (PfP) framework and implementation of the NATO Operational Capabilities Concept. To achieve interoperability with the armed forces of foreign nations, a cycle of Evaluation Level II of PARP Assessment has begun.

A:

Self-Evaluation Level I and NATO Evaluation Level I - 10 units (LF - 3, AF - 3, Naval Forces - 4); Self Evaluation Level II - 7 units (LF - 2, AF - 3, Naval Forces - 2);

NATO Evaluation Level II - 4 units (LF - 2, AF - 2)

Armament, Materiel supply, logistics

Troops (forces) supplied with new items of equipment

112 new and modernised items of equipment were brought into service. 1,300 new and upgraded key items of materiel and more than 7,000 pieces of other military equipment were purchased.

Comprehensive disposal of missiles, ammunition, and liquid rocket fuel components

161,300 tons of ammunition and 6,600 tons of rocket fuel components were withdrawn and disposed of from arsenals, bases and storage depots of the Armed Forces

Freeing the Armed Forces of Ukraine from their non-core functions.

100% of the Armed Forces units (institutions) were switched to a new food supply system through commercial suppliers.

Despite such promising developments, at the turn of the decade, Ukraine's integration process with Western partners faced a setback due to both external and internal factors. On an international level, the biennial 2008–2010 saw the emergence of two crucial events. While the financial crisis influenced defence reforms on an economic plane (Howard & Pukhov, 2015), the Russian invasion of Georgia also slowed the transition to a professional force. The invasion also affected Ukraine's internal political balance, with the then Prime Minister Julija Tymoschenko openly disagreeing with President Yushchenko's choice to support Tbilisi and opposition leaders endorsing Russian claims over South Ossetia and Abkhazia (Simon, 2009).

The definitive turning point occurred when one of these opposition members, Viktor Yanukhovic, leader of the Party of Regions, was sworn in as President of Ukraine in February 2010. Yanukhovic, who was well-known for his pro-Russian positions, started a renege on all the Western integration reforms resulting in many objectives of the 2006–2011 defence reform programmes being cancelled or severely reduced in scope. On the other hand Yanukhovic, on the basis that Ukraine

Immediately prior to 2014, the Ukrainian Ground Forces were configured as follows: 70800 land personnel, 775 tanks, twelve missile launchers, 2280 armoured personnel carriers, 988 artillery launchers and 330 air defence missile launchers. In addition, airborne units and Marines 8500 completed the framework of Ukraine's military personnel (Sutyagin & Clarke, 2014). Throughout the early stages of the 2014 conflict, whilst

was not facing any military threat, carried on with the reduction of military personnel as well as professionalisation plans (Polyakov L., 2017).

Although such projects were also part of the pro-Western reforms envisioned by the previous political leadership, the drastic reduction of the armed forces without adhering to the proper NATO integration plan combined with financial hardships experienced by the Ministry of Defence had a disastrous effect on Ukraine's military power and capability to defend itself. Furthermore, the professionalisation of military personnel originated from a problem of "regionalisation" of Ukrainian's Armed Forces, since soldiers would sign up for service not far from where they lived, exacerbating regional divisions inside the army. On the eve of the Russian invasion of Crimea, most of the soldiers stationed in the peninsula were originally from Crimea itself and were thus not eager to fight against Russia, sometimes even embracing the local separatist sentiments (Howard & Pukhov, 2015).

b. The Intensification Process After the Annexation of Crimea

Ukraine struggled to increase its number of effective forces through mobilising reserve units and resorting to volunteering programs, substantive support from NATO Countries was limited to basic equipment, betraying a lack of clear leadership, especially amongst the European Members of the Atlantic Alliance (Polyakov L., 2017). The shortcomings of the Ukrainian Army ultimately resulted in the loss of Crimea in April 2014. Never-

theless, this outcome did not prevent the prolonging of clashes between the Ukrainian Forces and pro-Russian separatists and mercenary troops. Despite the Minsk I Protocol signed on 5 September 2014 establishing a bilateral ceasefire, hostilities continued notwithstanding the signing of another Protocol (Minsk II) in February 2015, with occasional outbursts continuing until the 2022 Russian invasion.

During this period, there was reticence in providing Ukraine with adequate support owing largely to Yanukovich's anti-NATO reforms, which raised doubts among the Atlantic Alliance's Members to do with Ukraine's capacity to fully integrate with them. On the other hand, the lack of readiness to support Kyiv with substantial military aid in response to the Russian aggression in 2014 generated doubts around NATO on the Ukrainian side as well, leading to a subtle, mutual distrust. Nevertheless, the Atlantic Alliance ultimately decided to support Ukraine with substantial aid, as demonstrated by the Comprehensive Assistance Package (CAP) launched in July 2016, which consisted of a series of assistance measures in different key areas (NATO Fact Sheet, 2016). As far as interoperability is concerned, the CAP provided NATO support to Ukraine in modernising its Command Control, Communication and Computers (C4) structures and capabilities, to facilitate their interoperability with NATO to contribute to NATO-led exercises and operations and enhance Ukraine's ability to provide for its defence and security. The package envisioned assistance and supervision in other areas, namely logistics, standardisation, cyber-defence and hybrid warfare mitigators, energy

security, medical rehabilitation and explosive device neutralisation.

Besides these forms of assistance of a programmatic character, NATO Members have also unilaterally contributed to arming Ukraine with lethal and non-lethal weaponry in the two conflicts. Between 2015 and 2017, the U.S. government provided Ukraine (through both donations and sales) with AN/TPQ-36 radar systems and Javelin anti-tank missiles, together with sniper rifles, ammunition and accessories (Marzalik & Toler, 2018). Significant assistance came from Members of NATO's eastern flank. Out of a reasonable concern for further Russian aggressive conduct, these countries boosted their defence budget and directed part of it to benefit Ukraine. Right after the outbreak of the Russian conflict in 2014, Poland provided body armour and old ammunition stocks as the Ukrainian armed forces were confronted with severe shortages. In the following years, Polish assistance came under the form of defence cooperation with regards to industry and sharing of doctrines. One of the most successful results of this cooperation was the establishment *Litpolukrbrig*, a brigade composed of Lithuanian, Polish and Ukrainian troops including Ukraine's 80th Airborne Brigade, which was declared to be in line with NATO standards in late 2016 (Holcomb, 2016).

Lithuania was the only European NATO Member to provide lethal arms to Ukraine after Crimea's annexation. In 2016 Vilnius' Government supplied Ukraine with 60 KPV-14.5 *Vladimirov* heavy machine guns, 86 *Degtyaryov* 12.7 mm portable machine guns, 150 tons of ammunition, as well as 7,000 Kalashnikov rifles, 80 machine guns, mortars

and anti-tank weapons. This soviet-era equipment required training that was provided by Lithuanian, Polish, and American military instructors (Marzalik & Toler, 2018).

c. Comparing Forces: The State of Russian and Ukrainian Militaries On The Eve of War

By the end of 2021, there was a significant disparity between Russian and Ukrainian armed forces, both in quantity and quality of military personnel and equipment. However, both Kyiv and Moscow shared an overall decrease of military expenditure with respect to 2020, even though the Russian defence budget, amounting to \$45,8 billion was more than a tenfold bigger than Ukraine's. Ukraine also adopted a new military doctrine in accordance with the 2020 National Security Strategy. The programme called for a general reorganisation of Ukraine's military structure, including the establishment of new commands, as well as the separation of the position of chief of the general staff from that of commander in chief of the armed forces (The Military Balance, 2022).

Russian forces also underwent structural changes. In response to a growth in perceived NATO threats, the Russian Ministry of Defence announced its intention to create twenty new formations and military units in the Western Military District by the end of 2021. One of Moscow's first moves was to increase the number of personnel stationed in Kaliningrad and to arm them with new equipment. Following this it managed to establish a permanent base for an additional Airborne Force

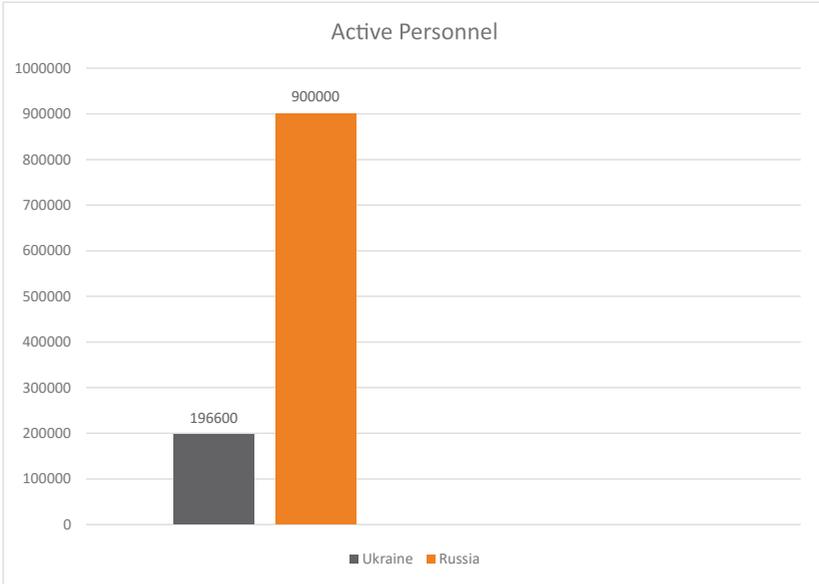
in Crimea. In spring 2021, Russia started its military build-up near the Ukrainian border, mobilising anywhere from 25 percent to 33 percent of its total deployable ground forces in a few months. By August of 2021, 168 Battalion Tactical Groups (BTG's) were reported as having deployed near the border, as opposed to the 28 BTG stationed in the same area prior to April of the same year (International Institute for Strategic Studies, 2022).

In truth, the overall modernisation of Russian Armed Forces equipment has been hampered by several delays and there has not been significant progress in the last fifteen years save for a few exceptions: ground forces have been strengthened to counter air defence, with systems capable of engaging at varying altitudes and ranges as well as electronic warfare capabilities increasing thanks to the introduction of new systems. Missile and artillery units, however, witnessed the most interesting developments with the introduction of the 9K720 *Iskander-M* (RS-SS-26 'Stone') with a five hundred kilometre range and the capacity to utilise both ballistic and cruise missiles, replacing older and shorter-ranged systems. The BM-30 *Smerch* multiple rocket launcher system was provided with a new Tornado-S system, and the shorter-range BM-21 *Grad* system has been upgraded with the Tornado-G system (International Institute for Strategic Studies, 2022).

By the first months of 2022, the state of Russian and Ukrainian armed forces was the following²:

2. Source: The Military Balance 2022, International Institute for Strategic Studies

Table 2: Comparison of Russia and Ukraine's Military Personnel



As far as military personnel are concerned, Russia could additionally count on 2 million reservists, compared to Ukraine's 900,000. Moreover, Russian-backed Ukrainian sep-

aralist forces in the Donetsk and Luhansk regions, respectively, amount to 20,000 and 14,000 units.

Table 3: Comparison of Russia and Ukraine's Air Forces

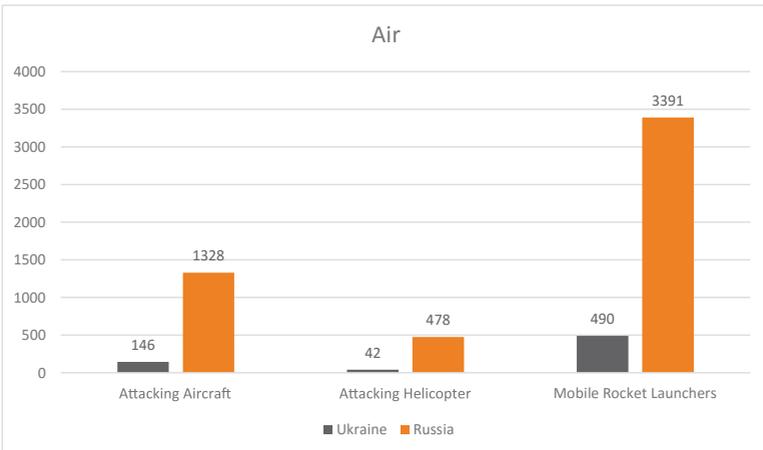
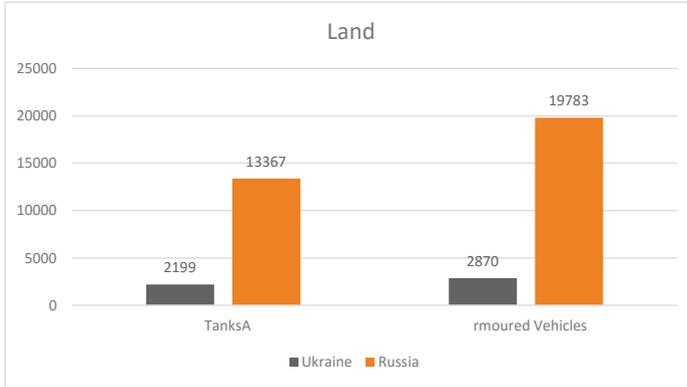


Table 4: Comparison of Russia and Ukraine's Ground Forces



The comparison is even worse with regards to naval forces. Following the loss of Crimea and the subsequent Ukrainian Navy HQ relocation to Odessa, a number of the vessels stationed in the peninsula remained in Russia's hands. The Ukrainian Navy consisted of only one principal surface combatant, twelve patrol and coastal combatants, one counter-measure ship, two amphibious platforms and eight support vessels. Moreover, Ukraine completely lacked a submarine fleet (Martin, 2022).

As the graphics above show, as far as raw numbers are concerned, Russia overwhelmed Ukrainian forces by a significant margin on the eve of the aggression. Furthermore, despite Kyiv's aforementioned efforts in modernising its defence apparatus, the equipment still mainly consisted of Soviet-era weaponry. Despite being broad and solid, even the industrial sector is still bound to its Soviet heritage, as it retains the capability to build Soviet-era land systems and can maintain and modestly upgrade Soviet-era tactical combat aircraft.

II- COOPERATION AND INTEROPERABILITY ENHANCEMENTS DURING THE 2022 CONFLICT

INTRODUCTION

During the night between the 23rd and 24th of February 2022, Russia officially launched the operation for Ukraine's invasion. The attack was carried out on a large scale, with air and missile attacks being directed against the main cities of the country and on strategic objectives such as air bases, airports, logistics depots, command centres and air defence sites. The action involved Tu-95 and Tu-160 strategic bombers, which employed Kh-101 and Kh-505 cruise missiles, Su-24 tactical bombers and Su-34 heavy fighter-bombers. Ground artillery launched *Iskander* tactical ballistic missiles, while ships from the Russian Navy fired *Kalibr* ship launched long-range cruise missiles. At the same time, Russian forces conducted amphibious operations seemingly against the ports of Odessa and Mariupol, with the latter also enduring heavy fire from Russian artillery (Batacchi, 2022). The first mechanised columns and battleships penetrated from the north, crossing the border from the Belgorod district to target the city of Kharkiv, supported by self-propelled fire and field rocket launchers. At the same time, Russian forces reached the suburbs of Karkhiv itself (Batacchi, 2022). Meanwhile, in the South, the Russian Navy seized control of the strategically positioned Snake Island in the Black Sea (Benecki, 2022). Despite Russia's evident hopes to swiftly conclude the

operations, the conflict is, at the time of writing, still ongoing, now in its seventh month. Ukraine has received various forms of assistance from several countries within this period.

a. Economic Assistance

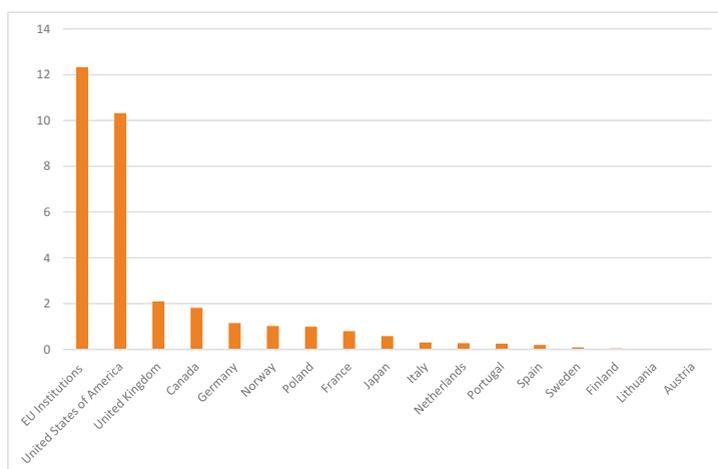
Since the Crimea crisis in 2014, Ukraine has been facing dire financial straits. In 2015, Kyiv's economy collapsed, with a 9,9 per cent GDP decrease in 2015 compared to the previous year. Compared with 2011, Ukraine's economic output in 2015 fell by 15,6 per cent, and it heavily suffered from supply line disruption, high inflation, and falling real incomes (The Economist, 2016). In 2020 when Ukraine finally managed, albeit slowly, to exit the recession, the country was devastated by the Covid-19 crisis due to facing a massive decrease of exports vital to its economy as well as currency devaluation (Paul & Filipchuk, 2020). This situation naturally had serious defence implications, as demonstrated by Ukraine's reduction of its defence budget in 2021. It follows that Ukraine needed serious financial aid to upgrade, expand and maintain its armed forces to effectively respond to the Russian aggression. Since August 3, 2022, Kyiv has received financial support from NATO, EU, G7 countries as well as from other states:

Table 5: Financial Aid to Ukraine to August 3, 2022;

Source: Antezza et al. (2022) "The Ukraine Support Tracker" Kiel WP

Country	Financial Aid (in billion €)
EU Institutions	12,32
United States of America	10,32
United Kingdom	2,10
Canada	1,82
Germany	1,15
Norway	1,03
Poland	0,99
France	0,80
Japan	0,59
Italy	0,31
Netherlands	0,28
Portugal	0,25
Spain	0,20
Sweden	0,09
Finland	0,05
Lithuania	0,01
Austria	0,01

Table 6: Financial Aid to Ukraine to August 3, 2022, Graphic Representation



Several countries combined economic support for Ukraine with economic sanctions for Russia. Among these measures was the decision approved by United States, France, Canada, Italy, Great Britain and the European Commission to exclude Russian banks from the SWIFT system. This measure has been quite effective, not least owing to Russia's heavy reliance on Western markets, as by the end of 2021 16 percent of Russia's foreign reserves were held in dollars and 32 percent in euros, with Germany, the Netherlands, and the U.S. all amongst its top trade partners (Perez, 2022).

Nevertheless, some clarifications with regards to international economic support are necessary. Although the table above shows that states committed a sum of around €31 billion in financial aid, the actual delivery of said funds proceeded slowly, with only €7,6 billion being transferred by the 28th of June. These delays have hindered the effect of international assistance and did not prevent the Ukrainian economy from nearly collapsing. The National Bank resorted to buying government bonds, which basically amounted to

printing money and thus increasing inflation. In addition, Ukraine has been facing with sharp depleting of foreign currency reserves since the beginning of the conflict (Repko, 2022).

b. Weaponry Supply

Granted that financial aid is certainly important and should not be overlooked, it was clear from the beginning of the conflict that Ukraine primarily needed more weapons. The expansion and modernisation of Ukrainian limited and outdated weaponry would require time and financial resources, both of which are in short supply for Kyiv. During the course of the conflict, Ukraine received a wide range of military equipment, including small arms, artillery vehicles, tanks, spare parts and ammunition. The following section lists weaponry provided by ten NATO Members ranked by military assistance to Ukraine (Ukraine Support Tracker, 2022).

USA- As of September 8, the United States provided Ukraine with the following equipment:

Table 7: U.S Military Assistance to Ukraine

Source: Fact Sheet on U.S. Security Assistance to Ukraine Sept. 8 2022 (defense.gov)

Equipment	Amount Provided to Ukraine
Stinger anti-aircraft systems	Over 1400
Javelin anti-armour systems	Over 8500
General anti-armour systems	Over 32000
Tactical UAS	Over 1400
155mm and 105mm Howitzers	146 (126-155mm; 20-105mm)

Tactical Vehicles	148
High Mobility Artillery Rocket Systems	16
120mm mortar systems	20
TOW missiles	1500
National Advanced Surface-to-Air Missile Systems (NASAMS)	8
Mi-17 Helicopters	20
M113 Armoured Personnel Carriers	200
Mine Resistant Ambush Protected Vehicles	40
Grenade launchers and small arms	Over 10000
Small arms ammunition	Over 60000
Sets of body armour and helmets	Over 10000
Counter-artillery radars	50
Counter-mortar radars	4
Air-surveillance radars	4
Coastal and riverine patrol boats	18
Armoured medical treatment vehicles;	100
Harpoon coastal defence systems	2

In addition, the U.S provided thousands of units of further military equipment, including explosives, demolition munitions and demolition equipment for obstacle clearing; Tactical secure communications systems; night vision devices, thermal imagery systems, optics, and laser rangefinders; Commercial satellite imagery services; Explosive ordnance disposal protective gear; Chemical, Biological, Radiological, Nuclear protective equipment; Medical supplies to include first aid kits, bandages, monitors, and other equipment; Electronic jamming equipment; Field equipment and spare parts. (Fact Sheet on U.S Security Assistance to Ukraine, 2022).

1. **United Kingdom** - Since the beginning of the war, the UK has provided a wide range of weaponry. On 9 March, the Ministry of Defence (MoD) announced it had delivered 3600 next-generation light anti-tank weapons (NLAWs). As of 15th August, London had provided Ukraine with thousands of Starstreak man-portable anti-aircraft missiles, Javelin missiles, “Stormer” armoured vehicles fitted with anti-air missile launchers, Harpoon anti-ship missile systems, long-range artillery such as M270 multiple-launch rocket systems and M-109 self-propelled artillery units. Unmanned

aerial vehicles and electronic warfare equipment were provided as well. In addition to lethal weapons, the UK provided Ukrainian forces with non-lethal equipment such as non-lethal aid, including body armour, ballistic helmets, and night vision goggles (UK House of Commons Library, 2022).

2. Poland - Poland is the first EU State as far as military aid to Ukraine is concerned. Besides the supply of weapons, Poland played a key role in logistics, as most Western-provided weaponry entered Ukraine through Poland. As of 18th August, the list of Polish armaments sent to Ukraine included over three hundred armoured fighting vehicles, main battle tanks, such as the T-72M(R), the T-72M1(R), as well as the highly ad-

vanced PT-91, multiple rocket launchers, air-to-air missiles, Unmanned Combat Aerial Vehicles, Reconnaissance UAVs and MANPADS. In addition to tanks and armoured vehicles, Poland provided long-range artillery armaments as well, such as 18 155mm AHS Krab, which combines the turret of the British AS-90M with a Rheinmetall 155mm/52-calibre barrel and a Polish Topaz fire-control system and is capable of striking objects within a 30km range. Furthermore, small arms, ammunition, and protective gears were supplied (Mitzer & Oliemans, 2022).

3. Germany - As of 13 September, the German Government had provided the following:

Table 8: German Military Assistance to Ukraine

Source: *Military support for Ukraine | Federal Government (bundesregierung.de)*

Equipment	Amount Provided to Ukraine
Self-propelled anti-aircraft guns GEPARD	24
M113 armoured personnel carriers	54
Auto-injector devices	100
General vehicles	280
Multiple rocket-launchers MARS	3
Anti-tank weapons Panzerfaust 3	3000
Anti-tank mines	14000
Man-Portable Air Defence Systems STINGER	500
Man-Portable Air Defence Systems STRELA	2700
Panzerhaubitze-2000 howitzers	10
Bunker buster missiles	50
MG3 machine guns	100

Anti-drone guns	10
Anti-drone sensors and jammers	14
Anti-tank weapons RGW 90 Matador	79444
Mobile decontamination vehicles HEP 70	6
Humvees	10
Armoured recovery vehicles	3
Mobile, remote controlled and protected mine-clearing systems	4
Mobile ground surveillance radars and thermal imaging cameras	8
Electronic anti-drone devices	8

In addition, Germany provided thousands of ammunition, spare parts, and general equipment such as body armours, helmets, night vision goggles, weapon sights, binoculars, and fuel.

4. Canada - Canadian military assistance to Ukraine began before the outbreak of the conflict, with the provision of non-lethal military goods, including bullet-proof vests and night-vision goggles which were delivered on 3rd February. Two weeks before the aggression, Canada opted for the supply of lethal weapons, such as C6 and C9 ma-

chine guns, pistols, carbines, 50-calibre sniper rifles, 60-millimetre mortars, Carl Gustaf M2 recoilless rifles, M-72 light anti-armour weapons, hand grenades and approximately 1.5-million rounds of ammunition. In April, the Canadian government began shipping artillery devices, such as the M777 155mm howitzers. In September, thirty-nine armoured combat support vehicles (ACSV) and associated parts and components will be transferred to Ukraine (Gallagher, 2022).

5. The Czech Republic

Table 9: Czech Military Assistance to Ukraine

Source: [Bohemian Brotherhood: List Of Czech Weapons Deliveries To Ukraine - Oryx \(oryxspioenkop.com\)](http://BohemianBrotherhood.com)

Category	System provided to Ukraine
Tanks	T-72M1
Infantry Fighting Vehicles (IFVs)	BVP-1; Pbv 501A
Self-Propelled artillery	52mm D-20 gun-howitzer; 152mm ShKH vz. 77 DANA

Towed artillery	152mm D-20 gun-howitzer
Multiple Rocket Launchers (MRLs)	122mm RM-70;
Heavy mortars	120mm vz. 82 PRAM-L "Type 82"
Man-portable air defence systems	160 9K32 Strela-2
Surface-To-Air Missile (SAM) Systems	9K35 Strela-10M
Reconnaissance UAVs	Bivoj
Attack Helicopters	Mi-24V

In addition, The Czech Republic provided Ukraine with a high number of small arms, including 30,150 Pistolet vz. 82 Pistols, 2,085 vz. Sixty-one Škorpión Machine Pistols, 5,000 vz. 58 Assault Rifles (Delivered along with at least 3.5 million 7.62mm rounds), CZ BREN 2 Assault Rifles (Delivered along with at least 3.5 million 7.62mm rounds), 3,200 UK vz. 59 Machine Guns (Delivered along with at least 3.5 million 7.62mm rounds), 12 Dragunov Marksman Rifles, 19 Falcon Anti-Materiel Rifles and 10,000 RPG-75s (Oryx, 2022).

6. Denmark - Prime Minister Mette Frederiksen announced Denmark's military support for Ukraine on 28th February. So far, the Danish Government has provided Ukraine with **2,700 shoulder-borne anti-tank rockets, 300 Stinger missiles**³ (Jenvall, 2022), 25 Sky-Watch tactical drones for reconnaissance and information gathering (Rasmussen, 2022), 50 M113 armoured personal carriers, 120mm M/10 mortars

(Szumski, 2022), and RGM-84 Harpoon anti-ship missiles (LaGrone, 2022).

7. Latvia - The military support provided by Latvia includes weapons, individual equipment, dry food rations, munitions, antitank weapons, anti-aircraft missiles Stinger, unmanned aircraft, self-propelling howitzers, helicopters, fuel, and other goods. At the end of August, the Ministry of Defence, in cooperation with the "Entrepreneurs for Peace" organization, launched a programme with the purpose of collecting donations of more than €7 million to provide military vehicles, armour, armoured ambulances, technology solutions, and other forms of military assistance to the Ukrainian armed forces (The Defence Post, 2022).

8. Estonia - By the end of August, Estonia provided Ukraine with €250 million worth of military aid. The equipment provided includes FGM-148 Javelin, anti-tank mines, small arms, ammunition, protective equipment, thirteen vehicles,

3. The missiles were assembled and made operational by the United States before the shipment to Ukraine

50,000 field rations and 9 D-30 howitzers (The Defence Post, 2022).

9. **France - France chose not to disclose the full extent of its military aid to Ukraine. The delivery of eighteen 55mm Caesar self-propelled guns (SPGs) certainly stands out as one of the most significant French contributions to the Ukrainian forces. France**

has provided Ukraine with fuel, protective equipment, uniforms, infra-red systems, and ammunition since the beginning of the conflict. However, from July onwards, France decided to intensify their armaments supply to Ukraine by sending the following:

Table 10: French Military Assistance to Ukraine

Source: [Arms For Ukraine: French Weapons Deliveries To Kyiv - Oryx \(oryxspioenkop.com\)](https://oryxspioenkop.com/)

Category	System provided to Ukraine
Self-Propelled artillery	155mm Caesars
Towed artillery	155mm TRF1s
Armoured Personnel Carriers	Véhicule de l'Avant Blindé (VAB)
Vehicles	TRM 2000s; Peugeot P4 SUVs
Man-portable air defence systems	Mistrals
Anti-tank guided missiles	MILANs; U.S FGM-148 Javelins
Anti-tank mines	HPD2A2

c. Training

Another aspect of foreign aid to Ukraine concerned training. During the first weeks of the conflict, the Ukrainian forces witnessed great difficulty absorbing all the weaponry provided by the West. One of the reasons behind this issue was the Ukrainian troops' lack of training to operate newly developed systems and armaments. So far, fourteen countries have contributed to training Ukraine's armed forces.

Brigadier general Oleksii Hromov, Oleksii Hromov, Deputy Head of the Main Operations Directorate of the General Staff of

the Armed Forces, reported that “more than 4,000 servicemen of the Armed Forces of Ukraine have been trained to perform tasks on foreign models of weapons and military equipment in fourteen partner countries. Of this personnel, more than 2,000 servicemen are artillerymen, five hundred specialists in the use of rocket salvo systems and air defence, almost two hundred people in operation and maintenance of anti-tank weapons, about one hundred specialists in operation and maintenance of radar systems” (Defence Express, 2022).

UK-led Operation Interflex stands out as the most notable effort to align Ukrainian troops

with NATO standards (Bayer, 2022). The operation was launched on 9th July 2022 and benefitted from the contribution of several countries due to the British Government invited the member states of the UK Joint Expeditionary Force to contribute to the training programme. On 7 August 2022, Sweden

accepted its invite and announced it would send 120 instructors, swiftly followed by a commitment from twenty instructors from Finland. Denmark, Germany, Latvia, and Norway announced they would be joining the training programme as well (Defence Express, 2022).

III-INTEROPERABILITY AND UKRAINE: LESSONS LEARNED FROM THE CONFLICT AND CHALLENGES AHEAD

a. The Impact of Western Military Aid

As the conflict unfolded, questions about the effectiveness of Western military assistance to Ukraine have been raised. The first problem that underpinned this support is one of logistics. NATO Members have provided weaponry to Ukrainian forces in a piecemeal fashion. Decisions came at separate times, and issues such as weapons supply and training have been almost treated as unrelated. Ukrainian soldiers experienced difficulties in operating Western systems that required complex training. The fragmented manner in which weapons have been delivered also caused maintenance problems due to the low quantities of weaponry being provided, meaning they could not be rotated in and out of the front line for maintenance.

Furthermore, despite the efforts of the Atlantic Alliance, armaments are not fully compatible yet. This can be seen with the German tanks *Panzerhaubitze 2000* and *Gepart* which have both suffered from compatibility issues with ammunition from other NATO members (Military Watch Magazine, 2022). These issues have severely affected Ukraine's capacity to absorb all the equipment provided by international allies.

Nevertheless, despite these issues hindering Western weaponry from being deployed to its fullest potential, military assistance to Ukraine has generally positively impacted Ukrainian forces on the battlefield. Indeed, the first wave of arms deliveries was decisive in hindering the initial "special operation"

of Russian forces around Kyiv (Péria-Peigné, 2022). Artillery supplied by the West allowed Kyiv's forces to hit Russian targets located at a fairly significant distances. Evidence of this can be seen in July 2022, when Ukraine's armed forces reportedly used HIMARS to destroy two Russian army ammunition depots in the Luhansk and Donetsk regions, specifically in Zymohirya, Perevalsk, Snizhne, Popasna, and Donetsk. These cities are approximately 50 km from the front line. HIMARS are also believed to have been employed against a Russian air base in the occupied city of Melitopol in the Zaporizhzhia region (Davydenko, Khvostova, & Lymar, 2022) and have proven to be effective in cutting Russian supply and communications lines (Tucker, 2022).

Ukrainian troops used Javelin and MANPADS systems provided by NATO Members to attack vulnerable Russian flanks, allowing them to exploit the Russian forces' logistical shortcomings. In addition, the Turkish drone Bayraktar TB2 managed to strike against Russian air-defence systems thanks to its capacity to operate at 20,000ft, outside of Moscow's air defence systems range (Foi & Bott, 2022). The successful counter-offensives that Ukraine led in September around Kherson and Kharkiv have, however, raised questions about the extent to which support from the West is decisive in securing successes in such Ukrainian operations. The success of the Ukrainian advance can be mainly attributable to the high morale of Ukrainian sol-

diers combined with their brilliant tactics, which allowed Kyiv's troops to catch the Russian forces by surprise in Kharkiv. During the weeks prior to the counter-offensives, Ukraine adverted a massive campaign in the south near Kherson, resulting in Russian generals amassing a large number of troops in that area. However, the area selected for Russian troop redeployment was located within the range of Ukrainian artillery, resulting in Russian difficulties in both re-supplying or retreating, as Ukrainian forces retained fire control over the Dnipr River's crossings. This also resulted in the large number of Russian

The conflict in Ukraine has highlighted some of NATO's weaknesses, particularly in its decision-making processes and its ability to coordinate Member States' efforts. The Alliance should identify key partners (such as Ukraine) and engage in advance planning in relation to the support that such partners would receive in the event of an attack. This will result in more efficient assistance. From a strategic point of view, the Alliance should focus on solidifying its unity. After all, the logistics issues witnessed with regard to weaponry supply derive from disunity at a political level. Suppose unity is challenged at the first sign of pressure. In that case, the conclusion that enemies may draw is that they can challenge the Alliance by pursuing aggressive policies without expecting a strong reaction from NATO. As far as weaponry interoperability is concerned, the conflict demonstrated that NATO's armaments are not fully standardised

troops stuck in Kherson being prevented from reaching Kharkiv. However, numbers are important to capitalise on these two successes. According to military experts, Western allies should keep supporting Ukraine by increasing the supply of counter-battery radars with self-propelled guns, HIMARS and MLRS, as well as by improving Ukraine's missile defence capabilities through providing NASAMS anti-aircraft systems (Davydenko, Khvostova, & Lymar, *Lessons for the West: Russia's military failures in Ukraine*, 2022).

b. Lessons Learned for NATO

yet. Therefore, further supervision of STANAG's implementation is needed. In addition, there is a need for better cooperation for the common procurement and coordination of defence industry to exploit the advantages of innovation without the latter hampering standardisation objectives previously achieved. Overall, a more comprehensive approach is advisable, as to be successful on the battlefield, it is necessary to look beyond it. Integrating non-military measures with "classical" combat means efficiency will be fundamental, as the conflict in Ukraine highlights the importance of economic warfare, with financial and technological sanctions and trade restrictions proving to be crucial measures in wartime. Finally, the Members of the Alliance need to strive for strategic autonomy as far as energy is concerned to avoid the paradoxical situation of being refuelled by their potential adversaries.

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