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The impact of the proliferation of ballistic missiles technology on international security

Abstract: Due to the rapid development of technology after the Second World War, the way of conducting conflict has changed significantly. One of the branches of the armaments industry that has developed the most is space technology and related to it ballistic missiles. Undoubtedly, possession by international entity ballistic missile technology, especially in connection with weapons of mass destruction, increases the importance and role of this entity on the international arena. Therefore, the proliferation of this technology or ready-made missile systems has a significant impact on regional and international security. Therefore, in order to explain this phenomenon, the first part of the article describes the role of ballistic missiles for international security. In the second part, author describes varied ways how international actor, such a state or organization may come into possession of ballistic missiles and also the methods used to stop or limit proliferation i.e. counter-proliferation methods. The last part of this article describes the ways how selected examples states such us Egypt, People's Republic of China, Israel, India, North Korea, Iraq and South Africa have come into possession of ballistic missile technology. In connection with the above, it will be possible to show what proliferation of this kind of technology looked like and may look like in practice.

Keywords: *Ballistic missile, proliferation, international security, technology, globalization*

Introduction

In the 2020s, we are witnessing a renewed space race, this time between the United States and the People's Republic of China, which are already establishing permanent bases on the Moon and planning an expedition to Mars. Nevertheless, unlike the situation that took place during the Cold War, in addition to the main actors in the aforementioned race, we can observe other new actors who are also developing their space technology. We are talking not only about state actors, but also private companies such as SpaceX, which as of today has

more space courts than all countries combined. However, the development of space technology is not only the development of science, but above all it is a related arms race, of which ballistic missiles are an emanation. Rather associated with the Cold War period, ballistic missiles, especially when combined with the ability to carry weapons of mass destruction, are not only still an extremely effective warfare, but also a political instrument for leverage and deterrence. As a result, we should not be surprised that more and more international actors want to take possession of this technology.

The emergence and proliferation of ballistic missiles throughout the world have led to what in military history is the extremely rare situation of absolute and lasting superiority of offensive over defensive weapons. Therefore, this military instrument, especially in its capacity as a highly effective means of transport for weapons of mass destruction, has become a significant political instrument with the power to influence, directly or indirectly, the security policy of individual actors, while also affecting regional security and the existing international order. With the Cold War finished and the bipolar world order at an end, it would appear that ballistic missiles, which were in a sense symbolic of that period, are no longer an issue. However, this is far from true, as with growing post-1989 globalisation and the consequent proliferation of ballistic missiles, the problem has become more pertinent in international relations.

Following their initial design and development, overseen by Wernher von Braun, missiles became a strategic issue for two major powers at the time, the United States and the USSR. After the Second World War, these two countries entered an arms race to find the most suitable means of transport for weapons of mass destruction (ballistic missiles), as they vied at the same time for the distinction of being the first to set foot on the Moon. The situation changed with the collapse of the bipolar world order, paving the way for the proliferation of these weapons to other international actors, including the so-called *states of concern* (Marquis, 2000), as well as subversive and terrorist non-state organisations (Baylis & Smith, 2008, pp. 107–127). The proliferation and development of domestic missile programmes, coupled with an absence of significant protective measures, means that international actors with a relatively weak economic and military potential may influence the policies of other actors within the region, or even project power over overwhelmingly superior entities, such as the United States.

However, rather than the military potential of ballistic missiles themselves, the problems referred to above have more to do with the shortcomings of defensive measures, such as missile defences. Currently, no international actor has at its disposal a proven, fully effective missile defence system with the capability to protect the entire territory of itself and its allies. This stems from a technological lag of preventive measures compared to weapons of aggression, as well as from purely economic constraints on the expansion of missile defences.

Considering all the above factors, it should be concluded that missiles can be the subject of separate research, which will be located in the area of social sciences with the dominant role of political science and international relations. Nevertheless, the issue under discussion

requires a largely interdisciplinary approach, and therefore, in addition to political science and administration, issues from history, sociology, military science and economics will also be used.

The ability to possess a missile arsenal, increases the importance and capabilities of a given entity in the international arena, and in extreme cases, can even give the status of a supra-regional and even global power. However, depending on the geopolitical, economic and military situation, each entity will create the role of its missile forces differently.

As of today, there are no effective forms of regulation and real action by international actors regarding the proliferation of ballistic missiles. As a result, there is an uncontrolled proliferation of ballistic missiles, which is one of the greatest threats to global security in the 21st century. Therefore, the main research objective of this paper is to determine the importance of ballistic missiles, as also the impact that proliferation has on international security. Proving the above thesis will be possible by pointing out the importance of this military measure in international politics. Most importantly, the phenomenon of proliferation itself, ways to counter it, as well as historical examples of the proliferation of ballistic missile technology will be described.

Ballistic missile technology is in fact not new and has been an important part of US strategic thought considerations since the end of World War II. Therefore, the literature on the subject is most extensive in the US, both strategically, militarily and technically. Since the topic is frequently discussed both in the media and in the general political debate, one can come across a relatively large number of sources, analyses and newspaper articles relating to ballistic missiles, weapons of mass destruction and strategies for their use. Nevertheless, the U.S. literature is of widely varying quality. Beginning with full analyses of Think-tanks, reports created on behalf of the US Congress, through university papers, pseudo-scientific analyses ending with journalism. It should also be noted the fact of particularly misleading analyses, which were often created on political orders.

In order to analyze the issue of ballistic missiles, it is also necessary to identify the methods and techniques of research appropriate to the social sciences, especially political science and security science, which will be used in this paper. Qualitative and quantitative research methods were used. The quantitative method is particularly relevant from the perspective of determining the scale of the problem, that is, quantifying existing ballistic missiles. Nevertheless, qualitative analysis of the found content was used for the vast majority of the work, so that it is possible to answer the question of why the studied entities act in this way and not in another way in their individual geopolitical situation. The paper's source base is largely based on numerous monographs, academic papers, as well as articles and online reports in both Polish and English. In order to help convey some events, a comparative method was also used, the aim of which was to identify identical, as well as those that could distinguish similar phenomena. This, in turn, made it possible to understand the disparities, as well as the elements that unite the quite different international actors that possess a missile arsenal. Nevertheless, one of the most important methods used in this work was

the behavioral method, which consisted of observing selected countries in the context of their missile arsenals and their reactions to the changing international environment and the proliferation of missile technologies.

The role of ballistic missile technology on international security

With that in mind, it is fair to assume that ballistic missiles have a significant impact on the security policy of those countries that possess them. Therefore, the proliferation of this military instrument will also considerably influence the local military balance and the regional arms race. However, research in this field is extremely challenging, as counterparties are reluctant to disclose any details of their transactions. In most cases, arms manufacturers do not wish to be embroiled in conflicts or expose themselves to any legal or reputational consequences. Buyers usually also maintain secrecy about the purchases of new types of armaments for security reasons in order to have the advantage of surprise in the event of a conflict situation. This is not the case with ballistic missiles. As already mentioned, ballistic missiles often also serve a public relations function in addition to their obvious military value. In foreign policy, ballistic missiles can be used to create a fictitious image of military might in order to deter a potential adversary. In domestic policy, they serve to boost the image of leaders in society. It is often during military parades that foreign military intelligence agencies first learn of a new type of missile, as has happened on numerous occasions in Russia, China (CGTN, 2019) or North Korea.

Among the most important aspects of ballistic missile proliferation is its inextricable connection with weapons of mass destruction. The acquisition of nuclear weapons is not sufficient for an actor to build up a viable and credible deterrent potential or effectively reverse a military situation. Indeed, nuclear weapons devoid of a reliable and effective means of transport may paradoxically invite sanctions or even trigger an armed conflict, as rival countries will move to de-escalate the nuclearisation. While bombers may fulfil the transport role, this tactic is far from optimal, requiring substantial airport infrastructure, trained personnel and a significant number of aircraft, as their use involves severe combat losses. In addition, a sizeable number of countries have air defence facilities, as well as fighter aircraft capable of destroying the carried explosives (Szulc, 2018, pp. 103–108).

With these factors accounted for, it is fair to assume that ballistic missiles are by far the more effective alternative for a nuclear state. Their survival rate is significantly higher than that of aircraft and only a few countries have missile defences in place. It is noteworthy that many researchers question the effectiveness of existing defences, especially in view of the latest countermeasures (Union of Concerned Scientists). Moreover, the current advancement of defence technology makes impossible the prevention of a massive missile strike, allowing only small pockets to be protected (Wilson & Parachini, 2020). The largest obstacle to the establishment of effective missile defence systems is the economic aspect. The overwhelming majority of countries are ill equipped to develop such systems from

scratch or purchase ready-made solutions, as those involve enormous costs – a fraction of the cost of the missiles – with no guarantee of success. What this means in practice is that any actor possessing even a small number of missiles can inflict huge losses on a relatively stronger state by destroying strategic military, demographic or infrastructural targets. Consequently, the most effective way to counter such a threat today is to develop domestic missile capability sufficient to deter a potential aggressor. As a result, many international actors, including subversive and terrorist organisations, seek to acquire all kinds of ballistic missiles. Obviously, their type will depend on the presumed targets and capabilities, so – for example – military powers such as Russia and China are focused on acquiring HGV technology, North Korea on ICBM-class missiles and organisations such as Hezbollah on unguided short-range missiles.

The emergence of rocket and space technologies always comes with the risk of their proliferation. The first instance of proliferation occurred immediately after the end of the Second World War and involved technology transfer from the Third Reich to the United States and the Soviet Union. This was a crucial turning point, as the latter two had achieved very little in that field. Moreover, the first missiles tested were copies or modified versions of the V-2 (A4) rocket, and the leading figure of the US space programme was Wernher von Braun, the founder of the German rocket programme. The Cold War period resulted in a whirlwind growth of rocket technology, driven mainly by the two opposing superpowers, the US and the USSR. It is remarkable that proliferation used to be always limited and linked to important political or military objectives. The situation changed dramatically just before the end of the Cold War, when mostly Soviet-based ballistic missile technology became accessible to an increasing number of actors. The scale of proliferation is evidenced by the fact that there are now as many as 13 international actors, including Hezbollah, among the entities that possess the technology to produce ballistic or long-range cruise missiles.

Types of proliferation of ballistic missile and methods of counteracting it

It is fair to assume that ballistic missile proliferation has an undeniable impact on international security and steps are needed to regulate, contain or completely ban the proliferation of missile technology. However, in order to be able to assess countermeasure options, it is necessary to first discuss the proliferation mechanisms themselves. Based on what seem to be the most obvious ways of acquiring missile technology, i.e. building domestic solutions with the help of existing knowledge and technological and economic background or acquiring ready-made missile systems, we can explore a range of intermediate possibilities.

Indirect methods of acquiring missile technology include, but are not limited to the purchase of ready-made systems, signing a licence agreement for the production of foreign solutions, copying missiles obtained under unclear circumstances, assembling imported components, establishing a research and development programme in cooperation with

another entity, and hiring specialists from other countries. Worth highlighting is the uncomfortable reality that relevant knowledge can be gained from generally available resources, i.e. publications, or even by enrolling in institutions of tertiary education, as exemplified by Chinese university students in the United States (Cimpanu, 2020).

Another noteworthy point is that recent years have seen intensified technological exchange between entities seeking to acquire ballistic missiles. This particular form of collaborative effort involving at least two parties is proving to be extremely effective, as progress comes much more quickly than would be possible individually, with added indirect benefits to the economy, including the military industrial complex. This marks a shift away from the traditional method of acquisition of nuclear weapons and their associated vehicles, with exchanges between parties often taking the form of bartering in which missiles or nuclear technology are the product (Pacholski 2004, p. 13). This occurs between entities of similar status and in cases where a stronger entity assists a weaker one in exchange for other political or economic benefits. An example of the first model of cooperation is the relationship between North Korea and Iran (Einhorn & Diepen, 2019, pp. 9–16). The second model can be found, for example, in Pakistani-Chinese relations (Chen, 2018).

In addition to the methods of ballistic missile proliferation discussed in the preceding sections, there is another possibility that does not fit easily into any of the above types. It involves linking ballistic missile development to launch vehicle (SLV) research used in civilian space programmes. This possibility arises from direct similarities in many aspects of the development of both types of missiles. In addition, work on the scientific part of space science provides an ideal 'smokescreen' for the real objective, which is to develop this technology for military use (Pacholski, 2004, pp. 15–16). A particular good example of this is Iran which – as reported by foreign intelligence agencies – uses the research and development programme on the Simorgh-type SLV remains merely a facade for work on long-range missiles (Center for Strategic and International Studies, 2017).

Any debate concerning the containment of missile technology proliferation should mention that due to the importance of the threat relating to this phenomenon, many international actors are themselves including countermeasures in their national security policies. Typologically, we can distinguish four ways of countering ballistic missile proliferation: legal, political and diplomatic, economic and military.

The first of the above, i.e. legal mechanisms for countering ballistic missile proliferation, comprises international agreements as well as internal regulations. These are primarily legal provisions addressing the possibility of, or a complete ban on, controlled or limited exports of this type of weaponry to other international actors.

The political and diplomatic ways of containment of ballistic missile proliferation primarily include *soft power*. The first method is to persuade other international actors to adopt appropriate legal standards, to verify compliance with the existing rules, and to respond to questionable behaviour by other political actors. Another political way is also to build a favourable international atmosphere that emphasises the importance and dangers

of uncontrolled ballistic missile proliferation. Another form of diplomatic counteraction is the shaping of political consultation mechanisms that would automate action in the event of suspected violations of legal and informal regulations (Pacholski, 2004, p. 22).

Among the economic methods of countering ballistic missile proliferation, two mechanisms should be singled out in particular. The first is the ban on trade in finished missile systems, their components and dual-use materials, and the promotion of this attitude among business partners. The second noteworthy method is the application of general trade sanctions aiming to restrict the acquisition of missile weapons, the ability to produce them or the financing of such projects. The final effect of these economic restrictions is to force other international actors, especially the proliferator, to internally review the political strategy of the state (Ebner, 2013).

Military counter-proliferation methods mainly include military intelligence activities of identifying and monitoring international actors with regard to ballistic missiles. Another form this can take is through political-military cooperation, as well as expert assistance in the field of defence against missile weapons. The third military measure, which should be highlighted, is the use of military superiority as a coercive measure to change the proliferator's existing strategy. Yet another way is to use one's own military capabilities to disrupt the supply chain of missile weapons or the components necessary for their production. Military prevention of ballistic missile proliferation can also take the form of pre-emptive attacks, including military and cyber strikes, on the proliferator's infrastructure responsible for the manufacture of missile weapons or their components. The final military means of preventing proliferation is direct military intervention to disarm the culpable international actor (Pacholski, 2004, p. 23).

In addition to the above-mentioned types of countering ballistic missile proliferation, multilateral cooperation should also be discussed. One of the first attempts to curb previously uncontrolled proliferation in this way was the development of an 'informal political agreement' – the *Missile Technology Control Regime* (MTCR) – in April 1987. It envisions a kind of regime under which signatories to the agreement control the proliferation of missile technology. Its key component is a ban on the sale of missiles and technology to produce missiles with a range of more than 300 kilometres and a payload of 500 kilograms and above. However, the MTCR is not a treaty-established body and therefore cannot impose any sanctions on non-compliant entities. Moreover, it does not even have the ability to exert political influence on countries that have not signed the agreement. The agreement was initially concluded between the G7 countries, with 28 further countries joining in later years. However, it is worth mentioning that the signatories mainly include countries that are unable to export this type of technology, as they do not have it themselves. Among the members of the MTCR is Poland, which chaired this informal assembly in 2002-2003 (Crook, 2012, p. 676).

In addition to the MTCR itself, one can also point to other initiatives that have anti-proliferation in their mission statement, for example: The Hague Code of Conduct Against

Ballistic Missile Proliferation (HCoC), the Global Control System for Missiles and Missile Technology (GCS – GSK), the UN Panel of Experts, the EU Action Plan, and the Zero Ballistic Missiles (ZBM) initiative. Despite numerous forms of activity based on multilateral cooperation, none has been particularly successful. Also, the signatories of such agreements are often countries that are affected by the issues in a very narrow sense, a case in point being the MTCR (Pacholski 2004, p. 23).

There is a considerable amount of overlap between the typologies cited above as well as the specific ways of countering ballistic missile proliferation, as they are extremely rare on their own. On the one hand, their number indicates a wide range of countermeasure options, and this, for obvious reasons, seems to have a positive impact on the preservation of international security. On the other hand, however, such a wide range of response options indicates at the same time the weakness of political and diplomatic solutions to contentious issues, including missile technology proliferation.

Historical examples of the proliferation of ballistic missile technology

Having discussed the theoretical aspects of ballistic missile proliferation and missile technology, we will now turn to examples of international actors who have attempted to acquire this particular military asset in the past. Most often, ballistic missile proliferation occurs through acquisition. It takes place both through official channels (as in the case of Poland's purchase of Patriot missile batteries) (Kelly, 2018) and through unofficial channels (as in the case of the North Korea-Iran exchanges). In the vast majority of cases, these are ready-made solutions that cannot, at least openly, be copied. Occasionally, however, there have been attempts at duplication or derivative production of imported designs. Moreover, some entities have used the purchased designs to create their own constructions, which, following some modifications, were exported to third countries. According to analyses, the design that is undoubtedly the most frequently sold, as well as the basis for subsequent solutions, is the Soviet Scud-type rocket (8K14, SS-N-1B) (Center for Strategic and International Studies, 2016).

The first example is, somewhat surprisingly in today's realities, **Egypt**. Having conducted observations of WW2-era V-2 rocket technology, as well as relying its own experience of armed conflict with Israel, Great Britain and France, Egypt decided to follow the example of the US and the USSR in developing its own arsenal by recruiting German scientists headed by Eugen Sänger. The then head of state, Gamal Abdel Nasser, presided over the project in a bid to attain undisputed hegemony in the Arab world, an impossible accomplishment without missile technology. The programme started in 1960 and was very successful. In 1961, the first research and development facility was established to test the Al Zafir and Al Kahir missiles in 1962. The goal was for the missile technology development programme to provide the Egyptian army in the 1970s with 900 missiles in three varieties. However, despite extensive propaganda, none of the missiles were deployed, and during the Six-Day

War no Egyptian missile of the aforementioned types reached Israeli territory (Sirrs, 2006, pp. 47–156). Eventually, Cairo acquired operational missile weapons after it entered into an alliance with the Soviet Union and received Scud-B (R-300 Elbrus) missiles (Sirrs, 2006, p. 196), which remain in the Egyptian army's possession until this day (Nuclear Threat Initiative, 2015). Therefore, it is fair to assume that despite its attempts to develop domestic ballistic missile technology, Egypt is only an importer of ready-made missile systems.

Another recipient country is the **People's Republic of China**. Although it is now seen as one of the leaders in innovation in the field, as well as one of the largest exporters of missile systems, its first R&D was based on Soviet design copies. Military cooperation between the two countries began back in the 1930s and involved the rearmament of communist guerrillas in China. This movement was of particular importance to the Soviet Union's far-reaching policy that regarded Beijing as a natural ally and, because of its large population, as a buffer against any possible US attack. As the Soviet industry was weak, it was decided to set up numerous production facilities with a broad profile, including armaments. The situation changed dramatically after the diplomatic conflict in 1960 and the breakdown of Sino-Soviet relations (Polit, 2004, p. 131). At that time, close military cooperation was discontinued and the last missiles delivered to Chinese territory were the R-2 type and early Scuds. It was on the basis of the latter that R&D work was undertaken to develop China's first DF-2 Don Feng-2-type ballistic missiles, whose upgraded DF-2A version, equipped with a nuclear payload, made its first ballistic flight in 1966. Ultimately, the Chinese army deployed the first ballistic missiles in 1972, but due to the small number of units produced, they were withdrawn after just eight years (Astronautix Encyclopedia, DF-2). Subsequent missile technology development efforts focused on missiles with a much longer range. The first results of this work – a great technological leap – included the two-stage DF-4 missile with a range of up to 4,500 kilometres deployed in 1980 (Center for Strategic and International Studies, 2019) and the DF-5 missile with a range of up to 10,000 kilometres deployed just a year later (Center for Strategic and International Studies 2, 2019). Both remain, with some modifications, in service with the Chinese army until this day. It is worth mentioning here that China's first missile programme came about largely thanks to extensive Sino-Soviet cooperation, as well as engineers who received the relevant training in the USSR. Even more interesting, however, is the fact that the 'great technological leap' referred to above was due to Chinese scientists returning from the United States in the 1940s and 1950s, who were repeatedly involved in military and space projects in that country. To this day, it remains unclear whether this massive return was a coincidence or a planned espionage operation by Chinese intelligence.

We can now see the results of the tremendous progress that has been made in the People's Republic of China over the past 50 years. Of course, this is primarily linked to the unprecedented pace of development, which the government in Beijing sees as inseparable from military security. This means that Chinese political thought, in contrast to Western political thought, does not separate economic development from military security. From

an importer of missile technology, China has evolved into an important global economic actor, while also being one of three innovators in space and missile technology. With this advantage, it is able to influence other actors, including through ballistic missile proliferation. China's main clients include Saudi Arabia, Iran, Iraq, North Korea, Libya, Pakistan, as well as Syria. Moreover, the government in Beijing has also taken steps to legalise these exports. The main instrument for this has been the introduction of three rules defining the role of missiles in the potential buyer's security policy:

1) The purchase must be for self-defence only;
2) The exported missiles are intended as a means of ensuring stability in the region;
3) The weaponry acquired may not be used to interfere with the internal affairs of another international entity (Nayyar, 2009).

In addition, mainly under pressure from the United States, China formally applied to join the MTCR structures in 2004, and expanded domestic legal regulations to prevent the uncontrolled proliferation of ballistic missiles. The result of these efforts is the *Regulations of People's Republic of China on Export Control of Missiles and Missile-related Items Technology* (China Atomic Energy Authority, 2010). However, it bears repeating that the MTCR is only an informal political assembly with no power to impose legal sanctions on non-compliant states, among whose number the United States is the most glaring example. Therefore, there is nothing to prevent China from continuing ballistic missile proliferation.

Unlike most states with missile capabilities, **Israel** maintains its ballistic missile arsenal in strict secrecy. Consequently, much of the information and technical data regarding the size of Israel's arsenal is based on conjecture by researchers and foreign intelligence. What is known, however, is that the first generation of missiles of this type was acquired by importing finished missile systems from a foreign entity. In 1963, the Tel Aviv authorities signed a contract with the French arms company Dassault to develop a ballistic missile with a range of up to 500 kilometres. In the following years, France was to produce 25 units and deliver them to Israeli territory. The design proposed by Paris was based on an existing solution, the Topaze, which had undergone its first tests only a year earlier. Israel thus came into possession of the latest technology available at the time. This included the use – for the first time in history – of a digital computer. In addition, the missiles in question could carry both conventional payloads and nuclear warheads. The first test flight of an MD-620-type missile took place in 1965 in the Mediterranean (Dassault Aviation). However, after the delivery of 12 missiles, which were later renamed 'Jericho', further deliveries were discontinued under the international sanctions imposed on Israel after the Six-Day War. In the following years, Tel Aviv began efforts to procure US Pershing II missiles to replace its missile arsenal in the future, but these attempts proved unsuccessful. Consequently, Israel began its own research and development of an improved version of the French missiles called Jericho 2. These were deployed in 1989 and remain with the Israeli army until this day (Center for Strategic and International Studies , 2017). Israel is therefore another entity that has gone from being

an importer of ready-made ballistic missile systems to becoming one of the key players in the conquest of space (Morelle, 2019), as well as in the development of rocket technology. However, unlike most countries, Israel does not publicise its achievements in this field or export its solutions to other international actors.

Despite the fact that **India's** Agni family of ballistic missiles is markedly different from the designs used in other countries, it is likely that that country, too, at least initially, was an importer of missile technology. India began to develop its missile programme in the 1980s, when it worked closely with the Soviet Union, mainly in the military field. Therefore, many researchers point out that the first jet engines were likely supplied by the USSR, and that Soviet scientists assisted in the design of the Indian versions. In the following years, information about the supply of some components from the Soviet Union and later Russia was officially confirmed – thus denying that there was ever a proliferation of finished missile systems to India (Isby, 2001, p. 10). This fact confirmed the effectiveness of India's space and missile programme. On the other hand, it testified to the fact that almost no international actor is able to produce national ballistic missiles completely on its own and has to rely, if only to a minimal extent, on imported technology.

Undoubtedly, the contemporary hotbed of international missile technology proliferation is **North Korea**. Clearly, this country's level of economic and technological development would not allow it to develop and produce its own ballistic missiles. The missile arsenal owned by the Kim family regime is the product of the highly effective foreign policy of North Korea's then leader, Kim Ir Sen, who skilfully exploited the temporary antagonisms between Moscow and Beijing. Taking advantage of its own geopolitical weight during the Cold War and carefully juggling its allies, Pyongyang received gifts from the USSR or China in the form of strategic armaments. Thus, North Korea obtained from Moscow the first Scud B-type ballistic missiles (8A61/8K11/8K14, SS-N-1B) – which were later modified using Chinese missile technology. Production of the North Korean version of the Soviet missile began in the 1980s under the name Hwasong-5, and by 1986, it had already been deployed by the Korean army (Isby, 2002, p. 4).

The problem that continues to plague North Korea is its economic backwardness and chronic lack of financial resources. Consequently, the technology acquired and developed by Pyongyang or the finished missile systems are sold to any international actor willing to pay enough. Among North Korea's confirmed customers are Iran, Yemen, Libya, Pakistan and Syria. Particularly noteworthy is the proliferation to Pakistan and Iran, which have purchased from Pyongyang ready-made lines for the production of modified Russian Scud missiles (Bermudez, 1990, p. 8). In the following years, as in the case of Israel, North Korea's missile programme expanded rapidly. As a result, the country today has intercontinental-range ballistic missiles, as well as strategic submarines equipped with native SLBM-type missiles (Nuclear Threat Initiative, 2018). Above all, however, North Korea is today seen as a potential instigator of international conflict, as well as a major unofficial distributor of missile technology.

Iraq was another country that benefited from technology exported by the USSR. Back in the 1970s, it purchased the first Scud B-type ballistic missiles from Moscow, which were first used in the Iran-Iraq war in the mid-1980s. However, they had a range of no more than 240 kilometres from the firing point, which proved insufficient in that particular conflict. Consequently, research and development of a modified version of Russian ballistic missiles began in the following years. The result was an Al-Hussein-type missile with a range of up to 650 kilometres, which could carry weapons of mass destruction in the form of chemical, biological or nuclear weapons (Central Intelligence Agency, 2005). Iraq did not stop at one modification, however, as over time Iraqi scientists developed and produced another version of the Scud in the form of Al-Abbas and Al-Hijarah rockets. However, they were not used as extensively as the previous models (Central Intelligence Agency, 2005). It is noteworthy that these missiles were used during the first Gulf War against targets located in Kuwait and Saudi Arabia. This is significant because it was during these very attacks that attempts were made to intercept the missiles by the US Patriot-type missile defence system, whose performance proved to be moderate (Select Committee on Intelligence United States Senate, 2004). As a result of Operation Iraqi Freedom, the entire Iraqi missile arsenal was scrapped.

Among recipients of missile technology is also **South Africa**. This country, like other international actors, began to invest in developing its own nuclear and missile capabilities as part of its deterrence strategy. As a result of these efforts, South Africa acquired nuclear weapons, as well as strategic aircraft capable of carrying these weapons. In the longer term, however, these were to be replaced by ballistic missiles. This is an interesting example, as the way to obtain them was through cooperation with Israel, which resulted in the testing of RSA-1 and RSA-2 missiles, i.e. modified versions of Jericho-2 missiles. Despite initial success, however, this programme was completely discontinued in 1993 (Stockholm International Peace Research Institute, 1994).

Worth mentioning is also **South Korea,** a country which has neither weapons of mass destruction nor relatively long-range missiles, and is therefore often overlooked in specialist studies. Although the South Korean military has held ballistic missiles since relatively recently (2008), they are a key element of the country's security policy. The *Kill Chain* and *Korea Massive Punishment and Retaliation* (KMPR) doctrines form the core of the country's missile arsenal. Both of these, unlike in other countries, rely on a conventional but extremely precise attack. The first strategy involves detecting a potential threat, mainly within North Korea, and striking pre-emptively. The second strategy, or KMPR, is about de-escalation in the event of a nuclear attack from the North. In this scenario, the targets of South Korean missiles are strategic military infrastructure, as well as North Korea's main political and military leaders, whose elimination is expected to topple the ruling regime (Center for Strategic and International Studies, 2018).

The Republic of North Korea's missile programme began in 1997, when the United States officially approved the first Hyumnoo-2 type missile with a range of up to 300 kilometres and capability to carry payloads of up to 500 kilograms (Hardy, 2012, p. 6). After the initial suc-

cesses, the US administration agreed to the continuance of the Korean missile programme, which involved the development and production of further versions of missiles. Currently in the final stages of development is a Hyumnoo-2C type missile with a range of up to 800 kilometres (Center for Strategic and International Studies, 2019). Due to the specific role to be played by South Korea's missile arsenal, all of these missiles are characterised by extremely high accuracy, which in theory allows even a specific person to be eliminated. Independent construction of such high-precision missiles requires decades of research and development work, as well as a huge intellectual and industrial base. For this reason, many researchers point out that it is likely that the Americans were also involved in their development, especially as the new designs are remarkably similar to US ATCAMS-type missiles.

In addition to the international actors mentioned above, other recipients of ballistic missiles include Afghanistan, Ethiopia, Hezbollah (Shaikh & Williams, 2018), Yemen, Ukraine, and Syria, among others. The most common reference is to Soviet Scud B-type missiles, which were imported directly or indirectly from the USSR.

It is also worth highlighting the significant role of the United States in the ballistic missile proliferation process. Washington, since taking possession of ballistic missiles, has been selling or deploying finished systems to its allies around the world, with the consequent potential for destabilisation in these regions.

To summarise: in the vast majority of cases, ballistic missiles proliferate to allies. However, this is not the rule, as in the case of North Korea, which exports its missiles for economic benefits. Even if sales are made through official channels, subsequent control is only illusory when the beneficiary resells the missiles to third countries. In addition, it is relatively common for acquired missiles to be refitted or copied, which in turn increases the number of producers.

It can therefore be concluded that the measures taken so far to control or limit proliferation are only a sham. Year after year, there is an increase in the number of producers and recipients of missile technology, which even finds its way to subversive or terrorist organisations. This is a tempting prospect, especially for developing countries, as it provides a relatively easy way to improve their position in the region or boost prestige – but above all, increases their military capabilities.

References:

Baylis, J. & Smith, S. (2008). *Globalizacja polityki światowej: wprowadzenie do stosunków międzynarodowych*, transl. M. Filary, Ł. Kamieński. UJ.

Bermudez, J. (1990). New Developments in North Korean Missile Programme. *Jane's Soviet Intelligence Review*.

Chen, S. (2018, March 22). *China provides tracking systems for Pakistan's missile programme*. South China Morning Post. https://www.scmp.com/news/china/society/article/2137643/china-provides-tracking-system-pakistans-missile-programme

Cimpanu, C. (2020, February 9). *FBI Investigating more than 1,000 cases of Chinese theft of US technology*. ZDNet. https://www.zdnet.com/article/fbi-is-investigating-more-than-1000-cases-of-chinese-theft-of-us-technology/

Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD. (2005, March). Central Intelligence Agency. https://www.cia.gov/library/reports/general-reports-1/iraq_wmd_2004/addenda.pdf

Crook, J. (2012). Twenty-Fifth Anniversary of the Missile Technology Control Regime. *American Journal of International Law*.

DF-2. *Astronautix Encyclopedia*. http://www.astronautix.com/d/df-2.html

DF-4 (Dong Feng-4 / CSS-3). (2017, October 26). *Missile Defense Project*, *Missile Threat*. Center for Strategic and International Studies. https://missilethreat.csis.org/missile/df-4/

DF-5 (Dong Feng-5 / CSS-4). (2016, August 12). *Missile Defense Project, Missile Threat*. Center for Strategic and International Studies. https://missilethreat.csis.org/missile/df-5-ab/

Dongfeng-5B nuclear missile formation reviewed at National Day parade. (2019, October 11). *CGTN*. https://youtu.be/uZXeLoIuTiI

Ebner, L. (2013). *Sanctions on Iran and Their Impact*, Nova Publishers.

Egypt. (2015, January). Nuclear Threat Initiative. https://www.nti.org/learn/countries/egypt/delivery-systems/

Einhorn, R. & Diepen, V.H. (2019, March) Constraining Iran's Missile Capabilities, *Foreign Policy*.

Hardy, J. (2012). South Korea reveals new cruise and ballistic missiles, *Jane's Missiles and Rockets*.

Hyunmoo-2C. (2017, October 10). *Missile Defense Project*, *Missile Threat*. Center for Strategic and International Studies. https://missilethreat.csis.org/missile/hyunmoo-2c/

Isby, D. (2001). Indian Army will operate Agni II. *Jane's Missile and Rockets*.

Isby, D. (2002). North Korea continues to test engines and export missiles. *Jane's Missiles and Rockets.*

Jericho 2. (2017, May 12). *Missile Defense Project*, *Missile Threat*. Center for Strategic and International Studies. https://missilethreat.csis.org/missile/jericho-2/

Kelly, L. (2018). *Poland signs $4.75 billion deal from U.S. Patriot missile system facing Russia*.

Marquis, C. (2000, June 20). U.S. Declares 'Rogue Nations Are Now 'States of Concern'. *New York Times*. https://www.nytimes.com/2000/06/20/world/us-declares-rogue-nations-are-now-states-of-concern.html?smid=em-share

MD 620 Jericho. *Dassault Aviation*. https://www.dassault-aviation.com/en/passion/aircraft/military-dassault-aircraft/md-620-jericho/

Missiles of South Korea. (2018, June 14). *Missile Defense Project*. *Missile Threat*. Center for Strategic and International Studies. https://missilethreat.csis.org/country/south-korea/

Morelle, R. (2019, April 11). Israel's Beresheet spacecraft crashes on Moon. *BBC News*. https://www.bbc.com/news/science-environment-47879538

Nayyar, G. (2009). China's Export Control System and the Role of MOFCOM. *Sassi Research Report*, *23*, https://www.files.ethz.ch/isn/128265/Report-23.pdf

North Korea Submarine Capabilities. (2018, October 4). *Nuclear Threat Initiative*. http://nti.org/7364A

Pacholski, P. (2004). *Proliferacja rakiet balistycznych i rozwoju systemów obrony przeciwrakietowej*. Ministerstwo Obrony Narodowej.

Polit, J. (2004) *Chiny*, TRIO.

Regulations of People's Republic of China on Export Control of Missiles and Missile-related Items Technology. (2010, December 13). *CEA*. https://media.nti.org/pdfs/6a.pdf

Report on The U.S. Intelligence Community's Prewar Intelligence Assessments on Iraq. (2004, June 7). *Select Committee on Intelligence United States Senate*. https://fas.org/irp/congress/2004_rpt/ssci_iraq.pdf

Shaikh, S. & Williams, I. (2018, July 5). *Hezbollah's Missiles and Rockets*. Center for Strategic & International Studies. https://www.csis.org/analysis/hezbollahs-missiles-and-rockets

Simorgh. (2017, September 28). *Missile Defense Project, Missile Threat*. Center for Strategic and International Studies. https://missilethreat.csis.org/missile/simorgh/

SIPRI Yearbook 1994. Stockholm International Peace Research Institute. Oxford University Press Inc.

Sirrs, O.L. (2006). *Nesser and the Missile Age in the Middle East (Contemporary Security Studies)*. Routledge.

SS-1 'Scud'. (2016, August 11). *Missile Defense Project, Missile Threat*. Center for Strategic and International Studies. https://missilethreat.csis.org/missile/scud/

Szulc, T. (2018). Rozprzestrzenianie rakiet balistycznych – przyczyny i skutki dla bezpieczeństwa narodowego, *Ekonomia XXI wieku*, *1*(17).

Topaze VE111. *Astronautix Encyclopedia*. http://www.astronautix.com/t/topazeve111.html

US Missile Defense. Unproven, unaccountable, and unhelpful for reducing the nuclear threat. Union of Concerned Scientists. https://www.ucsusa.org/nuclear-weapons/missile-defense

Wilson, P.A. & Parachini, J.V. (2020). *Russian S-400 Surface-to-Air Missile System: Is it Worth the Sticker?* https://www.rand.org/blog/2020/05/russian-s-400-surface-to-air-missile-system-is-it-worth.html