

REPORT

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# EUROPEAN SKY SHIELD INITIATIVE

Capacities, Criticisms,  
and Türkiye's  
Contribution

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SİBEL DÜZ, MUHAMMED SEFA KOÇAKOĞLU

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MUHAMMED SEFA KOÇAKOĞLU

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# ABBREVIATIONS

AI: Artificial Intelligence

ADA: Air Defense Artillery

AMDC2: Air and Missile Defense Command and Control System

AMRAAM: Advanced Medium-range Air-to-Air Missile

APAR: Active Phased Array Radar

ASELSAN: Military Electronics Industry (Askeri Elektronik Sanayi)

AUKUS: Australia, the United Kingdom, and the United States (Security pact)

BMC3I: Battle Management, Command, Control, Communications, and Intelligence

BMDS: Ballistic Missile Defense System

C2: Command and Control

CAMM: Common Anti-Air Modular Missile

CIWS: Close-in Weapon System

COP: Common Operational Picture

CPMIEC: China Precision Machinery Import-Export Corporation

DGAP: German Council on Foreign Relations (Die Deutsche Gesellschaft für Auswärtige Politik)

EMADS: Enhanced Modular Air Defense Solutions



ESSI: European Sky Shield Initiative  
ESSM: Evolved SeaSparrow Missile  
EU: European Union  
FCS: Fire Control System  
FETO: Fethullah Terrorist Organization  
FNC: Framework Nations Concept  
GBAD: Ground-Based Air Defense  
HVM: High-Velocity Missile  
IAI: Israel Aerospace Industries  
IAMD: Integrated Air and Missile Defense  
IFF: Identification Friend or Foe  
IOC: Initial Operational Capability  
IRIS-T: InfraRed Imaging System Tail/Thrust Vector-Controlled  
JETCO: Joint Economic and Trade Committee  
KMS: Kaideye Monteli Stinger (Stinger Mounted on Base)  
LALADMIS: Low Altitude Air Defense Missile System  
LRAD: Long-Range Air Defense Systems  
LVS NNbS: Luftverteidigungssystem Nah- und Nächstbereichsschutz (German Inner Layer Air Defense System)  
LvS103: Name of the Patriot system used in Sweden  
MALADMIS: Medium Altitude Air Defense Missile System  
MANPADS: Man-Portable Air-Defense Systems  
MEADS: Medium Extended Air Defense System  
MRAD: Medium-Range Air Defense  
MSE: Missile Segment Enhancement  
NAMFI: NATO Missile Firing Installation  
NASAMS: National Advanced Surface-to-Air Missile System  
NATINADS: NATO Integrated Air Defense System  
NATINAMDS: NATO Integrated Air and Missile Defense System  
NATO: North Atlantic Treaty Organization  
NDMA: Norwegian Defense Material Agency  
NDPP: NATO Defense Planning Process  
NSPA: NATO Support and Procurement Agency  
PAC: Patriot Advanced Capability  
PESCO: Permanent Structured Cooperation

- PKK: Kurdistan Workers' Party  
PYD: The Democratic Union Party (PYD)  
RAM: Rocket, Artillery, and Mortar  
RBS: Robotsystem (Robot System)  
ROKETSAN: Rocket Industry and Trade Inc. Roket Sanayi ve Ticaret A.Ş.  
SAGE: Defense Industry Research and Development Institute (Savunma Sanayii Araştırma ve Geliştirme Enstitüsü)  
SAM: Surface-to-Air Missile  
SAMP/T: Sol-Air Moyenne Portée/Terrestre (Medium Range Surface-to-Air Missile System)  
SES: Single European Sky  
SHORAD: Short-Range Air Defense Systems  
SİPER: A long-range air defense system being developed by ASELSAN, ROKETSAN, and TÜBİTAK SAGE  
SSB: Türkiye's Presidency of Defense Industries (Savunma Sanayii Başkanlığı)  
SWP: German Institute for International and Security Affairs (Stiftung Wissenschaft und Politik)  
THAAD: Terminal High Altitude Area Defense  
TLVS: Taktisches Luftverteidigungssystem (Tactical Air Defense System)  
TOS: Tactical Operations Stations  
TRML: Telefunken Radar Mobile Air Surveillance  
TSK: Turkish Armed Forces  
TÜBİTAK: Scientific and Technological Research Council of Türkiye (Türkiye Bilimsel ve Teknik Araştırma Kurumu)  
TWISTER: Timely Warning and Interception with Space Based Theater Surveillance (Space-Based Theater Surveillance with Timely Warning and Interception)  
UAV: Unmanned Aerial Vehicle  
UEWR: Upgraded Early Warning Radar  
VSHORAD: Very Short-Range Missiles  
YPG: People's Defense Units



# EXECUTIVE SUMMARY

The European Sky Shield Initiative (ESSI), spearheaded by Germany, represents a significant geopolitical and defense effort aimed at strengthening Europe's collective air and missile defense capabilities. Launched in October 2022 amid escalating concerns over Russia's missile deployments, particularly in Kaliningrad, ESSI seeks to create a unified and integrated defense system across member states. This initiative is a critical response to the vulnerabilities exposed by the war in Ukraine, with the primary objective of enhancing NATO's Integrated Air and Missile Defense System (NATINAMDS) and safeguarding Europe against growing missile threats, particularly from Russia.

## Main Findings:

- **Strategic Imperative:** The ESSI's core mission is to enhance Europe's capacity to respond to high-end missile threats, including ballistic, cruise, and hypersonic missiles, through the rapid procurement and integration of advanced air defense systems. It aims to provide a coordinated defense shield that can act as a deterrent against adversarial powers,

particularly Russia. This effort also aligns with NATO's broader strategic goal of fortifying Europe's defense posture.

- **Geopolitical Dynamics and Participation:** ESSI now includes a diverse array of European nations, including critical players such as the United Kingdom, Belgium, and the newly joined Türkiye and Greece. The participation of Türkiye is particularly notable, given its complex relationship with both NATO and Russia. However, ESSI faces political headwinds, with key European actors like France expressing reservations over Germany's leadership and the initiative's reliance on non-European defense technologies, which some argue undermines Europe's defense autonomy.
- **Capability Gaps and Integration Challenges:** Despite the ambitious scope of ESSI, significant disparities exist among member states' air defense capacities. Countries such as Germany and Sweden have robust, multi-layered air defense architectures, while others, particularly the Baltic states, lack sufficient medium- and long-range systems. Moreover, the integration of different defense systems, particularly in achieving full NATO interoperability, remains a major technical and strategic hurdle. A failure to resolve these gaps risks undermining the overall effectiveness of ESSI.
- **Political and Economic Obstacles:** ESSI faces substantial criticisms and challenges on multiple fronts. Politically, Germany's leadership has been criticized for not adequately accommodating the strategic interests of other European nations, notably France and Italy. Economically, the initiative demands significant financial investments in acquiring, modernizing, and integrating high-cost defense systems. The absence of a comprehensive cost-sharing framework exacerbates economic tensions, as countries with smaller defense budgets may struggle to meet their obligations.
- **Lessons from the Russia-Ukraine War:** The war in Ukraine has reshaped European defense priorities, underscoring the critical need for a resilient, multi-layered air defense strategy. Russia's sustained missile strikes have demonstrated that, even under sanctions, adversaries can maintain substantial missile stockpiles. This highlights the necessity for ESSI to ensure that its member states possess the munitions, technical

infrastructure, and strategic planning needed to sustain prolonged engagements. Additionally, Ukraine's experience shows that the gradual buildup of air defense capabilities, as seen throughout the conflict, must be avoided – nations should be equipped with comprehensive, advanced defense systems from the outset.

Key Considerations:

- **Strategic and Political Alignment:** ESSI must address the lack of a coherent, collective threat assessment, particularly in relation to Russia's advanced missile capabilities. Aligning national defense strategies within a broader European framework is essential to ensuring the success of this initiative.
- **Technological Integration and Operational Readiness:** Achieving full integration of air defense systems within NATO's command and control architecture remains a formidable challenge. ESSI must prioritize technological compatibility, particularly with NATO's communications systems, to create a seamless, multi-national air defense network capable of responding to dynamic threats.
- **Financial Viability and Sustained Investment:** The high costs associated with procuring and integrating air defense systems present economic obstacles, especially for smaller nations. ESSI's success will depend on the development of equitable cost-sharing mechanisms and long-term financial commitments from all member states.
- **The Need for a Multi-layered Defense Strategy:** Drawing from the lessons of the Russia-Ukraine conflict, ESSI must implement a layered defense architecture that integrates very short-, short-, medium-, and long-range systems to address different phases of missile threats. This layered approach will ensure resilience against high-volume attacks and improve Europe's collective deterrence capabilities.

Türkiye's potential contributions to ESSI:

- **Strategic Location:** Türkiye's unique geographical position at the intersection of Europe, Asia, and the Middle East grants it unparalleled strategic significance within ESSI. Serving as a frontline state, Türkiye

provides critical early warning and rapid response capabilities against potential threats emanating from volatile regions such as the Middle East and the Caucasus. This geostrategic advantage transforms Türkiye into a natural buffer zone, fortifying Europe's defense perimeter and complementing ESSI's broader objectives. While ESSI primarily focuses on threats originating from Russia, Türkiye's coverage of understudied, yet significant regions, underscores its indispensable role in a cohesive European defense strategy.

- **Technological Expertise:** Türkiye's investments in indigenous defense technologies have elevated it to a prominent position as a technological innovator in air defense. Flagship projects like the HİSAR-A, HİSAR-O, and the long-range SİPER systems showcase Türkiye's ability to design, develop, and deploy sophisticated systems that cater to a spectrum of threats, from short-range to extended strategic engagements. The SİPER Block-1, with a range exceeding 100 kilometers (62.14 miles), and future iterations reaching up to 180 kilometers, exemplify Türkiye's capacity to meet evolving defense challenges. Furthermore, the Çelik Kubbe (Steel Dome) system, a fully integrated and adaptive command-and-control framework, demonstrates Türkiye's ability to consolidate multifaceted air defense capabilities into a unified architecture. These advancements, coupled with Türkiye's focus on leveraging national resources, position it as a key contributor to ESSI's modernization efforts, offering cost-efficient and technologically advanced solutions to close existing gaps in the alliance's defense infrastructure. In addition to these technological achievements, Türkiye's defense industry provides critical contributions through its modern equipment, robust production infrastructure, and dynamic young white- and blue-collar workforce. These elements collectively address Europe's critical supply chain challenges and infuse fresh dynamism and strategic depth into the region's manufacturing and industrial capabilities.
- **Operational Experience:** Decades of navigating diverse security challenges have endowed Türkiye's military with exceptional operational expertise, making it a valuable asset to ESSI's defense strategies. Türkiye's successful deployment of indigenous air defense systems and seamless integration

with NATO-aligned platforms, such as Patriot missiles, have fostered a profound understanding of multi-layered defense operations. This expertise extends to countering asymmetric threats, including unmanned aerial vehicles (UAVs), cruise missiles, and rocket attacks, enabling Türkiye to address both conventional and unconventional threat landscapes. Additionally, Türkiye's demonstrated ability to mobilize and respond rapidly to crises in Iraq and Syria reinforces its reliability as a strategic defense partner. By integrating its operational insights with ESSI's collective capabilities, Türkiye can contribute to the development of robust and adaptable defense strategies, enhancing the alliance's overall resilience against emerging threats.

In conclusion, while ESSI represents a groundbreaking step toward securing Europe against modern missile threats, its success hinges on overcoming significant political, strategic, and technical challenges. By addressing these obstacles – particularly those related to system integration, financial sustainability, and political alignment – ESSI has the potential to transform Europe's air and missile defense infrastructure, offering both a powerful deterrent and a symbol of European unity in the face of evolving threats.





# INTRODUCTION

In response to Russia's missile strikes in Ukraine, Germany has spearheaded the European Sky Shield Initiative (ESSI), a comprehensive military endeavor aimed at creating an integrated, ground-based air and missile defense system across Europe. This initiative seeks to enhance anti-ballistic missile capabilities and fortify the continent's defense mechanisms.

The initiative was proposed by German Chancellor Olaf Scholz in August 2022 amid concerns over Europe's limited defense capabilities, especially against threats like the Russian 9K720 Iskander ballistic missile systems deployed in Kaliningrad.<sup>1</sup> In addition, Russia has deployed various systems to the region. In August 2022, Kinzhal hypersonic missiles were sent to the Kaliningrad area<sup>2</sup>. Kinzhal -one of Russia's newest and most advanced Russian weapons- has a range of up to 2,000 kilometers and can travel at speeds of up to 10 times the speed of sound (Mach 10). It is known that the Kinzhal, with its hypersonic

1 Sven Arnold and Torben Arnold, "Germany's Fragile Leadership Role in European Air Defence", (SWP, March 2023), pp. 1-4.

2 "Russia Says It Moved Hypersonic Missiles to Kaliningrad Region," Al Jazeera, August 18, 2022.

speed and heavy warhead, can be effectively used against targets such as underground bunkers and mountain tunnels.

Recently, Russia also unveiled and deployed the Oreshnik medium-range ballistic missile (MRBM) in an attack on a facility in Dnipro, allegedly linked to Ukraine's long-range missile systems.<sup>3</sup> As confirmed by President Vladimir Putin, the Oreshnik missile is equipped with a non-nuclear hypersonic warhead capable of reaching speeds exceeding Mach 10 and a range of up to 5,000 kilometers. Designed with advanced guidance systems and MIRV (Multiple Independently Targetable Reentry Vehicle) capabilities, the missile can target multiple locations simultaneously with remarkable precision. This makes it a significant challenge for existing missile defense systems like Patriot or THAAD, as it is specifically designed to evade interception through its speed and maneuverability. The deployment of the Oreshnik marks a notable escalation in the conflict, emphasizing Russia's ability to utilize advanced hypersonic technology to counter Western-supplied weaponry and NATO defense systems.

ESSI, launched on Oct. 13, 2022, the initiative now includes 21 member countries, The founding members of the ESSI include Germany, Belgium, the U.K., Bulgaria, Denmark, and Sweden joined the European Sky Shield Initiative in February 2023.<sup>4</sup> Switzerland and Austria declared their intention to join the ESSI in July 2023.<sup>5</sup> Türkiye and Greece joined the ESSI in February 2024.<sup>6</sup> Austria officially joined the ESSI in May 2024, while Switzerland completed its accession process in October 2024.<sup>7</sup>

3 Sibel Düz, "Escalation in the Ukraine-Russia Conflict and the Use of Advanced Missile Systems," *Sabah*, November 30, 2024.

4 "European Sky Shield Initiative Gains Two More Participants," NATO, February 15 2023, [https://www.nato.int/cps/en/natohq/news\\_211687.htm?utm\\_source=twitter&utm\\_medium=smc&utm\\_campaign=20230215&utm\\_id=webskyshield](https://www.nato.int/cps/en/natohq/news_211687.htm?utm_source=twitter&utm_medium=smc&utm_campaign=20230215&utm_id=webskyshield) , (Accessed: March 11, 2024).

5 Timo Kirez, "Austria, Switzerland Sign Declaration of Intent to Join European Sky Shield," *Anadolu Agency*, July 7 2023.

6 "Turkey and Greece to Join European Missile Shield," *Defense News*, February 16, 2024, <https://www.defensenews.com/global/europe/2024/02/16/turkey-and-greece-to-join-european-missile-shield/> , (Accessed: March 11, 2024).

7 "Air Defence: Austria Joins European Sky Shield Initiative (ESSI)," *Defence Industry Europe*, May 20, 2024, <https://defence-industry.eu/air-defence-austria-joins-european-sky-shield-initiative-essi/> , (Accessed: January 17 2025); Federal Council of Switzerland, "Switzerland to Join European Sky Shield Initiative," *The Federal Administration*, October 17 2023, <https://www.admin.ch/gov/en/start/documentation/media-releases.msg-id-102847.html> , (Accessed: January 17, 2025).

The first indication that “Sky Shield” would be established was highlighted in Chancellor Scholz’s speech, six weeks before the official announcement of Sky Shield:

*“We have a lot of catching up to do in Europe when it comes to defense against airborne and space-based threats. That is why we in Germany will be investing very significantly in our air defense over the years ahead. All of those capabilities will be deployable within the framework of NATO.”*<sup>8</sup>

Olaf Scholz’s speech on Feb. 27, 2022, was described as a turning point in Germany’s defense and security policy, referred to as “Zeitenwende.” The German Federal Government has translated the term “Zeitenwende” as “Watershed” in the English version of the speech text.<sup>9</sup> Although the translation given is “watershed,” “Zeitenwende” signifies a comprehensive and significant change.<sup>10</sup> Following this speech, especially at the end of the sixth month, significant steps were taken, leading to the emergence of ESSI.

Czechia, Estonia, Finland, Hungary, Latvia, Lithuania, the Netherlands, Norway, Romania, Slovakia, and Slovenia, joined the initiative at its inception in October 2022, aiming to strengthen NATO’s joint air defense and enhance member states’ capabilities against missile, rocket, or aircraft attacks.<sup>11</sup> As a result, the total area covered by the initiative spans 3,697,779.6 square kilometers (1,427,720.69 square miles). Türkiye’s participation in the initiative is viewed as having a significant impact.<sup>12</sup> On Oct. 11, 2023, an additional 10 NATO allies took steps to further boost European air and missile defense capabilities.<sup>13</sup>

8 “Speech by Federal Chancellor Olaf Scholz at the Charles University in Prague on Monday, 29 August 2022,” Die Bundesregierung informiert, August 29, 2022, <https://www.bundesregierung.de/breg-en/news/scholz-speech-prague-charles-university-2080752>, (Accessed: March 31, 2024).

9 “Policy Statement by Olaf Scholz, Chancellor of the Federal Republic of Germany and Member of the German Bundestag, 27 February 2022 in Berlin,” Die Bundesregierung informiert, February 27, 2022, <https://www.bundesregierung.de/breg-en/news/policy-statement-by-olaf-scholz-chancellor-of-the-federal-republic-of-germany-and-member-of-the-german-bundestag-27-february-2022-in-berlin-2008378>, (Accessed: March 11, 2024).

10 “Zeitenwende,” DGAP, <https://dgap.org/en/research/expertise/zeitenwende>, (Accessed: July 20, 2024).

11 “European Sky Shield Initiative Signing Ceremony,” NATO, October 13 2022, [https://www.nato.int/cps/en/natohq/photos\\_208070.html](https://www.nato.int/cps/en/natohq/photos_208070.html), (Accessed: March 11, 2024).

12 “Turkey and Greece to Join European Missile Shield,” Defense News, February 16, 2024, <https://www.defensenews.com/global/europe/2024/02/16/turkey-and-greece-to-join-european-missile-shield/>, (Accessed: March 11, 2024).

13 “10 NATO Allies Take Further Step to boost European air and missile defence capabilities,” NATO, October 11, 2023, [https://www.nato.int/cps/en/natohq/news\\_219119.htm?selectedLocale=En](https://www.nato.int/cps/en/natohq/news_219119.htm?selectedLocale=En), (Accessed: March 11, 2024).

Despite these developments, the likelihood of a direct missile attack by Russia on NATO countries appears slim in the short term. However, in the medium and long term, improving air and missile defense in Europe could limit Russia's ability to exert pressure on NATO, thereby potentially strengthening the unity of the alliance.

To achieve this objective and unlock the initiative's entire potential, it's essential to address existing strategic, technical-operational, as well as political challenges and obstacles. Failing to do so might not only diminish the chances of the initiative's success but also risk weakening NATO both politically and technically.<sup>14</sup>

One of the aims of the initiative is to test NATO's integrated air and missile defense system (IAMD). Air defense systems belonging to NATO members are operated in the NATO Integrated Air and Missile Defense System (NATINAMDS).<sup>15</sup> This system integrates radar stations from all member nations to monitor airspace, while centrally managing the anti-missile and anti-aircraft systems of allied countries.

In summary, the objective of the initiative can be described as procuring additional air and missile defense systems as quickly as possible and integrating them into NATO's unified air and missile defense network.

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14 Lydia Wachs, *Russian Missiles and the European Sky Shield Initiative: German Plans to Strengthen Air and Missile Defence in the Current Threat Environment*, (SWP, August 2023), pp. 1-7.

15 Maciej Marszałek, "Modern Missile Defense System as an Indispensable National and NATO's Deterrence Tool," (Safety & Defense, 2021), pp. 1-11.

# ESSI MEMBERS' AIR AND MISSILE DEFENSE CAPABILITIES

Russia's annexation of Crimea in 2014 and subsequent attacks on Ukraine triggered renewed attention to air and missile defense in NATO and Europe. This was particularly due to the Russia's active use of missile systems and a large number of unmanned aerial systems in these attacks.

In 2016, at the NATO Warsaw summit, Russian missile capabilities were recognized as a clear threat.<sup>16</sup> However, no decisions were made regarding missile threats from countries outside of Russia, such as Iran.

Air defense systems are crucial because they protect against aerial threats. Russia, inheriting the vast arsenal from the Soviet era, possesses one of the world's largest and most diverse missile systems. Even though the stockpile has significantly decreased

<sup>16</sup>"NATO Summit Guide Warsaw, 8-9 July 2016," NATO, July 10, 2016, [https://www.nato.int/nato\\_static\\_fl2014/assets/pdf/pdf\\_2016\\_07/20160715\\_1607-Warsaw-Summit-Guide\\_2016\\_ENG.pdf](https://www.nato.int/nato_static_fl2014/assets/pdf/pdf_2016_07/20160715_1607-Warsaw-Summit-Guide_2016_ENG.pdf), (Accessed: April 3, 2024).

during the Ukraine war, a substantial inventory still remains. Russia's missile threat necessitates countermeasures, as it has a formidable missile force capable of traditional or conventional warheads across its short-, medium-, long-range and cruise missiles, excluding its intercontinental and submarine-launched ballistic missiles. Additionally, Russia's UAV and armed UAV capabilities play a significant role in assessing its military strength, notably in its operations in Ukraine, annexation of Crimea, and interventions in Syria.

Ground-to-air defense systems are complex weapon systems designed to protect against aerial threats by detecting, tracking, and destroying enemy aircraft, helicopters, unmanned aerial vehicles (UAVs), and missiles. These systems vary significantly in range, altitude, and threat type, and can be either fixed or mobile. They include very short-, short-, medium-, and long-range systems:

- Very Short-Range Missiles (VSHORAD): Highly mobile and cost-effective, primarily consisting of MANPADS and light air defense vehicles. These systems are effective against low-flying aircraft, helicopters, and UAVs, but are limited in missile defense capabilities.
- Short-Range Air Defense Systems (SHORAD): Designed to protect against low-altitude threats, characterized by rapid response times, and capable of covering a wide area against enemy air forces, ballistic, and cruise missiles.
- Medium-Range Air Defense Systems (MRAD): Effective against threats at medium altitudes and ranges, often equipped with larger and more complex radar systems, providing broad geographic coverage against high-altitude threats.
- Long-Range Air Defense Systems (LRAD): Designed to protect strategic assets and large areas, utilizing long-range radars and missiles capable of detecting and neutralizing threats at high altitudes and distances. These systems are often positioned strategically to cover wide areas from national borders.

These systems can integrate various sensors and interactive networks for a coordinated and rapid response to threats, distinguishing between civilian and military air traffic to reduce false alarm rates and minimize the risk of mistakenly firing at friendly forces or civilian aircraft. In European coun-

tries, the development and use of ground-to-air defense systems are critically important, especially in response to Russia's evolving aerial threats.

While examining capacities, ESSI's focus on the Russian threat necessitates an individual review of all countries, starting with those bordering Russia: Estonia, Latvia, Lithuania, Finland, Norway, Belarus, Ukraine, and Poland.

Among these countries, Belarus, Poland, and Ukraine are not members of the ESSI. To briefly address this context; Ukraine is currently at war with Russia and is in the process of NATO accession. Belarus maintains relatively close ties with Russia and has multiple agreements with Moscow. Belarusian President Alexander Lukashenko has sought to reinforce the Belarusian identity following Russia's annexation of Crimea and the start of the Russia-Ukraine War. For the first time, he delivered a speech in Belarusian instead of Russian, the language most commonly spoken in the country, stating, "*We are not Russians, we are Belarusians.*"<sup>17</sup> On Sept. 14, 2017, Belarus and Russia normalized relations by conducting joint military exercises.<sup>18</sup> However, tensions between the two countries persisted between 2020 and 2022. Most recently, in February 2022, Belarus allowed Russian forces to pass through its territory to attack Ukraine.<sup>19</sup> Lukashenko stated that Belarusian troops could support Russia if necessary.<sup>20</sup> Therefore, although the relationship between Belarus and Russia occasionally faces tensions, it remains largely positive overall. Poland's situation is different, and this topic is addressed in detail in the criticisms section.

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17 Sergey Kozlovsky, "The Strange Death of Russia's Closest Alliance," Global Voices, February 21, 2017, <https://globalvoices.org/2017/02/21/the-strange-death-of-russias-closest-alliance/>, (Accessed: March 31, 2024).

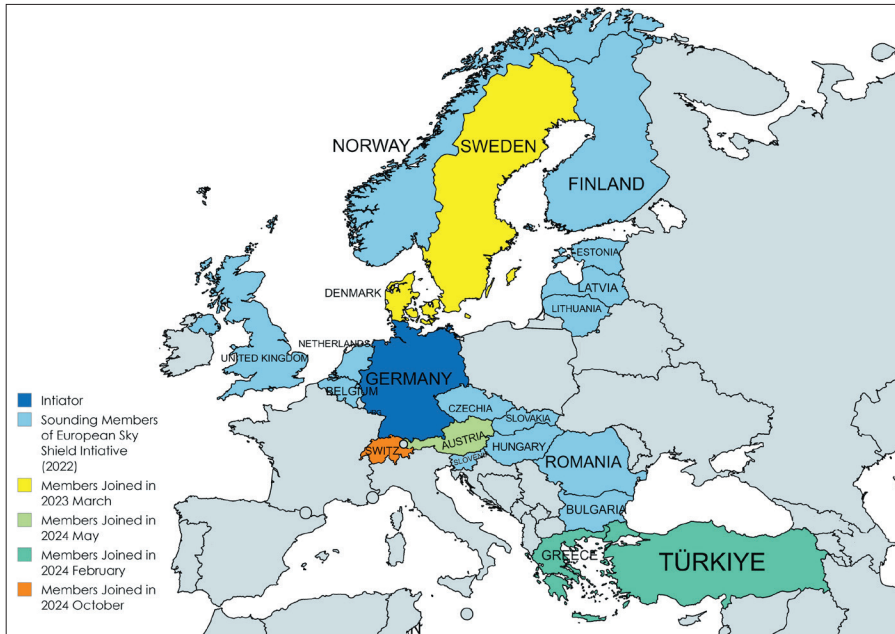
18 David Filipov, "Russia and Belarus Launch War Games Aimed at Holding the Line Against the West," Washington Post, September 17 2017.

19 Tim Lister and Julia Kesaieva, "Ukraine Says It Was Attacked Through Russian, Belarus, and Crimea Borders," CNN, February 24 2022.

20 "Belarusian Troops Could Be Used in Operation Against Ukraine if Needed, Lukashenko Says," Reuters, February 24, 2022.



Map 1 ESSI Member States



Source: Compiled by the authors.

## The Baltic States

In terms of air defense system capacity, especially at the onset of the war, Estonia and Latvia possessed only very short-range defense systems. Lithuania had a short-range defense system. Following Russia’s attack on Ukraine in 2022, the Baltic states accelerated their defense modernization programs. Estonia purchased Piorun MANPADS in September 2022.<sup>21</sup> Latvia acquired additional RBS 70NG systems in November.<sup>22</sup> An unnamed Baltic state enhanced its defense capacity by purchasing Pioruns in December.<sup>23</sup> Furthermore, the defense ministers of Latvia and Estonia signed a letter in late June

21 “Estonia Signed a Contract for Purchase of Polish Piorun MANPADS,” Militar NYI, September 7 2022, <https://mil.in.ua/en/news/estonia-signed-a-contract-for-purchase-of-polish-piorun-manpads/>, (Accessed: March 31, 2024).

22 “Saab Receives Orders for Short-Range Air Defence Systems from Latvia,” Saab, December 14 2022, <https://www.saab.com/newsroom/press-releases/2022/saab-receives-orders-for-short-range-air-defence-systems-from-latvia> , (Accessed: March 31, 2024).

23 “Polish Defence Industry Signs Fourth Export Contract for Piorun MANPADS This Year,” Defence Industry EU.com, December 2 2022, <https://defence-industry.eu/polish-defence-industry-signs-fourth-export-contract-for-piorun-manpads-this-year/> , (Accessed: March 31, 2024).

2022, expressing their intent to jointly purchase short-range air defense systems, covering the acquisition of at least four batteries of an undetermined system.<sup>24</sup> In 2017, Lithuania procured the NASAMS-3 system to enhance its air defense capabilities, receiving two batteries by 2020.<sup>25</sup>

Following these developments, Latvia signed a contract worth approximately 600 million euros (\$619.93 million) for the IRIS-T medium-range air defense system in November 2023. In its statement, manufacturer Diehl described the agreement as Latvia's "largest defense investment since gaining independence more than 30 years ago." The initial deliveries are expected to begin in 2026.<sup>26</sup>

This procurement follows a framework agreement the company previously signed with Latvia and Estonia in September. Furthermore, in July 2024, Latvia and Estonia announced plans under the European Sky Shield Initiative (ESSI) to acquire IRIS-T SLM air defense systems equipped with TRML-4D radars, with a total value exceeding 100 million euros.<sup>27</sup>

Despite these developments, due to budget constraints, the Baltic states cannot acquire or develop a multi-layered air defense system. The current systems can provide local protection, especially for mobile small military units but are insufficient in protecting critical centers, important infrastructure, superstructure systems, and densely populated cities. Even with limited purchases that extend their capabilities, they will only provide partial protection for their forces and, particularly, their capitals.

In summary, the Baltic states, especially Estonia and Latvia, followed by Lithuania, are in a relatively weak position. However, the addition of IRIS-T

24 "Latvia and Estonia Sign Letter of Intent for Joint Procurement of Medium-Range Air Defence Systems," Ministry of Defence of the Republic of Latvia, June 30 2022, <https://www.mod.gov.lv/en/news/latvia-and-estonia-sign-letter-intent-joint-procurement-medium-range-air-defence-systems>, (Accessed: March 31, 2024).

25 "Lithuania Buys Norwegian Air Defence System Amid Russia Fears," Space Daily, October 28 2017, [https://www.spacedaily.com/reports/Lithuania\\_buys\\_Norwegian\\_air\\_defence\\_system\\_amid\\_Russia\\_fears\\_999.html](https://www.spacedaily.com/reports/Lithuania_buys_Norwegian_air_defence_system_amid_Russia_fears_999.html), (Accessed: January 17, 2025).; "Litvanya, NASAMS Orta Menzilli Hava Savunma Sistemlerini Teslim Aldi," Defence Turk, October 27 2022, <https://www.defenceturk.net/litvanya-nasams-orta-menzilli-hava-savunma-sistemlerini-teslim-aldi>, (Accessed: January 17, 2025).

26 Elisabeth Gosselin-Malo, "Latvia Signs Order for German IRIS-T Air Defences," Defense News, December 4 2023, <https://www.defensenews.com/global/europe/2023/12/04/latvia-signs-order-for-german-iris-t-air-defences/>, (Accessed: January 17, 2025).

27 Linus Höller, "Latvia, Estonia Tap German Industry for Air Defense Radars, Weapons," Defense News, July 5 2024, <https://www.defensenews.com/land/2024/07/05/latvia-estonia-tap-german-industry-for-air-defense-radars-weapons/>, (Accessed: January 17, 2025).

systems and the inclusion of advanced radars will represent a significant step forward, addressing some of the existing gaps in their air defense capabilities.

## Finland

Finland possesses MANPADS and artillery systems for the protection of its forces. Finland has the NASAMS (Norwegian Advanced Surface-to-Air Missile System, also known as the National Advanced Surface-to-Air Missile System), which is a network-connected air defense system distributed across short to medium ranges, with a radar range of 120 kilometers and missile range varying between 30-50 kilometers depending on the type.<sup>28</sup> NASAMS uses AIM-120 AMRAAM (Advanced Medium-range Air-to-Air Missile), which is abundantly found in the inventories of NATO members. This system offers an advantage in terms of cooperation and resupply. Considering that Norway possesses it and the plans of Latvia and Estonia to acquire it, it could be integrated and operated in coordination. Finland stands in the most advantageous spot, possessing the broadest and most densely packed very short-range air defense system in the area, capable of offering protection for the entirety of its military forces.

The European Union's (EU) Permanent Structured Cooperation (PESCO) defense technology initiative, the Timely Warning and Interception with Space Based Theater Surveillance (TWISTER) project was launched by France in 2019. The EU's PESCO website describes TWISTER as follows: "The spectrum of threats on the European territory is evolving towards more complex and evolving air threats, notably in the missile domain. The project therefore aims at strengthening the ability of Europeans to better detect, track and counter these threats through a combination of enhanced capabilities for space-based early warning and endo-atmospheric interceptors. It promotes the European self-standing ability to contribute to NATO Ballistic-Missile Defense (BMD).<sup>29</sup> Finland will also be included in an early

28 "NASAMS Air Defence System," KONGSBERG, September 2022, [https://www.kongsberg.com/globalassets/kongsberg-defence--aerospace/2.-what-we-do/1.3-defence--security/intergrated-air-and-missile-defence/luftvern-final\\_september-2022\\_web.pdf](https://www.kongsberg.com/globalassets/kongsberg-defence--aerospace/2.-what-we-do/1.3-defence--security/intergrated-air-and-missile-defence/luftvern-final_september-2022_web.pdf), (Accessed: April 2, 2024).

29 "Timely Warning and Interception with Space-Based Theater Surveillance (TWISTER)," PESCO, <https://www.pesco.europa.eu/project/timely-warning-and-interception-with-space-based-theater-surveillance-twister/>, (Accessed: April 3, 2024).

warning system within this project's framework. However, the main issue in terms of ESSI cooperation is France, the leader of the TWISTER project, having a negative stance towards ESSI. Thus, although advantageous on an individual capacity level, this project will not provide a gain within the ESSI partnership under current conditions. Finland is working to purchase the David's Sling medium- to long-range surface-to-air anti-ballistic missile system developed by Israeli defense contractor Rafael Advanced Defense Systems and the American defense contractor Raytheon.<sup>30</sup> The most significant development for Finland was its accession to NATO in April 2023.<sup>31</sup>

## Norway

Norway does not have any very short-range systems. Previously, it owned Stinger systems, but its service life has ended. It also had RBS-70 systems but sold them to Lithuania.<sup>32</sup> In 2022, the Norwegian Defence Materiel Agency (NDMA) signed a contract with the Polish company Mesko for the purchase of Piorun portable air defense systems (MANPADS). The contract was valued at approximately \$35 million, and the initial systems were planned to be delivered in 2023, with the first delivery occurring in November 2023.<sup>33</sup> This purchase enabled Norway to add such air defense systems to its inventory for the first time, thereby enhancing its defense capability against very low-level air threats. In Norway, the NASAMS short-range system, comprising three batteries, is deployed to protect the main air bases at Orland and Evenes. An additional battery of the same system is also deployed to cover the country's only army brigade in the north. Norway has stated that by

30 Seth J. Frantzman, "Finland to Buy Israel's David's Sling Air Defense System," *Defense News*, April 7 2023, <https://www.defensenews.com/global/europe/2023/04/07/finland-to-buy-israels-dauids-sling-air-defense-system/>, (Accessed: April 3, 2024).

31 "Finland Joins NATO as 31st Ally," *NATO INT*, April 4 2023, [https://www.nato.int/cps/en/natohq/news\\_213448.htm](https://www.nato.int/cps/en/natohq/news_213448.htm), (Accessed: April 3, 2024).

32 "Lithuanian Airspace to be Safeguarded by Air Defence Armaments Donated by Norway," *Defense-Aerospace*, November 15, 2004, [http://www.defense-aerospace.com/articles-view/release/3/49386/lithuania-receives-rbs-70-missiles-\(nov.-25\).html](http://www.defense-aerospace.com/articles-view/release/3/49386/lithuania-receives-rbs-70-missiles-(nov.-25).html), (Accessed: March 11, 2024).

33 "Norway Buys Polish Piorun MANPADS in \$35M Deal," *Defbrief*, November 29 2022, <https://defbrief.com/2022/11/29/norway-buys-polish-piorun-manpads-in-35m-deal/>, (Accessed: April 3, 2024); "First Batch of Piorun MANPADS Delivered to Norway by Polish Defence Industry," *Defence Industry EU*, December 12, 2023, <https://defence-industry.eu/first-batch-of-piorun-manpads-delivered-to-norway-by-polish-defence-industry/>, (Accessed: April 3, 2024).

2026-2027, the launcher will be equipped with new and more mobile versions.<sup>34</sup> For the first time in March 2023, and then in December 2023 and early 2024, Norway committed NASAMS to Ukraine. Some of the systems were donated directly from the Scandinavian country's own stock, while others were purchased.<sup>35</sup> Norway placed an order for an air defense system worth \$130 million to replenish the donated NASAMS, so the exact current number of systems in Norway is not precisely known.<sup>36</sup>

## Denmark

Like Norway, Denmark does not possess very short-range air defense systems and currently lacks short-range air defense systems as well. However, the country aims to acquire very short and short-range launcher systems by 2024 and has signed various contracts in this direction. Denmark's search for a missile defense system began in 2017, following Russia's annexation of Crimea and the tensions with Ukraine. Initially, it could be said that efforts in this area saw slow progress.<sup>37</sup> After the 2022 Ukraine war, this search gained momentum. Denmark hosts the Ballistic Missile Early Warning Radar System in the city of Thule, Greenland. Although Denmark does not have a direct defense system, it possesses technologies such as the Active Phased Array Radar (APAR) and the CEROS 200 Fire Control System (FCS). These systems contribute to Denmark's missile defense through the Iver Huitfeldt-class frigates. The Huitfeldt-class frigates are designed for air defense purposes and each includes a

34 "Norway Acquires New NASAMS Air Defence Systems," KONGSBERG, January 31 2024, <https://www.kongsberg.com/kda/news/news-archive/2024/norway-acquires-new-nasams-air-defence-systems/>, (Accessed: April 3, 2024).

35 The Shephard News Team in London, "Norway to Provide More NASAMS to Ukraine," SHEPHARD Media, February 9 2024, <https://www.shephardmedia.com/news/landwarfareintl/norway-seeks-to-provide-more-nasams-to-ukraine/>, (Accessed: April 3, 2024).

36 "Norway Orders More NASAMS to Replace Donations to Ukraine," SHEPHARD, January 31 2024, <https://www.shephardmedia.com/news/landwarfareintl/norway-orders-more-nasams-to-replace-donations-to-ukraine/>, (Accessed: April 3, 2024).

37 "Terma Signs Framework Agreement With Danish Defence on System Integration and Maintenance for Integrated Air and Missile Defense System," TERMA, January 19 2023, <https://www.terma.com/news-events/news/news-archive/2023/terma-signs-framework-agreement-with-danish-defence/>, (Accessed: April 4, 2024); Rojof Manuel, "Denmark to Base Short-Range Air Defense System on Rheinmetall's Skyranger," The Defense Post, May 17 2023, <https://www.thedefensepost.com/2023/05/17/denmark-air-defense-skyranger/>, (Accessed: April 4, 2024); Abel Romero, "Denmark: Onboard with NATO Missile Defense?" Real Clear Defense, December 4 2016, [https://www.realcleardefense.com/articles/2016/12/05/denmark\\_onboard\\_with\\_nato\\_missile\\_defense\\_110436.html](https://www.realcleardefense.com/articles/2016/12/05/denmark_onboard_with_nato_missile_defense_110436.html), (Accessed: April 4, 2024).

SMART-L air/surface radar, an APAR search, tracking and guidance radar, and two CEROS 200 fire control radars.<sup>38</sup> In October 2023, Denmark announced it would purchase 5 THALES Ground Master 200 Multi-Mission Compact radars to support air surveillance and air defense missions, ranging from counter-drone measures to ballistic missile defense, featuring various surveillance capabilities.<sup>39</sup> In addition to these developments, Denmark boasts key domestic technological capabilities in the air defense domain. The Danish company Terma specializes in command-and-control systems for naval platforms, significantly enhancing the integration and operational efficiency of air defense systems on sea-based platforms.<sup>40</sup> Similarly, Weibel Scientific, a Denmark-based radar firm, has gained recognition for its advanced sensor technologies.<sup>41</sup> In recent years, Weibel has made substantial progress in developing radar systems tailored for short- and very short-range air defense, including anti-drone applications. These technologies position Denmark as a nation capable of contributing critical sensor and command solutions to NATO's broader air defense architecture. Denmark's efforts to strengthen its air defense systems should be seriously considered inadequate. This deficiency poses a problem that complicates NATO's use of the facilities at Denmark's Esbjerg port to accommodate U.S. troops reaching Europe.<sup>42</sup>

## Sweden

Sweden possesses MANPADS and very short-range artillery systems to protect its troops.<sup>43</sup> However, due to their limited number, it cannot protect all

38 "Denmark's Ballistic Missile Defense Capabilities," Missile Defense Advocacy, April 3 2024, [https://missile-defenseadvocacy.org/intl\\_cooperation/denmark/](https://missile-defenseadvocacy.org/intl_cooperation/denmark/), (Accessed: April 4, 2024).

39 "Thales to Reinforce Denmark's Air Surveillance and Defence with Five GM200 Radars," THALES Group, October 31 2023, [https://www.thalesgroup.com/en/countries-europe/denmark/press\\_release/thales-reinforce-denmarks-air-surveillance-and-defence-five](https://www.thalesgroup.com/en/countries-europe/denmark/press_release/thales-reinforce-denmarks-air-surveillance-and-defence-five), (Accessed: April 4, 2024).

40 Terma, "Radars," Terma Official Website, <https://www.terma.com/products/radars/>, (Accessed: January 17, 2025).

41 Weibel Scientific, "Weibel Radars," Weibel Official Website, <https://www.weibelradars.com/>, (Accessed: January 17, 2025).

42 Jacek Tarociński & Justyna Gotkowska, "Safe Skies? Air Defence on NATO's Northern, Eastern and South-Eastern Flank", OSW, January 19 2023, <https://www.osw.waw.pl/en/publikacje/osw-commentary/2023-01-19/safe-skies-air-defence-natos-northern-eastern-and-south>, (Accessed: April 4, 2024).

43 "Man Portable Air Defense Missile System - Sweden," *Army Recognition*, March 3 2023, [https://armyrecognition.com/sweden\\_swedish\\_missile\\_systems\\_and\\_vehicles\\_uk/rbs\\_70\\_manpads\\_man\\_portable\\_air\\_defense\\_missile\\_system\\_data.html](https://armyrecognition.com/sweden_swedish_missile_systems_and_vehicles_uk/rbs_70_manpads_man_portable_air_defense_missile_system_data.html), (Accessed: April 5, 2024).

its units. Additionally, the phased withdrawal of MANPADS from service in the near future is also being considered. Sweden has short-range RBS-98, and RBS-23 systems.<sup>44</sup> Sweden has medium-range air defense capabilities and, in 2018, ordered four Patriot batteries in the PAC-3+ configuration from the United States.<sup>45</sup> In March 2021, the Swedish Armed Forces reactivated the medium-range air defense system Launcher Unit 23, which had been kept in material reserve for some time and was developed in the 1990s and completed in the early 2000s. Launcher Unit 23, an enhanced version of Air Defense System 15, can be transported by any towing vehicle and is currently deployed in Gotland, Sweden.<sup>46</sup> In November 2021, Sweden received delivery of the Patriot PAC-3 missile defense systems, thereby expanding its defense capabilities to include two types of missiles, three varieties of launchers, a command center, and an integrated reconnaissance and fire control radar.<sup>47</sup> There is also the I-HAWK system, known as Rb 67, in the inventory of the Swedish Air Force in the medium-long range.<sup>48</sup>

Known as LvS103 in Sweden, this system will utilize the PAC-3 Missile Segment Enhancement (MSE) modification, having the capability to intercept long-range missiles and air attacks. In December 2021, the Swedish Armed Forces announced that the Patriot air defense systems had reached their initial operational capability, providing protection against enemy aircraft, ballistic, and cruise missiles.<sup>49</sup> This capability represents a significant improvement over previous defense systems. Additionally, it aligns Sweden with other countries using the Patriot system, such as Germany and the Netherlands, in terms of

44 Utku Cakirozer, NATO's Evolving Air and Missile Defence Posture - Preliminary Draft General Report, NATO Parliamentary Assembly Defence and Security Committee, March 28 2024, <https://www.nato-pa.int/document/2024-air-and-missile-defence-posture-report-cakirozer-048-dsc-24>, (Accessed: July 15, 2024).

45 "Sweden Orders Additional Missiles for the Patriot Air Defense System," Military NYI, December 26 2022, <https://mil.in.ua/en/news/sweden-orders-additional-missiles-for-the-patriot-air-defense-system/>, (Accessed: April 5, 2024).

46 "Sweden," *Missile Defense Advocacy*, [https://missiledefenseadvocacy.org/intl\\_cooperation/sweden/](https://missiledefenseadvocacy.org/intl_cooperation/sweden/), (Accessed: April 5, 2024).

47 "Sweden Officially Introduces US Patriot PAC-3 MSE Air Defense Missile System into Service," Army Recognition, November 20 2021, [https://armyrecognition.com/defense\\_news\\_november\\_2021\\_global\\_security\\_army\\_industry/sweden\\_officially\\_introduces\\_us\\_patriot\\_pac-3\\_mse\\_air\\_defense\\_missile\\_system\\_into\\_service.html](https://armyrecognition.com/defense_news_november_2021_global_security_army_industry/sweden_officially_introduces_us_patriot_pac-3_mse_air_defense_missile_system_into_service.html), (Accessed: April 5, 2024).

48 Anders Annerfalk, *Flygvapnet: An Illustrated History of the Swedish Air Force* (Aviatic Förlag AB, 1999), pp. 128–132.

49 Nicholas Fiorenza, "Swedish Patriots Reach IOC," JANES, December 23 2021, <https://www.janes.com/defence-news/news-detail/swedish-patriots-reach-ioc>, (Accessed: April 5, 2024).

operational compatibility, thus marking a positive development for ESSI. In this context, when considering other countries, Sweden stands out as the only country in the region with a multi-layered air defense system possessing very short, short, and medium-range systems. However, the relatively small number of these makes it challenging for decisionmakers to assign protection duties to specific critical infrastructures or units.

## Romania

Romania has various air defense systems available at different ranges. However, these systems are either old or nearing the end of their service life. For very short ranges, Romania possesses the M 1980/77 and Oerlikon GDF-003 mobile air defense artillery systems, Gepard (self-propelled artillery systems), and MANPADS 9K31 Strela 1, 9K32 Strela 2.<sup>50</sup> At low altitudes and short range, the Soviet Union developed the mobile, tactical surface-to-air missile system 9K33 Osa.<sup>51</sup> Additionally, there is the Soviet-made low and medium-range mobile surface-to-air missile system 2K12 Kub, the short to medium-range air defense system MIM-23 Hawk, as well as the Soviet-made medium-range S-75 systems, are also available.<sup>52</sup>

Additionally, Romania plans to acquire 200 PAC-2 GEM-T missiles to complement its existing Patriot batteries and enhance its air defense capabilities.<sup>53</sup> The Romanian Defense Ministry reported this request to the Romanian Parliament in December 2023.<sup>54</sup> This procurement is part

50 *Romania Army, National Security and Defense Policy Handbook Volume 1 Strategic Information and Developments* (New York: International Business Publications), p.79; *Romania Army, National Security and Defense Policy Handbook Volume 1 Strategic Information and Developments* (New York: International Business Publications), p. 90.

51 *Romania Army, National Security and Defense Policy Handbook*, p. 90; *Romania Army, National Security and Defense Policy Handbook*, p. 79.

52 *Romania Army, National Security and Defense Policy Handbook*, p. 90; Jacek Tarociński & Justyna Gotkowska, Safe Skies? Air Defence on NATO's Northern, Eastern and South-Eastern Flank, OSW, January 19, 2023, <https://www.osw.waw.pl/en/publikacje/osw-commentary/2023-01-19/safe-skies-air-defence-natos-northern-eastern-and-south>, (Accessed: April 4, 2024).

53 Elisabeth Gosselin-Malo, "European Nations Team Up to Buy Patriot Missiles in \$5.5 Billion Deal," *Defence News*, January 3 2024, <https://www.defensenews.com/global/europe/2024/01/03/european-nations-team-up-to-buy-patriot-missiles-in-55-billion-deal/>, (Accessed: July 15, 2024).

54 "Romania is Arming Itself: The Ministry of Defense Purchases 200 Patriot Missiles from the Americans, as Part of a NATO Program," *Romanian Business Journal*, January 4 2024, <https://www.romanianbusinessjournal.ro/romania-is-arming-itself-the-ministry-of-defense-purchases-200-patriot-missiles-from-the-americans-as-part-of-a-nato-program/>, (Accessed: July 15, 2024).



of a joint acquisition program conducted in collaboration with Germany, the Netherlands, and Spain, encompassing the purchase of a total of 1,000 Patriot missiles.<sup>55</sup> Moreover, the Patriot system was also recently delivered.<sup>56</sup>

## Bulgaria

Bulgaria is in a similar situation to Romania. For very short ranges, Bulgaria has the Zu-23-2 and MANPADS systems including SA-7 Grail 9K32 Strela 2, SA-14 Gremlin 9K34 Strela 3, SA-16 Gimlet, SA-18 Grouse 9K38 Iгла, and 9K35 Strela 10.<sup>57</sup> For short ranges, it possesses the 2K12 KUB and 9K33 OSA, and for short to medium ranges, the S-125 systems.<sup>58</sup> In the medium range, Bulgaria has the S-300 and S-200 systems.<sup>59</sup>

The outdated nature of the systems in Bulgaria and Romania and how active they could be in the event of an attack is a matter of debate. Moreover, the extent to which they can contribute to a joint air defense is also problematic.

55 Tim Martin, "NATO Signs Off on \$5.5 Billion Contract for Hundreds of Patriot Missiles," *Breaking Defense*, January 5 2024, <https://breakingdefense.com/2024/01/nato-signs-off-on-5-5-billion-contract-for-hundreds-of-patriot-missiles/>, (Accessed: July 15, 2024).

56 "România. Cele Patru Sisteme de Rachete Destinate Forțelor Aeriene au Fost Testate și Recepționate," *Euronews*, May 9 2023, <https://www.euronews.ro/articole/sistemele-patriot-au-ajuns-in-posesia-armatei-romaniei-cele-patru-sisteme-de-rach>, (Accessed: April 6, 2024).

57 "ZU-23-2 23 mm Anti-Aircraft Twin-Barrel Gun," *Army Recognition*, March 31 2024, [https://armyrecognition.com/russia\\_russian\\_army\\_light\\_heavy\\_weapons\\_uk/zu-23\\_zu-23-2\\_anti-aircraft\\_23mm\\_twin\\_gun\\_technical\\_data\\_sheet\\_specifications\\_information\\_descriptio.html](https://armyrecognition.com/russia_russian_army_light_heavy_weapons_uk/zu-23_zu-23-2_anti-aircraft_23mm_twin_gun_technical_data_sheet_specifications_information_descriptio.html), (Accessed: April 6, 2024); "SA-13 Gopher 9K35 Strela-10 SAM," *Army Recognition*, May 25 2024, <https://armyrecognition.com/military-products/army/air-defense-systems/air-defense-vehicles/sa-13-gopher-russia-uk>, (Accessed: April 6, 2024).

58 "SA-6 Gainful 2K12 Kub," *Army Recognition*, March 20 2024, [https://armyrecognition.com/russia\\_russian\\_missile\\_system\\_vehicle\\_uk/sa-6\\_gainful\\_2k12\\_kub\\_ground-to-air\\_missile\\_system\\_technical\\_data\\_sheet\\_specifications\\_information.html](https://armyrecognition.com/russia_russian_missile_system_vehicle_uk/sa-6_gainful_2k12_kub_ground-to-air_missile_system_technical_data_sheet_specifications_information.html), (Accessed: April 6, 2024); "SA-8 Gecko 9K33 OSA," *Army Recognition*, March 15 2024, [https://armyrecognition.com/russia\\_russian\\_missile\\_system\\_vehicle\\_uk/sa-8\\_gecko\\_9k33\\_osa\\_ground-to-air\\_missile\\_system\\_data\\_fact\\_sheet.html](https://armyrecognition.com/russia_russian_missile_system_vehicle_uk/sa-8_gecko_9k33_osa_ground-to-air_missile_system_data_fact_sheet.html), (Accessed: April 6, 2024); "SA-3 Goa S-125 Neva/Pechora Ground-to-Air Missile System," *Army Recognition*, February 21 2024, [https://armyrecognition.com/russia\\_russian\\_missile\\_system\\_vehicle\\_uk/sa-3\\_goa\\_s-125\\_neva\\_pechora\\_ground\\_to\\_air\\_missile\\_system\\_technical\\_data\\_sheet\\_specifications\\_uk.html](https://armyrecognition.com/russia_russian_missile_system_vehicle_uk/sa-3_goa_s-125_neva_pechora_ground_to_air_missile_system_technical_data_sheet_specifications_uk.html), (Accessed: April 6, 2024).

59 "Bulgaria Could Have Sent S-300 and S-200 to Ukraine," *Bulgarian Military com*, June 4 2023, <https://bulgarianmilitary.com/2023/07/04/bulgaria-could-have-sent-s-300-and-s-200-to-ukraine-for-200m/>, (Accessed: April 6, 2024).

## Hungary

Hungary only has MANPADS for very short-range systems, which are few and provide limited area protection. The lack of artillery systems and very short-range systems is a significant vulnerability, especially against unmanned aerial vehicle (UAV) threats. In this context, after the war, Hungary sought artillery systems and placed an order for the Skyranger 30 on Dec. 15, 2023.<sup>60</sup> The Skyranger 30 is a system designed to counter drone attacks and other very short-range air threats. Hungary has the 2K12 KUB system for short ranges.<sup>61</sup> In November 2023, Hungary also acquired the first two NASAMS air defense systems, which were agreed upon in 2020, thus obtaining a short-to-medium range system.<sup>62</sup>

## Slovakia

Slovakia has only MANPADS and 2K12<sup>63</sup> systems for very short and short ranges. However, the MANPADS in its inventory have reached the end of their service life. Similarly, the 2K12 systems are quite outdated. To address this shortfall, the Slovak government approved the decision to procure Piorun MANPADS from Poland.<sup>64</sup> The Slovak military also possesses the S-300PMU medium-long range system.<sup>65</sup> However, despite the need for modernization of old systems, modernization has not been possible because the Russian

60 "Breakthrough for Skyranger 30 Air Defence System: Rheinmetall Awarded Development Contract for Skyranger Variant of Lynx in Hungary," Rheinmetall: The International Integrated Technology Group, December 20 2023, <https://www.rheinmetall.com/en/media/news-watch/news/2023/12/2023-12-20-lynx-with-skyranger-30-for-hungary>, (Accessed: April 6, 2024).

61 "SA-6 Gainful 2K12 Kub," Army Recognition, March 20 2024, [https://armyrecognition.com/russia\\_russian\\_missile\\_system\\_vehicle\\_uk/sa-6\\_gainful\\_2k12\\_kub\\_ground-to-air\\_missile\\_system\\_technical\\_data\\_sheet\\_specifications\\_information.html](https://armyrecognition.com/russia_russian_missile_system_vehicle_uk/sa-6_gainful_2k12_kub_ground-to-air_missile_system_technical_data_sheet_specifications_information.html), (Accessed: April 6, 2024).

62 Joe Saballa, "Hungary Receives First NASAMS Air Defense Systems From Norway," The Defense Post, November 7 2023, <https://www.thedefensepost.com/2023/11/07/hungary-nasams-air-defense/>, (Accessed: April 6, 2024).

63 "SA-6 Gainful 2K12 Kub," Army Recognition, March 20 2024, [https://armyrecognition.com/russia\\_russian\\_missile\\_system\\_vehicle\\_uk/sa-6\\_gainful\\_2k12\\_kub\\_ground-to-air\\_missile\\_system\\_technical\\_data\\_sheet\\_specifications\\_information.html](https://armyrecognition.com/russia_russian_missile_system_vehicle_uk/sa-6_gainful_2k12_kub_ground-to-air_missile_system_technical_data_sheet_specifications_information.html), (Accessed: April 6, 2024).

64 Jakup Palowski, "Piorun MANPADS Headed to Slovakia: We Know the Details," Defence 24 com, October 9 2023, <https://defence24.com/armed-forces/piorun-manpads-headed-to-slovakia-we-know-the-details>, (Accessed: April 6, 2024).

65 "Air Defence and Options for the Slovak Army," CZ Defence, February 3, 2021, <https://www.czdefence.com/article/air-defence-and-options-for-the-slovak-army>, (Accessed: April 6, 2024).

company Almaz-Antey is on the EU and U.S. sanctions list. Therefore, it can be clearly stated that Slovakia's current situation is not good. Additionally, Slovakian Defense Minister Robert Kalinak announced that the country is considering purchasing Patriot missile defense systems from the United States to enhance its air defense capabilities.<sup>66</sup> Minister Kalinak indicated that this plan is long-term, suggesting that the likelihood of placing an order for Patriot systems in the short term is low.

In late August 2024, Slovakia approved the purchase of six units of the Barak MX multi-layered air defense system, produced by Israel's IAI, along with accompanying equipment, for approximately 554 million euros. If negotiations between Slovakia and Israel on the final terms of the agreement conclude successfully, the first delivery is expected to take place by the end of 2025.<sup>67</sup>

## Slovenia

Slovenia has the SA-24 9K338 Igla-S MANPADS for very short-range systems.<sup>68</sup> Apart from this, it does not have a system for very short and short ranges. However, for medium range, particularly gaining importance within the framework of ESSI, Slovenia signed a contract on Jan. 25, 2024, for the procurement of the German defense manufacturer Diehl's IRIS-T SLM (Surface Launched Medium-range) air defense system.

The order includes a shooting unit consisting of a radar, a tactical operation center, and four missile launchers.<sup>69</sup> Additionally, IRIS-T SL missiles and logistical support are included. It is anticipated that more systems will be purchased to increase Slovenia's currently insufficient capacity.

Slovenia's decision to procure the IRIS-T SLM air defense system not only enhances the country's air defense capabilities but also demonstrates the

<sup>66</sup> "Slovakia Looks to Buy Patriot Air Defence System from United States," Reuters, January 29, 2024.

<sup>67</sup> Jaroslaw Adamowski, "Slovakia to Buy Israeli Barak MX Air Defense Systems for \$610M," *Defense News*, August 29 2024, <https://www.defensenews.com/global/europe/2024/08/29/slovakia-to-buy-israeli-barak-mx-air-defense-systems-for-610m/>, (Accessed: January 17, 2025)./.

<sup>68</sup> Military Factory, "Heckler & Koch HK416 Assault Rifle," *Military Factory*, [https://www.militaryfactory.com/smallarms/detail.php?smallarms\\_id=714](https://www.militaryfactory.com/smallarms/detail.php?smallarms_id=714), (Accessed: April 6, 2024).

<sup>69</sup> Dan Taylor, "Medium-Range Air Defense Systems for Slovenia to Be Supplied by Diehl Defence," *Military Embedded com*, January 9 2024, <https://militaryembedded.com/radar-ew/sensors/medium-range-air-defense-systems-for-slovenia-to-be-supplied-by-diehl-defence>, (Accessed: April 6, 2024).

growing interest in Germany's proposed IRIS-T GBAD systems for the ESSI air defense system.

## The Czech Republic

The Czech Republic is among the countries that possess systems from the Soviet era. For very short-range systems, the Czech Republic only has MANPADS.<sup>70</sup> For short ranges, it also possesses the 2K12 Kub system.<sup>71</sup> In 2021, the Czech Republic Ministry of Defense signed a purchase agreement for the short-to medium-range Spyder surface-to-air missile systems developed and produced by Israel's Rafael Advanced Defense Systems, at \$627 million.<sup>72</sup> In conclusion, while the Czech Republic is in a position to relatively meet its basic air defense needs, it does not have the strength to withstand a comprehensive air operation.

## Belgium

Belgium can be considered one of the countries with a relatively weak air defense system overall. It possesses Mistral MANPADS, which are very short-range systems.<sup>73</sup> There are no short-, medium-, or long-range systems available (according to open sources).<sup>74</sup> However, Belgium is a participant in the Modular Ground Based Air Defense (Modular GBAD) project, which aims to provide a multinational framework for the enhancement of air threat defense capabilities and the procurement of air defense systems across all

70 "RBS 70 MANPADS," Army Recognition, March 3 2024, [https://armyrecognition.com/sweden\\_swedish\\_missile\\_systems\\_and\\_vehicles\\_uk/rbs\\_70\\_manpads\\_man\\_portable\\_air\\_defense\\_missile\\_system\\_data.html](https://armyrecognition.com/sweden_swedish_missile_systems_and_vehicles_uk/rbs_70_manpads_man_portable_air_defense_missile_system_data.html), (Accessed: April 6, 2024).

71 "2K12 M2 KUB - NATO CODE: SA-6 GAINFUL," *Ministry of Defence & Armed Forces - Army.cz*, <https://www.army.cz/scripts/detail.php?id=6318>, (Accessed: April 6, 2024).

72 Jaroslav Adamowski, "Czech Republic Buys Israeli Spyder Air-Defense Weapon for \$627 Million," *Defence News*, September 28 2021, <https://www.defensenews.com/global/europe/2021/09/28/czech-republic-buys-israeli-spyder-air-defense-weapon-for-627-million/>, (Accessed: April 6, 2024).

73 Militaire Spectator, *Militaire Spectator 6-2017*, <https://www.militairespectator.nl/sites/default/files/bestanden/uitgaven/Militaire%20Spectator%20%206-2017.pdf>, (Accessed: April 7, 2024).

74 "Making the Most of the European Sky Shield Initiative," CSIS, May 19 2023, [https://csis-website-prod.s3.amazonaws.com/s3fs-public/2023-05/230519\\_Monaghan\\_European\\_SkyShield.pdf](https://csis-website-prod.s3.amazonaws.com/s3fs-public/2023-05/230519_Monaghan_European_SkyShield.pdf), (Accessed: April 7, 2024).

domains.<sup>75</sup> The project was initiated during the Virtual Defense Ministers Meeting in October 2020 and involves NATO with ten signing member countries. The member countries are Belgium, Denmark, Germany, Hungary, Italy, Latvia, The Netherlands, Slovenia, Spain, and the U.K., with all except Italy and Spain being members of ESSI. The participants are working on the design or acquisition of a system that can provide very short to medium-range protection and can adapt to individual operations but remains modular. NATO describes the project as intending to equip “participating Allies with versatile, scalable solutions through a systematic modular approach.” This approach will allow Modular GBAD operators to mix and match different components to create modules of air defense capabilities based on a single system. The project had anticipated starting procurement and development activities in 2022.<sup>76</sup> Various meetings have reiterated the common goal, although no direct purchases or joint ventures have been reported.<sup>77</sup> The U.S. State Department has approved a possible military sale to Belgium worth \$380 million, but this does not directly include an air defense system.<sup>78</sup>

## The Netherlands

The Netherlands has systems in place for every range type in terms of current capacity. It possesses Stinger MANPADS for very short ranges.<sup>79</sup> It has short- to medium-range NASAMS systems.<sup>80</sup> For medium- to long-range defense, it possesses the Patriot system.<sup>81</sup> It also features advanced

75 “Modular Ground Based Air Defence (Modular GBAD),” *NATO*, July 2021, [https://www.nato.int/nato\\_static\\_fl2014/assets/pdf/2021/2/pdf/2102-factsheet-m-gbad.pdf](https://www.nato.int/nato_static_fl2014/assets/pdf/2021/2/pdf/2102-factsheet-m-gbad.pdf), (Accessed: April 7, 2024).

76 “Modular Ground Based Air Defence (Modular GBAD),” *NATO*, July 2021, [https://www.nato.int/nato\\_static\\_fl2014/assets/pdf/2021/2/pdf/2102-factsheet-m-gbad.pdf](https://www.nato.int/nato_static_fl2014/assets/pdf/2021/2/pdf/2102-factsheet-m-gbad.pdf), (Accessed: April 7, 2024).

77 “Fifteen Allies deepen cooperation on Ground Based Air Defence,” *NATO*, October 21 2021, April 7, 2024, [https://www.nato.int/cps/en/natohq/news\\_187698.htm](https://www.nato.int/cps/en/natohq/news_187698.htm), (Accessed: April 7 2024).

78 Zamone Perez, “US Approves Arms Sales to Switzerland, Lithuania and Belgium,” *Defence News*, November 19, 2022, <https://www.defensenews.com/global/europe/2022/11/18/us-approves-arms-sales-to-switzerland-lithuania-and-belgium/>, (Accessed: April 7, 2024).

79 “Army Ground Based Air Defence System,” *Defensie NL*, <https://www.defensie.nl/onderwerpen/materieel/bewapening/army-ground-based-air-defence-system-agbads>, (Accessed: April 7, 2024).

80 “Defence Ground-Based Air Defence Command,” *Defensie NL*, <https://english.defensie.nl/organisation/army/units/defence-ground-based-air-defence-command>, (Accessed: April 7, 2024).

81 “PATRIOT Deployment,” *NATO*, May 2015, [https://www.nato.int/nato\\_static\\_fl2014/assets/pdf/pdf\\_2015\\_05/20150508\\_1505-Factsheet-PATRIOT\\_en.pdf](https://www.nato.int/nato_static_fl2014/assets/pdf/pdf_2015_05/20150508_1505-Factsheet-PATRIOT_en.pdf), (Accessed: April 7, 2024).

detection technologies capable of identifying a wide range of aerial targets, and tracking them, and possesses the highly mobile and accurate TRML (Telefunken Radar Mobile Air Surveillance) radar system which can also detect low-altitude air threats.<sup>82</sup> With all these systems, the Netherlands has a diverse inventory that supports both individual and NATO collective defense missions and collaboration. It is also a significant member of the ESSI framework. However, when considering its geographical location, the contribution of these systems against the threat from Russia is a subject of debate among other member states. In addition to having these systems, the Netherlands continues to work on increasing its current capacity, modernizing, and renewing its capabilities. Among the reasons for this include having sent a certain amount to Ukraine (e.g., 200 Stinger MANPADS in 2022).<sup>83</sup> The Dutch Ministry of Defense announced in June 2023 plans to replace the existing short and medium-range air defense systems with a single modern system. These new systems, provided by Kongsberg Defence & Aerospace (Norway) and Raytheon (USA), are planned to be operational from 2026.<sup>84</sup>

Additionally, there are efforts to increase the number of MANPADS and ongoing negotiation processes.<sup>85</sup> It also purchased the Advanced Stinger Trainer, a comprehensive Human MANPADS operator training system designed to provide operational and tactical training to Stinger users. This system, which operates within a 360° high-resolution VR environment, allows up to four Stinger teams to work simultaneously.<sup>86</sup> Therefore, it can be said that the Netherlands is in a better position compared to other countries up to now.

82 OuinetAdmin, "EADS Wins Dutch Air Defense Contract (Mar. 10)," *Defense Aerospace*, March 9, 2005, <https://www.defense-aerospace.com>, (Accessed: April 7, 2024).

83 "Netherlands to Supply Ukraine with 200 Stinger MANPADS," *Interfax*, (February 26, 2022), <https://interfax.com/newsroom/top-stories/74492/>, (Accessed: April 7, 2024).

84 "Acquisition of Short- and Medium-Range Air Defense in One Project," *Defense-Aerospace.com*, June 6, 2024, <https://www.defense-aerospace.com/netherlands-to-modernize-ground-based-air-defense/>, (Accessed: April 7, 2024).

85 "NATO Support and Procurement Agency (NSPA) – Stinger Missiles," *Defense-Aerospace.com*, (January 3, 2024), <https://www.defense-aerospace.com/us-approves-780-million-sale-of-stinger-missiles-to-germany-italy-and-netherlands/>, (Accessed: April 7, 2024).

86 The Shephard News Team in London, "The Netherlands Buys Immersive Stinger Missile Trainer," *SHEP-HARD Media*, January 8, 2024, <https://www.shephardmedia.com/news/training-simulation/netherlands-buys-advanced-stinger-virtual-trainer>, (Accessed: April 7, 2024).

## Austria

Austria currently only has very short-range systems within its air defense systems. These systems include MANPADS MISTRAL missiles and 35 mm anti-aircraft guns. The basis for this is the ban on Austria having weapons with a range greater than 30 kilometers until 1990, according to the 1955 state treaty made with the Allied occupying forces.<sup>87</sup> However, following the Russia-Ukraine war, efforts to increase defense spending and strengthen air defense systems have intensified. After joining ESSI, in September 2023, the Austrian defense minister announced the purchase of eight IRIS-T air defense launchers. The plan includes eight systems: four short-range systems capable of reaching up to 15 kilometers and four additional medium-range systems capable of hitting targets up to 50 kilometers away.<sup>88</sup>

The Commander of the Austrian Air Forces, Brig. Gen. Gerfried Promberger made the following statements about the decision:

*“This is not just a joint purchase but also a joint training initiative. The aim is to establish a European Air Defense School. We have a significant capability gap in ground-based air defense. We need something that has been tried and tested. This is not an offensive weapon, but a defense weapon.”<sup>89</sup>*

On Nov. 15, 2023, at a press conference organized by the Austrian government, it was announced that the Austrian government plans to strengthen its air defense by adding long-range air defense missiles to its armed forces from 2027. Two weapon systems are being evaluated for the long-range air defense system, but specific information about their types is not available. The main candidates are thought to be the American-made Patriot system or the American-Israeli Arrow 3.<sup>90</sup> In the final assessment, it is seen that Austria

87 Linus Höller, “Austria to buy long-range air defenses under Sky Shield push,” *Defence News*, November 16, 2023, April 8, 2024, <https://www.defensenews.com/global/europe/2023/11/16/austria-to-buy-long-range-air-defenses-under-sky-shield-push/>, (Accessed: April 8, 2024).

88 Linus Höller, “Austria Eyes German IRIS-T Buy for Nascent European ‘Sky Shield,’” *Defence News*, September 13, 2023, <https://www.defensenews.com/global/europe/2023/11/16/austria-to-buy-long-range-air-defenses-under-sky-shield-push/>, (Accessed: April 8, 2024).

89 Eren Yiğitoğlu, “Avusturya’dan IRIS-T Hava Savunma Sistemi Tedariki,” *Defence Turk*, September 15, 2023, <https://www.defenceturk.net/avusturyadan-iris-t-hava-savunma-sistemi-tedariki>, (Accessed: April 8, 2024).

90 Linus Höller, “Austria to Buy Long-Range Air Defenses Under Sky Shield Push,” *Defence News*, November 16, 2023, <https://www.defensenews.com/global/europe/2023/11/16/austria-to-buy-long-range-air-defenses-under-sky-shield-push/>, (Accessed: April 8, 2024).

has made significant efforts following the start of the war and its participation in ESSI.

## Switzerland

In the 1960s, Switzerland introduced the BL-64 “Bloodhound” missile system, establishing its first short-range ground-based air defense systems, and has acquired various systems up to the present day. The initial systems were replaced by the Rapiers surface-to-air missile, FIM-92 Stinger MANPADS, and Oerlikon GDF towed anti-aircraft artillery at very short to short ranges.<sup>91</sup> It also possesses the Oerlikon Skyguard system, which can direct up the Oerlikon 35 mm air defense weapon and the Sparrow or Aspide air defense missiles at very short and short ranges.<sup>92</sup> Switzerland launched the “Air 2030” program in 2017, a comprehensive modernization project aimed at restructuring and updating the long-term air defense capabilities of the Swiss Air Force.<sup>93</sup> The main goals of the program are to renew air defense systems, combat aircraft, and related technologies, and to restructure them to meet Switzerland’s air defense needs for the coming decades. In this context, the New Ground-Based Air Defense System aims to update Switzerland’s aging air defense systems and provide more effective air defense capabilities. As part of Switzerland’s Air 2030 program, the U.S. State Department approved the purchase of five Patriot Advanced Capability-3 (PAC-3) Missile Segment Enhancement (MSE) systems and related support equipment in September 2020, which was formalized by the signatures of officials from both countries in October 2023.<sup>94</sup> Although not officially announced yet,

91 “Switzerland,” *Missile Defense Advocacy*, [https://missiledefenseadvocacy.org/intl\\_cooperation/switzerland/](https://missiledefenseadvocacy.org/intl_cooperation/switzerland/), (Accessed: April 9, 2024).

92 “Skyguard,” *Military Periscope*, <https://www.militaryperiscope.com/weapons/sensors/electronics/ground-radars/skyguard/overview/>, (Accessed: April 9, 2024).

93 Sebastian Sprenger, “Switzerland Names Contenders in \$8 Billion ‘Air 2030’ Program,” *Defense News*, (March 27, 2018), <https://www.defensenews.com/land/2018/03/27/switzerland-names-contenders-in-8-billion-air-2030-program>, (Accessed: April 9, 2024).

94 Switzerland – Patriot Configuration-3+ Modernized Fire Units and Weapons,” *Defense Security Cooperation Agency*, September 30 2020, <https://www.dsca.mil/press-media/major-arms-sales/switzerland-patriot-configuration-3-modernized-fire-units-and-weapons>, (Accessed: April 9, 2024); “U.S. and Switzerland Sign Agreement For PAC-3 MSE Missile,” *Lockheed Martin News*, October 31 2023, <https://news.lockheedmartin.com/2023-10-31-us-and-switzerland-sign-agreement-for-pac-3-mse-missile>, (Accessed: April 9, 2024).



there is a high likelihood that an order for the IRIS-T SLM will be placed under the ESSI framework.<sup>95</sup>

## Greece

Greece has a substantial capacity in air defense systems. At the core of this capacity, in 1964, Greece and several other NATO countries signed the “Multilateral Agreement” regarding the use and operation of the NATO Missile Firing Installation (NAMFI) on Crete, Greece’s largest island.<sup>96</sup> Greece possesses short-range air defense systems including the FIM-92 Stinger, Tor-M1 air defense system, Rheinmetall Twin AA Gun MK-20 (also known as the Rheinmetall MK 20 RH-202), Crotale, also known as Crotale NG (New Generation), VELOS, Artemis 30, and the Phalanx Close-In Weapon System (CIWS), also known as Phalankisa, and the 9K33 systems. At medium range, it has the Evolved SeaSparrow Missile (ESSM) system.<sup>97</sup> Additionally, Greece owns Russian-made S-300 and Patriot PAC-2 (GEM-T) systems.<sup>98</sup> NAMFI, under the administrative control of the Greek National Defense General Staff, conducts live fire exercises with air and missile defense platforms operated by Germany, Greece, and the Netherlands to test systems under realistic tactical scenarios.<sup>99</sup>

## The UK

Although the United Kingdom’s air defense system features various radar and missile systems, it has vulnerabilities, particularly at medium and long ranges due to various shortcomings. Sir Tony Radakin, head of the British

95 “Switzerland to Order Air Defense Systems within the European Sky Shield Initiative,” *MilitarNYI*, April 10 2024, <https://mil.in.ua/en/news/switzerland-to-order-air-defense-systems-within-the-european-sky-shield-initiative/>, (Accessed: April 12, 2024).

96 “What is NAMFI,” *NATO Missile Firing Installation (NAMFI)*, <https://www.namfi.gr/what-is-namfi/>, (Accessed: April 10, 2024).

97 “Greece,” *Missile Defense Advocacy*, January 10, 2024, [https://missiledefenseadvocacy.org/intl\\_cooperation/greece/](https://missiledefenseadvocacy.org/intl_cooperation/greece/), (Accessed: April 10, 2024).

98 “PATRIOT Deployment,” *NATO*, (May 2015), [https://www.nato.int/nato\\_static\\_fl2014/assets/pdf/pdf\\_2015\\_05/20150508\\_1505-Factsheet-PATRIOT\\_en.pdf](https://www.nato.int/nato_static_fl2014/assets/pdf/pdf_2015_05/20150508_1505-Factsheet-PATRIOT_en.pdf), (Accessed: April 7, 2024).

99 “What is NAMFI,” *NATO Missile Firing Installation (NAMFI)*, <https://www.namfi.gr/what-is-namfi/>, (Accessed: April 10, 2024).

Armed Forces, has stated that England is vulnerable to potential missile or drone attacks.<sup>100</sup> While there are deficiencies in the missile system, it can be said that the radar network is relatively more comprehensive. Among these, the Upgraded Early Warning Radar (UEWR) at RAF Fylingdales station in North Yorkshire is highly advanced, capable of tracking multiple objects over long distances and rapidly acquiring high-resolution data essential for early warning and missile defense. The facility provides data to both the U.K. and the U.S.<sup>101</sup> In this context, the Ballistic Missile Defense Framework Memorandum of Understanding was signed between the U.S. and the U.K. in 2003, establishing cooperation models, especially in research and development in missile defense.<sup>102</sup> Collaboration continues today on advanced technology programs and system-level analyses.

The U.K. possesses systems like the Stormer HVM (High Velocity Missile), Starstreak Missile System, and Rapier FSC (Field Standard C), mounted on armored vehicles capable of reaching very high speeds at very short and short ranges. It also has Enhanced Modular Air Defence Solutions (EMADS), designed with modular structures to meet specific air defense needs through the integration of various sensors and weapon systems.

The U.K. has recently introduced CAMM (Common Anti-Air Modular Missile) and CAMM-ER (Extended Range) systems, produced by MBD and Thales.<sup>103</sup> These systems are equipped with modern technology and designed to address short- to medium-range air defense requirements effectively. Their flexible and modular structure allows them to be deployed on various platforms, both on land and at sea, significantly contributing to the U.K.'s air defense architecture.

At medium range, the SKY-Sabre systems protect against air attacks on sea systems and fleets. The Type 45 system has effective anti-missile defense

100 Dan Sabbagh, "UK Vulnerable to Potential Missile or Drone Attack, Says Military Chief," *The Guardian*, September 14 2023.

101 "The Changing Faces of RAF Fylingdales," *The Whitby Gazette*, August 30, 2013, archived from the original on December 1, 2017, (Accessed: November 30, 2017).

102 "America's Cooperative Approach to Missile Defense," *U.S. Department of State*, December 17 2004, <https://2001-2009.state.gov/t/isn/rls/rm/39920.htm>, (Accessed: April 11, 2024).

103 "Common Anti-Air Modular Missile (CAMM)," *Think Defence*, November 5 2022, <https://www.think-defence.co.uk/2022/11/common-anti-air-modular-missile-camm/>, (Accessed: January 17, 2025); UK Government, "New Order of Missiles Secures Future Supply for UK Armed Forces," *GOV.UK*, January 11 2023, <https://www.gov.uk/government/news/new-order-of-missiles-secures-future-supply-for-uk-armed-forces>, (Accessed: January 17, 2025).

capabilities across a wide operational area.<sup>104</sup> The shipborne missile defense components of Type 45 include the Sea Viper missile defense system, Sampson multi-function radar, and radar-controlled Phalanx Gatling gun; the latter serves as the last line of defense against incoming aerial threats. Other sea-based systems include the Phalanx Gatling Gun and Sea Wolf.

The U.K. Defense Ministry in its report “Combat Air Strategy: An ambitious vision for the future” has prioritized Ground-Based Air Defenses (GBAD).<sup>105</sup> Various initiatives in this area include the establishment of the U.K. Missile Defence Center in 2003, a government-industry partnership under the Defense Ministry’s Defence Science and Technology program. Collaborating companies include defense industry leaders like BAE Systems, L3Harris ASA, Lockheed Martin U.K., MBDA, QinetiQ, Fluid Gravity Engineering, and Airbus Defense and Space U.K. Significant efforts are made in six main areas: Scenario Assessment and War Games, Sensors and Architectures, Threat Characterization, Threat Reduction and Lethality, Maritime BMD, and Innovative Technology.

## Germany

ESSI’s founder, Germany, is also the largest ballistic missile defense provider in Europe. Even before ESSI, Germany was a country engaged in GBAD (Ground-Based Air Defense) research. In addition to traditional systems, Germany began developing a ground-based, mobile, laser-based missile defense system in 2008, which uses concentrated infrared laser beams that can track, identify, and destroy missiles.<sup>106</sup>

After 2014, NATO started refocusing on collective defense strategies, increasing the need for various, short and medium-range surface-to-air defense systems.<sup>107</sup> The annexation of Crimea by Russia and the war in Ukraine,

104 “United Kingdom,” *Missile Defense Advocacy*, June 27, 2018, [https://missiledefenseadvocacy.org/intl\\_cooperation/united-kingdom/](https://missiledefenseadvocacy.org/intl_cooperation/united-kingdom/), (Accessed: April 11, 2024).

105 Ministry of Defence (MoD), ‘Combat Air Strategy: An Ambitious Vision for the Future’, July 16, 2018, p. 11.

106 Kelsey D. Atherton, “This German Laser Is Made to Shoot Down Drones,” *Popular Science-Popsci.com*, June 17 2016, <https://www.popsci.com/german-laser-weapons-on-display-at-european-defense-show/>, (Accessed: April 12, 2024).

107 Aziz Armutlu, *NATO’s Changing Role and Türkiye: Security Dynamics and Evolution of Relations*, (Journal of Middle East Perspectives, 2023), pp. 2-51.

as previously mentioned, made this situation an urgent agenda item. From 2014 to 2022, Germany accelerated its efforts to fulfill the commitments of the NATO Defense Planning Process (NDPP).<sup>108</sup> In this context, Germany significantly began restructuring the Bundeswehr for traditional military conflicts and enhancing its air defense capabilities in 2014.

Germany possesses ASRAD and Stinger systems for very short-range defense. Furthermore, Germany is developing a very short-range air defense system project. The LVS NNbS (Luftverteidigungssystem Nah- und Nächstbereichsschutz) project, one of the notable initiatives, is being developed to reinforce Germany's role within NATO and to support ESSI.<sup>109</sup> Managed by German defense industry companies Rheinmetall, Diehl Defence, and Hensoldt, these systems are specifically designed to protect against kamikaze drones and cruise missiles.<sup>110</sup>

Germany protects military bases from missile, artillery, and mortar attacks with the MANTIS system and has equipped Wiesel 2 vehicles with Stinger launchers and a LeFlaSys Ozelot battery for mobile force protection.<sup>111</sup> Although ongoing purchases and projects exist, Germany needs to enhance its capabilities in the very short and short-range sectors.<sup>112</sup> Germany also possesses the Skyshield 35 system, an advanced ground-based air defense system for short to medium range, and owns Patriot missiles for medium-long range.<sup>113</sup>

108 "Defence Budget and Security Investment Section," *Vertreter der Bundesrepublik Deutschland bei der NATO*, [https://nato.diplo.de/nato-de/ueber-uns/politicaldivision/2241578#content\\_2](https://nato.diplo.de/nato-de/ueber-uns/politicaldivision/2241578#content_2), (Accessed: April 12, 2024).; "NATO Defence Planning Process," *NATO*, [https://www.nato.int/cps/en/natohq/topics\\_49202.htm](https://www.nato.int/cps/en/natohq/topics_49202.htm), (Accessed: April 12, 2024).

109 Tim Martin, "'Decisive Step': Germany Inks \$1.3 Billion Short Range Air Defense Development Contract," *Breaking Defense.com*, January 25 2024, <https://breakingdefense.com/2024/01/decisive-step-germany-inks-1-3-billion-short-range-air-defense-development-contract/>, (Accessed: April 12, 2024).

110 "German Inner Layer Air Defence System Nah- und Nächstbereichsschutz: Rheinmetall, Diehl and Hensoldt Are Lining Up Together," *Rheinmetall: The International Integrated Technology Group*, <https://www.rheinmetall.com/en/microsites/nnbs>, (Accessed: April 12, 2024).

111 "Ground-Based Air Defense," *Bundeswehr.de*, <https://www.bundeswehr.de/en/ground-based-air-defense-5067200>, (Accessed: April 12, 2024).

112 Sebastian Sprenger, "Germany Spends \$1.3 Billion on Missile-Based Short-Range Air Defenses," *Defense News*, January 2024, <https://www.defensenews.com/global/europe/2024/01/19/germany-spends-13-billion-on-missile-based-short-range-air-defenses/>, (Accessed: April 12, 2024).

113 "Germany," *Missile Defense Advocacy*, (October 14, 2022), [https://missiledefenseadvocacy.org/intl\\_cooperation/germany/](https://missiledefenseadvocacy.org/intl_cooperation/germany/), (Accessed: April 12, 2024).

Importantly, Germany is one of the most significant users of the Patriot missile defense system in Europe, with over 12 Patriot batteries deployed across the country.<sup>114</sup> These systems provide medium- to long-range air and missile defense, enhancing Germany's ability to protect critical infrastructure and respond to aerial threats. The Patriot systems have been a cornerstone of Germany's air defense strategy for decades, offering interoperability within NATO's integrated air and missile defense network. In recent years, Germany has also focused on modernizing its Patriot systems to maintain their effectiveness against evolving threats.

In 2005, Germany, the U.S., and Italy (MBDA Deutschland GmbH, Lockheed Martin, and MBDA Italia) initiated the Medium Extended Air Defense System (MEADS) program to develop a medium-range air defense system. MEADS is a versatile air and missile defense system that was planned to use PAC-3 missiles and is designed to replace old Patriot systems. To reduce high operational costs, the MEADS system was integrated with the more economical German short-range IRIS-T SL air defense system instead of the expensive PAC-3 MSE missiles. In 2011, the U.S. withdrew from the program, but development continued until a prototype was developed in 2014. Instead of purchasing this system independently, In June 2015, the German Federal Ministry of Defense decided to use the MEADS infrastructure for the new generation network-based tactical air and missile defense system, Taktisches Luftverteidigungssystem (TLVS), opting for TLVS instead of Patriot.<sup>115</sup> Following discussions with MBDA Deutschland on the development and acquisition of the first batteries for the TLVS, the signing of the contract was expected, followed by the Bundestag's approval for funding the program. However, collaboration issues with Lockheed Martin and other partners prolonged the process. After these delays, in September 2016, MBDA Deutschland submitted its initial proposal to the Federal Bundeswehr Equipment Office (BAAINBw).

Germany's additional demands included the enhancement of the multi-functional fire control radar, a surveillance radar, and a medium-range radar

114 "Germany," *Missile Defense Advocacy*.

115 Agence France-Presse, "Germany Opts for MEADS Missile Defense System," *Defense News*, June 9 2016), <https://www.defensenews.com/home/2015/06/09/germany-opts-for-meads-missile-defense-system/>, (Accessed: April 12, 2024).

compatible with IRIS-T SL. Ultimately, MBDA Deutschland presented a proposal in May 2017, and the official negotiation process began. Doubts about the German subsidiary of the MBDA Group's capability to handle such a complex weapons program were dispelled in March 2018 when MBDA Deutschland (60%) and Lockheed Martin (40%) established TLVS GmbH as the main contractor for the program.<sup>116</sup> However, various problems persisted into 2020, preventing the project from being finalized.<sup>117</sup> Moreover, a symbolic amount of \$2.4 million was allocated for the VLSV in the 2021 Defense Budget. In March 2021, the German Defense Ministry announced the suspension of plans for the next-generation TLVS air defense system, opting instead to invest in air defense systems against UAVs and focus on modernizing the country's aging Patriot fleet.<sup>118</sup>

In 2022, Germany requested U.S. approval to purchase the American anti-ballistic missile defense system Terminal High Altitude Area Defense (THAAD) designed to intercept and destroy short, medium, and intermediate-range ballistic missiles during in their high-altitude or terminal phase. In August 2022, the U.S. approved the sale of 96 THAAD missile interceptors, two THAAD Launch Control Stations (LCS), and two THAAD Tactical Operations Stations (TOS), although a sale has not yet occurred.<sup>119</sup> According to a report by Bloomberg news agency, the German government has decided in favor of the Israeli-U.S. Arrow 3 system, and against the U.S. THAAD system produced by Lockheed Martin.<sup>120</sup>

116 Jen Judson, "Long-Delayed German Missile Defense Deal with Lockheed, MBDA Expected by Year's End," *Defense News*, March 6 2018, <https://www.defensenews.com/land/2018/03/06/long-delayed-german-missile-defense-deal-with-lockheed-mbda-expected-by-years-end/>, (Accessed: April 12, 2024).

117 Sebastian Sprenger, "German Industry Lead Prepares for Possible Collapse of TLVS Anti-Missile Program," *Defense News*, December 4 2020, <https://www.defensenews.com/global/europe/2020/12/04/german-industry-lead-prepares-for-possible-collapse-of-tlvs-anti-missile-program/>, (Accessed: April 12, 2024).

118 Sebastian Sprenger, "Germany Shelves New Anti-Missile Weapon and Turns to Drone Defense," *Defense News*, March 23 2021, <https://www.defensenews.com/global/europe/2021/03/23/germany-shelves-new-anti-missile-weapon-and-turns-to-drone-defense/>, (Accessed: April 12, 2024).

119 "Germany Requests New Weapon Systems to US Including THAAD Air Defense Missile Systems," *Army Recognition*, (March 18, 2022), [https://www.armyrecognition.com/defense\\_news\\_march\\_2022\\_global\\_security\\_army\\_industry/germany\\_requests\\_new\\_weapon\\_systems\\_to\\_us\\_including\\_thaad\\_air\\_defense\\_missile\\_systems.html](https://www.armyrecognition.com/defense_news_march_2022_global_security_army_industry/germany_requests_new_weapon_systems_to_us_including_thaad_air_defense_missile_systems.html), (Accessed: April 12, 2024).

120 Michael Nienaber, "Germany Snubs Lockheed, Opts for Israeli Air-Defense System," *Bloomberg*, September 12 2022, <https://www.bloomberg.com/news/articles/2022-09-12/germany-set-to-buy-israeli-manufactured-arrow-air-defense-system>, (Accessed: April 12, 2024).

Developments for the purchase of Arrow 3, jointly developed by the Israeli Missile Defense Organization and the U.S. Missile Defense Agency (lead company as Aerospace Industries- IAI),<sup>121</sup> have also progressed following approvals from U.S. Department of State officials to senior defense leaders.<sup>122</sup> The Israeli government announced in August 2023 that it would sell the Arrow 3 missile defense system to Germany in a deal worth \$3.5 billion.<sup>123</sup> Then-Israeli Defense Minister Yoav Gallant and his German counterpart Boris Pistorius did sign the Declaration of Intent for the Arrow 3 missile defense system at the German Ministry of Defense in Berlin on Sept. 28, 2023. The agreement was signed, and in June 2023, the German parliament approved a fund of 560 million pounds (\$694.68 million) for Arrow 3. The total contract volume for Arrow 3 is expected to be around \$3.5 billion.<sup>124</sup>

In light of all these developments, Germany continues its efforts to strengthen its air defense infrastructure with systems it has developed, such as IRIS-T. Although it has suspended various initiatives like MEADS/TLVS, it has gained various experiences and infrastructures. Moreover, the concrete steps it has taken toward possessing numerous air defense systems, such as THAAD and Arrow 3, clearly demonstrate the importance attributed to this area. (For now, we can assume that only the Arrow 3 system has been definitively selected.)

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121 Seth J. Frantzman, "Israel Finalizes Arrow 3 Deal with Germany, Aims for Late 2025 Delivery," *Breaking Defense.com*, November 22 2023, <https://breakingdefense.com/2023/11/israel-finalizes-arrow-3-deal-with-germany-aims-for-late-2025-delivery/>, (Accessed: April 12, 2024).

122 Tzally Greenberg, "Israel's Arrow 3 Missile-Defense Sale to Germany Gets US Nod," *Defense News*, August 17 2023, <https://www.defensenews.com/global/mideast-africa/2023/08/17/israels-arrow-3-missile-defense-sale-to-germany-gets-us-nod/>, (Accessed: April 12, 2024).

123 Carrie Keller-Lynn, "Germany Signs Nearly €4 Billion Deal for Israel's Arrow 3 Missile Defense System," *Times of Israel.com*, September 28, 2023.

124 Tzally Greenberg, "Israel's Arrow 3 Missile-Defense Sale to Germany Gets US Nod," *Defense News*, August 17 2023, <https://www.defensenews.com/global/mideast-africa/2023/08/17/israels-arrow-3-missile-defense-sale-to-germany-gets-us-nod/>, (Accessed: April 12, 2024).

## CHALLENGES AND CRITICISMS

The European Sky Shield Initiative is designed to offer advanced security and defense capabilities, as it has the potential to address numerous technical deficiencies through the development and acquisition of new technologies.<sup>125</sup> This initiative aims to enhance the political and strategic autonomy of the member states, encourage inter-state cooperation and collective action, and increase economic mobility.<sup>126</sup> However, in practice, it also includes some significant issues that can lead to various challenges and criticisms.

The challenges and criticisms can be addressed under five main headings:

- Criticisms from other European countries
- Strategic and political alignment and coordination among member countries

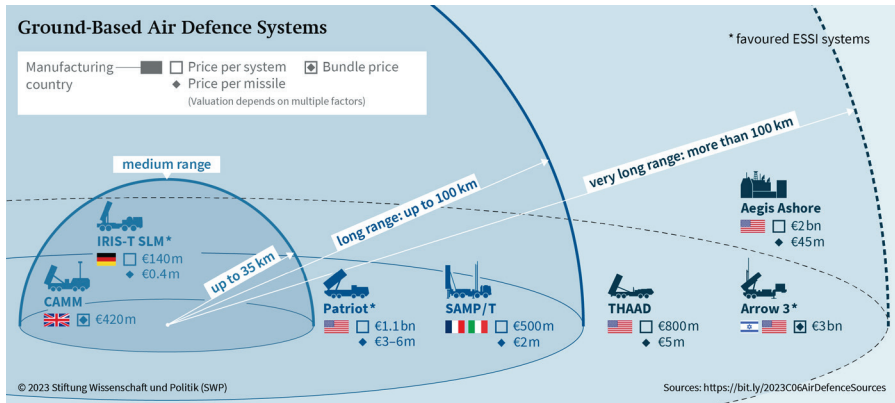
125 Ralf Bosen, "Sky Shield Initiative: Can It Protect Europe," *Deutsche Welle*, September 28, 2023.

126 Vivienne Machi and Elisabeth Gosselin-Malo, "Europe's Defense Leaders Push Competing Air Defense Visions," *Defense News*, July 3 2024, <https://www.defensenews.com/global/europe/2023/07/03/europes-defense-leaders-push-competing-air-defense-visions/>, (Accessed: April 13, 2024).



- Variability in system requirements, integration, and meeting needs through intra-European supply
- High costs and economic challenges
- Technical and system constraints

Figure 1 ESSI Systems



Source: SWP

## Criticisms from Other European Countries

Other European countries have criticisms of ESSI that encompass the other four issues listed above. Particularly, France has serious criticisms of the initiative. French President Emmanuel Macron has openly expressed his criticisms at various meetings and forums. The criticisms include ESSI’s insufficient support for the European defense industry, exclusion of systems like the ASTER 30 SAMP/T air defense system developed by the EURO-SAM consortium formed by MBDA-France and Thales-Italy, and similar systems.<sup>127</sup> France also criticizes ESSI for having a narrow vision, strategic deficiencies, and coordination issues.<sup>128</sup>

127 “France and Italy Promote SAMP/T Against European Air Defense Initiatives,” *Army Recognition*, July 19 2024, <https://www.armyrecognition.com/news/army-news/army-news-2024/france-and-italy-promote-samp-t-against-european-air-defense-initiatives>, (Accessed: July 23, 2024).

128 Clement Charpentreau, “France Challenges German-Led European Sky Shield Initiative,” *Aerotime Hub/ Aerotime.aero*, June 6 2023, <https://www.aerotime.aero/articles/france-challenges-german-led-european-sky-shield-initiative>, (Accessed: April 13, 2024).

Italy, in particular, criticizes ESSI's dependency on non-European defense systems. Italy opposes the neglect of the SAMP/T system among the countries included in ESSI and considers the shift toward non-European systems a significant issue.<sup>129</sup>

Poland, being a country that shares a border with Russia and has a high risk of direct conflict, is making significant defense expenditures. Polish Defense Minister Wladyslaw Kosiniak-Kamysz has stated that his country urgently needs to prepare for a possible war threat from Russia.<sup>130</sup> However, despite all its preparations, Poland has not joined ESSI. Poland, particularly, questions Germany's leadership and criticizes the dependency on non-European systems like other countries.<sup>131</sup> Poland is focused on developing its own defense strategies and remains distant from ESSI, preferring bilateral defense agreements over multiple initiatives and deals.

There are similar criticisms within ESSI, as well. Slovakia has pointed out that the selection of the German-made IRIS-T within the initiative excludes other European systems like MBDA's CAMM system.

There are also criticisms that ESSI is not compatible with the defense policies of some European countries and does not offer sufficient flexibility.<sup>132</sup> In this context, the non-member European countries, led by France, have three main criticisms of ESSI: lack of strategic approach and coordination, dependency on non-European Systems, and negative impact on national and European industries. These three criticisms are not only from other European countries but are also part of the general criticisms made against ESSI mentioned above. Therefore, other criticisms and challenges have been detailed as well.

129 "Italy to Receive Four SAMP/T NG Air Defense Missile Systems," *Army Recognition*, February 2 2022, [https://armyrecognition.com/defense\\_news\\_february\\_2024\\_global\\_security\\_army\\_industry/italy\\_to\\_receive\\_four\\_samp/t\\_ng\\_air\\_defense\\_missile\\_systems.html](https://armyrecognition.com/defense_news_february_2024_global_security_army_industry/italy_to_receive_four_samp/t_ng_air_defense_missile_systems.html), (Accessed: April 13, 2024).

130 "Poland Preparing for Threat of War with Russia, Defence Minister Says," *Yahoo News*, February 5 2024, <https://news.yahoo.com/poland-preparing-threat-war-russia-152700704.html?guccounter=1>, (Accessed: March 31, 2024).

131 Aja Melville, "Germany Forges Path to Leadership Through the European Sky Shield Initiative," *Defense and Security Monitor - DSM.forecastinternational.com*, <https://dsm.forecastinternational.com/2024/01/19/germany-forges-path-to-leadership-through-the-european-sky-shield-initiative/>, (Accessed: April 13, 2024).

132 "10 NATO Allies Take Further Step to Boost European Air and Missile Defence Capabilities," *Defense-Aerospace*, October 11 2023, <https://www.defense-aerospace.com/only-9-of-18-original-members-sign-up-for-germanys-european-sky-shield-essil/>, (Accessed: April 13, 2024).

## Strategic and Political Alignment and Coordination Among Member Countries

ESSI is an initiative that faces numerous strategic and political challenges and criticisms. Strategically, there has been no proper threat analysis or perception conducted within ESSI. Although Russia is recognized as the primary threat, a comprehensive threat analysis regarding this has not been conducted and evaluated within ESSI.<sup>133</sup> This has led to criticisms that there is random planning at a system level due to the lack of necessary analyses. Indeed, ESSI members generally show interest in Israel's Arrow system.<sup>134</sup> However, there are uncertainties about which Russian weapons the Arrow system is intended to defend against. This leads to strategic gaps as there are concerns that this system may not be compatible with Russia's current threats.<sup>135</sup>

During the 2023 Paris Air Show – the first major air show since Russia's February attack on Ukraine – French President Macron cautioned against reliance on non-European systems and stated that a missile defense initiative similar to Israel's "Iron Dome" would not work across the entire European continent.<sup>136</sup> He emphasized the importance of a strategic approach by stating, "When we talk air defense, we would be wrong to rush into capacity. The question is, first of all, strategic."<sup>137</sup> In this context, while the technical capabilities of Arrow, notably its range exceeding 500 kilometers, suggest

133 Clement Charpentreau, "France Challenges German-Led European Sky Shield Initiative," *Aerotime Hub/Aerotime.aero*, June 6 2023, <https://www.aerotime.aero/articles/france-challenges-german-led-european-sky-shield-initiative>, (Accessed: April 13, 2024).

134 One of the most significant factors that can influence the defense system preferences of ESSI member states is the field experience and success demonstrated in testing. The Arrow-3 system holds a strong reference in this regard. With its history of active deployment in the field and proven success in tests, Arrow-3 stands out as a well-established solution. On the other hand, while the IRIS-T system possesses a robust technological infrastructure, it falls short in terms of field experience and testing history compared to Arrow-3. This is an important factor that ESSI members are likely to consider in their decision-making processes.

135 Lydia Wachs, "Russian Missiles and the European Sky Shield Initiative: German Plans to Strengthen Air and Missile Defence in the Current Threat Environment", (SWP, August 2023).

136 Vivienne Machi and Elisabeth Gosselin-Malo, "Europe's defense leaders push competing air defense visions," *Defense News*, July 3 2024, April 13, 2024, <https://www.defensenews.com/global/europe/2023/07/03/europes-defense-leaders-push-competing-air-defense-visions/>, (Accessed: April 13, 2024).

137 Vivienne Machi and Elisabeth Gosselin-Malo, "Europe's Defense Leaders Push Competing Air Defense Visions," *Defense News*, July 3 2024 <https://www.defensenews.com/global/europe/2023/07/03/europes-defense-leaders-push-competing-air-defense-visions/>, (Accessed: April 13, 2024); Sylvie Corbet, "Macron Urges Europe to Develop Its Own Air Defense Systems and Not Rely on the US," *AP News*, June 19 2023.

it could be effective against Russia's Iskander-M system, NATO compatibility remains a critical concern.<sup>138</sup> The integration of any adopted systems into those of NATO member states is vital. Even if integration is achieved within ESSI member states, compliance with NATO is critically essential and urgent.

Strategically, the deployment of systems and how information sharing will be conducted are significant issues. Even if system and technical infrastructures are established, questions remain on how an integrated system will be planned, where the command-and-control centers will be located, whether there will be information sharing at the level of all systems and radars between countries, and to what extent, and whether a joint decisionmaking approach will be adopted. Many strategic questions, including these, remain unanswered. Additionally, the issue of being members of other organizations and alliances raises both political and strategic problems. The question of the impact of some states being only NATO members and others being only European Union members remains an important point of uncertainty.

Then-NATO Secretary-General Jens Stoltenberg stated at the NATO 2023 press conference:

*“Germany is leading the Sky Shield initiative where several Allies have gone together and ensuring that they are delivering on the NATO capability targets for more air defense. So yes, we need to do more because we need the quality, we need the quantity to ensure that we have sufficient air defense to protect against missiles, drones, and planes.”*<sup>139</sup>

Therefore, it can be considered that NATO supports ESSI in this context, but there is no formal decision and no action plan for implementation in a potential situation. For instance, it is unknown what the general opinion of NATO members would be regarding the sharing of information and data from an integrated system with an ESSI member who is not part of NATO. There could be opinions or various objections from France or

138 Lydia Wachs, “Russian Missiles and the European Sky Shield Initiative: German Plans to Strengthen Air and Missile Defence in the Current Threat Environment”, (SWP, August 2023), pp. 1-7.

139 “Press Conference by NATO Secretary General Jens Stoltenberg on the Release of His Annual Report 2023,” NATO, March 14 2024, [https://www.nato.int/cps/en/natohq/opinions\\_223662.htm?selectedLocale=en](https://www.nato.int/cps/en/natohq/opinions_223662.htm?selectedLocale=en), (Accessed: April 15, 2024).

any NATO member regarding this issue, and the potential consequences of these are uncertainties that need to be resolved. Indeed, there are views that the potential problems that could arise here could cause issues in both the political and technical aspects of NATO.

On the other hand, there could be various interactions and potential conflicts between the Timely Warning and Interception with Space Based TheatER Surveillance (TWISTER) Project and ESSI. So far, there has been no direct analysis regarding whether TWISTER, coordinated by France, will directly cause a clash or potential conflict with ESSI. From this, it can be inferred that similar outcomes to the slow progress encountered in the Single European Sky (SES) initiative, which results from conflicting national interests, may occur. The SES initiative is not just a technical or administrative matter but also a complex process with strong rhetorical and political dimensions. Conflicts of interest and rhetorical battles among actors significantly influenced the implementation and timing of SES. It is anticipated that such dynamics could lead to similar strategic conflicts within ESSI.<sup>140</sup>

Politically, a significant issue is leadership. We can say that Germany's leadership has emerged supported by the idea of coordinating efforts to develop joint capabilities through systems like the Framework Nations Concept (FNC) in European defense cooperation. The FNC model was considered a potential game-changer in European defense cooperation, spearheaded by Germany.<sup>141</sup> Additionally, Germany's leadership role, especially in light of the Ukraine crisis, was supported by growing expectations that Germany should assume a leadership role in European foreign policy.<sup>142</sup> Following the outbreak of the Ukraine-Russia War and during the establishment phase of ESSI as mentioned above, Germany took on this leadership role. However, ESSI, under Germany's leadership, is also the focus of criticism. There is a perception that Germany's leadership does not

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140 Pertti Alasuutari, et al. Shattering the Single European Sky: Argument from authorities in dealing with the SES initiative. (*European Journal of Cultural and Political Sociology*, 2019), pp. 68-94.

141 Robin Allers, Framework Nation: Can Germany Lead on Security? (*International Affairs*, 2016), pp.1167-1187.

142 Aggestam, L., & Hyde-Price, A.). Learning to lead? Germany and the leadership paradox in EU foreign policy. (*German politics* , 2020), pp.8-24.

adequately consider Europe's security interests and has failed to convince its partners.<sup>143</sup>

This fact, strongly defended by France, is one of the elements that show the fragility of German leadership. The presence of multinational companies such as Thales and MBDA highlights the consortium structure established in Europe to assume this role. Germany holds only a minor share through MBDA-Germany, while the consortium's center of gravity lies in France. This raises the question of whether leadership should remain with Germany, the originator of the idea, or shift to France, which possesses a stronger production infrastructure within the partnership. However, France's critical stance toward ESSI and its non-membership indicate that there is no leadership rivalry between the two nations within the context of ESSI. Nonetheless, Germany's leadership aspirations may face challenges due to France's larger shares in the companies involved. Particularly, Thales, as the producer of sensors and command-and-control systems, could play a decisive role in the defense network architecture, sparking debates around work-share and cost-share dynamics, which could become significant points of contention. On the other hand, how the leading country will influence the decisionmaking process, the inclusion of members in decisionmaking, and the implementation phase also pose challenges for leadership. These problems are controversial not only for Germany but for any leading country.

Consequently, alongside leadership, the management of ESSI generally involves problems. Leadership and management raise the following questions: Will there be command and control centers, and if so, in which countries or locations will they be situated? Will there be headquarters and joint bases, and how will their management and command be handled? The participation of members in the joint decisionmaking mechanism and the system that will be established for the relevant ministries and armies of the countries have not been fully determined, both for the Initiative and on a national level for all members. In conclusion, Ger-

143 Aja Melville, "Germany Forges Path to Leadership Through the European Sky Shield Initiative," *Defense and Security Monitor - DSM.forecastinternational.com*, January 19 2024, <https://dsm.forecastinternational.com/2024/01/19/germany-forges-path-to-leadership-through-the-european-sky-shield-initiative/>, (Accessed: April 13, 2024).

many's leadership role within ESSI, along with its challenges, also presents opportunities for Germany and is ultimately a matter of debate.<sup>144</sup>

## **The Diversity of System Requirements, Integration, and the Inability to Meet Needs Through Intra-European Supply**

The variability and integration of system requirements are fundamentally identified with strategic criticisms. It is essential for many ESSI members that the systems to be procured are not only compatible with the countries' inventories but also compliant with NATO standards. Technically, NATO's air defense communication and linkage systems have a highly complex and integrated structure. These systems can share information with many platforms and also receive information from them.<sup>145</sup> NATO's air defense system uses a communication link called Link 16. Link 16 connects various air defense assets with naval and land-based platforms, creating a Joint Operational Picture (JOP) in the national airspace.<sup>146</sup> Therefore, procuring products that are and are not NATO standards can lead to integration issues within the country's systems, as well as general integration issues within ESSI. If we evaluate the system as a whole at a more general level over NATO, its Air and Missile Defense Command and Control System (AMDC2) provides the technology to effectively plan, execute, and monitor all NATO air operations in Europe. This system ensures the continuous availability of NATO's and national battle management, command, control, communications, and intelligence (BMC3I) systems. Whether the integration of systems to be procured by NATO member states is feasible remains a question. Moreover, there are currently no answers to whether ESSI will establish a network with a common architecture and structure similar to NATO or PESCO, or whether NATO or PESCO will provide information transfer to ESSI.

<sup>144</sup> Sven Arnold & Torben Arnold, "Germany's fragile leadership role in European air defence: The need for adjustments at all levels of the European Sky Shield Initiative". (SWP Comment 6 February 2023), pp.1-8.

<sup>145</sup> "Air and Missile Defence Command and Control," *NATO Communications and Information Agency*, <https://www.ncia.nato.int/what-we-do/air-missile-defence.html>, (Accessed: April 16, 2024).

<sup>146</sup> "Link 16 U.S. Command and Control, Missile Defense," *Missile Defense Advocacy*, January 2017, <https://missiledefenseadvocacy.org/defense-systems/link-16/>, (Accessed: April 15, 2024).

Another significant criticism concerns the investment outside of the European Defense Industry and the preference for sourcing within Europe. Criticisms are made that choosing systems like the mentioned SAMP/T, not only impacts economically but also harms efforts to enhance Europe's defense technology capacity. Macron has often voiced his criticisms in this context. He is a strong advocate for Europe to develop its own defense capabilities, reduce its dependence on external powers, particularly the U.S., and gain strategic autonomy.<sup>147</sup>

In this context, he seriously supports the creation of a common European intervention force and a joint defense budget, thereby directly enhancing the EU's operational capabilities. Macron wants Europe to play a more independent and decisive role in global issues once it achieves these gains. He desires Europe to be in a position to influence world issues independently of the influence of major powers and to engage in diplomatic and military actions.<sup>148</sup> He believes that this is through strengthening the European Defense Industry and economy. This is one of the harshest points of France's criticism of ESSI.<sup>149</sup>

At the national level, interests cannot be denied. In terms of sourcing within Europe, German IRIS-T systems are preferred over the French-Italian SAMP/T system. Thus, ESSI also has negative impacts in terms of the individual interests of France and Italy.

## High Costs and Economic Challenges

ESSI, as it includes technically complex and costly defense systems, some countries face difficulties in covering the high costs of the project. There is no agreement on cost sharing among member countries. There is no provision for joint use of the systems to be supplied, nor are there plans for sending them to countries that may need them or installing them at designated

<sup>147</sup> Jamil Anderlini and Clea Caulcutt, "Europe Must Resist Pressure to Become 'America's Followers,' Says Macron," *Politico EU*, April 9, 2023

<sup>148</sup> Lucia Schulten, "Is the French President's Vision for Europe Realistic?" *Deutsche Welle*, April 13, 2023

<sup>149</sup> Vivienne Machi, "Macron Petitions Europe to Support Its Own Defense Industry Amid New 'War Economy'," *Defense News*, June 13 2022, <https://www.defensenews.com/digital-show-dailies/euro-satory/2022/06/13/macron-petitions-europe-to-support-its-own-defense-industry-amid-new-war-economy/>, (Accessed: April 16, 2024).



base points. Therefore, each country will proceed with procurement based on its own needs. However, the defense budgets of these countries, or specifically the budgets allocated for air defense systems within those expenditures, may not be sufficient. The efforts to harmonize and modernize the technological infrastructures of member countries also require significant budgets. Beyond acquiring the systems, technological integration and compatibility, especially when merging systems from different countries, lead to substantial costs. A similar situation was observed in the Single European Sky (SES) initiative.<sup>150</sup> Furthermore, IRIS-T and SAMP/T can be added to the criticisms as an inter-country competition and economic challenge. Thus, infrastructure, modernization, and integration are the main challenges and can cause tension and criticism, contributing to internal European competition that directly affects the performance of ESSI.

## Technical and System Constraints

Technical and systemic constraints can be considered under two items: Potential technical shortcomings in current or planned/future capacity and the general technical constraints of air defense systems. In the first section, evaluating the existing systems of the ESSI member countries and the procurement processes carried out so far, it can be said that there will still be deficiencies in establishing full-capacity air defense architectures and that it can be realized in the longer term. Moreover, there are problems in establishing a multi-layered defense system. To achieve this, the integration of different systems designed to neutralize threats at various ranges and altitudes is necessary. Therefore, an integrated wide air defense system network is required. Of course, countries evaluate and prepare this with comprehensive plans according to their threat perception and budgets.

Among the technical deficiencies, the most important component of the air defense system, the munitions, is included. Even when a full-capacity, multi-layered defense network is established, a vulnerability due to a shortage of munitions can be observed. Ukraine has experienced a serious ammunition shortage for its air defense systems, significantly affecting its capacity

150 Kenneth Button & Rui Neiva, *Single European Sky and the functional airspace blocks: Will they improve economic efficiency?* (Journal of Air Transport Management, 2013), pp.73-80.

to continue military operations. The existing systems cannot be operated at full capacity and effectively due to a lack of ammunition. Stoltenberg mentioned in February 2023 that the supply of necessary ammunition to Ukraine could take up to 28 months.<sup>151</sup> It has also been seen that the countries supplying ammunition to Ukraine have been experiencing difficulties in this regard.<sup>152</sup> Similarly, after the Oct. 7, 2023, Israel-Hamas conflict, some missiles launched by Hamas at Tel Aviv were not intercepted by the Iron Dome system.<sup>153</sup> This is thought to be due to a shortage of munitions. Israel, especially during high-intensity conflict periods, struggles to provide sufficient munitions for the Iron Dome system. Studies on Israel's ongoing ammunition supply strategies are also known. The Iron Dome, which has shown a success rate of up to 96% in some attacks, demonstrated a 44% success rate in a missile attack by Hamas in April 2023. Therefore, performance can vary depending on various factors.<sup>154</sup>

Air defense systems have technical limitations. Advanced systems are designed to stop high-altitude ballistic missile threats and are quite effective under certain conditions. However, no air defense system can guarantee 100% effectiveness because advanced or numerous missile attacks can exceed the capacities of the systems. Additionally, radar resolutions and designs can bring some limitations. Modern air defense systems typically possess advanced radar and sensor technologies to detect and track high-speed, low-flying cruise missiles and UAVs that can evade radars. However, the "Size, Flight Altitude, and Cruise Routes" of cruise missiles and UAVs can lead to various challenges and detection issues. Attack plans prepared with comprehensive technical and electronic intelligence activities pose a challenge for air defense systems.

151 Joe Gould, "Weapons Shortages Spark Tough Choices for Ukraine's Allies," *Defense News*, November 22 2022, <https://www.defensenews.com/pentagon/2022/11/21/weapons-shortages-spark-tough-choices-for-ukraines-allies/>, (Accessed: April 16, 2024).

152 Tom Kington, "Too Little, Too Late? Ukraine's Backers Lose Ground in the Ammo Race," *Defense News*, February 2023, <https://www.defensenews.com/global/europe/2024/02/23/too-little-too-late-ukraines-backers-lose-ground-in-the-ammo-race/>, (Accessed: April 16, 2024).

153 Iain Boyd, "Iron Dome's Vulnerability: How Hamas Pierced Israel's Prized Air Defense Shield," *Sci Tech Daily*, October 24, 2023, <https://scitechdaily.com/iron-domes-vulnerability-how-hamas-pierced-israels-prized-air-defense-shield/>, (Accessed: April 16, 2024); "Army Reportedly Looking Into Why Iron Dome Missing Missiles," *Time of Israel.com*, May 2 2023, [https://www.timesofisrael.com/liveblog\\_entry/army-reportedly-looking-into-why-iron-dome-missing-missiles/](https://www.timesofisrael.com/liveblog_entry/army-reportedly-looking-into-why-iron-dome-missing-missiles/), (Accessed: April 16, 2024).

154 "Iron Dome is Facing Its Greatest Test in War with Hamas," *Time of Israel.com*, October 24 2023, <https://www.timesofisrael.com/iron-dome-is-facing-its-greatest-test-in-war-with-hamas/>, (Accessed: April 16, 2024).

Another challenge that air defense systems face in detecting missiles is the use of systems equipped with stealth technology. Stealth employs advanced technologies to evade enemy radars and sensors.<sup>155</sup> Stealth aircraft can challenge the capacities of GBAD and missile interception systems by making launches from more limited distances within specific flight plans, potentially remaining undetected by the target country's radar systems. For instance, Russia's first fifth-generation multirole fighter, the Sukhoi Su-57, is equipped with stealth technology.<sup>156</sup> Similarly, there are missiles designed with stealth technology.<sup>157</sup> They are covered with materials that have a low radar signature and are shaped to scatter radar waves. Stealth missiles are planned to bypass enemy air defense systems and directly attack high-value targets. One of the objectives can also be to strike directly at an air defense system, making the target more vulnerable to missile attacks. Such missiles typically possess precise striking capabilities and are especially used against strategic targets. However, while they do not guarantee perfect invisibility, they can be detected with advanced countermeasures.

Another challenge for air defense systems is "vulnerabilities to electronic warfare (EW) and jamming techniques." Modern electronic warfare techniques can disrupt or deceive the radars and sensors of air defense systems.<sup>158</sup> This can prevent the systems from accurately detecting and tracking threats. Successful jamming of radar seekers can reduce the missile weapon system's hit rate or completely disrupt its control. New-generation electronic warfare methods include smart jamming, cognitive techniques, and quantum electronic warfare methods.<sup>159</sup> For example, physical layer security threats have evolved beyond traditional jammers into smart jammers. Smart jammers, due to their covert nature, can leave wireless communication systems

155 Arvind Gangoli Rao & Shripad P. Mahulikar. *Integrated review of stealth technology and its role in airpower*. (The aeronautical journal, 2002), pp. 629-642.

156 "Первый серийный истребитель Су-57 поступил в авиаполк Южного военного округа," *TASS Russian News Agency*, December 25, 2020, <https://tass.ru/armiya-i-opk/10352497>. (Accessed April 16, 2024)

157 "JASSM / JASSM ER," *Missile Threat, CSIS*, July 30 2021, <https://missilethreat.csis.org/missile/jassm/>, (Accessed: April 16, 2024).

158 David Adamy, *EW 102: A Second Course in Electronic Warfare* (Artech House, 2004).

159 Fei Cao, et al., "Single-Pulse System of Radar Anti-Aimed Jamming Performance," (*Applied Mechanics and Materials*, 2013), pp. 576-579

vulnerable and easily deceive a detection system.<sup>160</sup> The integration of electronic warfare with the cyber realm has also increased cybersecurity risks for communication system infrastructures. Air defense systems rely on complex network-connected technologies. Particularly, insufficient protection against cyberattacks targeting vulnerabilities in network and communication components can lead to the manipulation of critical systems.<sup>161</sup>

In conclusion, there needs to be an integrated system and sufficient ammunition capacity. Additionally, air defense systems must be supported by force multiplier technologies such as electronic warfare and signal intelligence, and countermeasures must be implemented. Cybersecurity infrastructures also need to be robust. Therefore, a holistic structure is necessary to establish a strong network of systems.

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160 Awais Yousaf, et al., “Physical-Layer Intrusion Detection System for Smart Jamming Attacks,” (*Transactions on Emerging Telecommunications Technologies*, 2017).

161 Don Snyder, et al., *Improving the Cybersecurity of US Air Force Military Systems Throughout Their Life Cycles*, (RAND, 2015).



# TÜRKİYE'S AIR DEFENSE CAPABILITY, POSSIBLE CONTRIBUTIONS TO ESSI, AND CHALLENGES AND CRITICISMS FOR TÜRKİYE

## Acquisition and Capacity of Türkiye's Air Defense Systems

Although the procurement and new product development process of Türkiye's air defense systems has gained momentum over the last 15 years, it has a history that dates back to the Cold War and the dissolution of the Soviet Union. Türkiye, which shared a border with the Soviet Union, was in a critical geographical position for NATO's defense planning in Europe, both for emergency planning and early warning and precautions. Therefore, various levels of radar and NATO's integrated systems were present in Türkiye. The dissolution of the Soviet

Union led to the emergence of different threat groups for Türkiye. Particularly, the spread of missiles such as the R-11 and R-17, developed by the Soviet Union and known in NATO nomenclature as Scud missiles, which generally have short and medium-range versions, to Türkiye's regional neighbors has resulted in emerging threats. It is known that various countries have acquired Scud missiles.<sup>162</sup> However, during this period, Türkiye's security relations with NATO and the U.S. remained positive. The U.S. was focused on the threat from Iraq in the region. Similarly, Israel was openly perceiving Iraq as a threat. In 1991, during Operation Desert Storm, the U.S. conducted a major air attack on Iraq.<sup>163</sup> In the operation, Iraq's air defense systems, communication networks, weapon factories, oil refineries, and other strategic targets were intensely bombed using highly-tech weapons. Among them were stealth bombers, cruise missiles, and laser-guided "smart" bombs.

To enhance its air defense capabilities against threats, Türkiye requested the deployment of Patriot missiles from NATO. However, NATO was slow in delivering the Patriot batteries to Türkiye.<sup>164</sup> Türkiye warned its citizens about the possibility of a chemical attack. Residents in the southeast of the country taped their windows and doors with duct tape to protect themselves from a potential chemical attack from Iraq.<sup>165</sup> At the same time, the impact of a Scud missile launched from Iraq landing on an empty plot in Diyarbakır highlighted the importance of Türkiye having its own air defense system. Initially, to address this issue, Türkiye started negotiations with Israel. In 1996, Türkiye signed a mutual military cooperation agreement with Israel.<sup>166</sup> In 1997, Israel and Türkiye began negotiations for the sale of Israel's

162 Center for Strategic and International Studies (CSIS), "Scud," *Missile Threat*, <https://missilethreat.csis.org/missile/scud/>, (Accessed: April 17, 2025). "Iran's Missile Program: Past and Present," *Iran Watch.org*, June 29 2020, <https://www.iranwatch.org/our-publications/weapon-program-background-report/history-irans-ballistic-missile-program>, (Accessed: April 17, 2024).

163 "OPERATION DESERT STORM: 17 JANUARY to 28 FEBRUARY 1991," *U.S. Army Center of Military History*, <https://history.army.mil/html/bookshelves/resmat/desert-storm/index.html>, (Accessed: April 17, 2024).

164 "Türkiye ve Füze Savunması," *Ekonomi ve Dış Politika Araştırmaları Merkezi*, November 2012, <https://edam.org.tr/wp-content/uploads/2012/05/T%C3%BCrkiye-ve-F%C3%BCze-Savunmas%C4%B1.pdf>, (Accessed: April 17, 2024).

165 Nicole and Hugh Pope, *Turkey Unveiled: A History of Modern Turkey* (Woodstock: Overlook Press, 2000).

166 "Türkiye & İsrail Savunma İş Birliği Anlaşması (1996)," *Mavivatan.net*, November 3 2022, <https://mavivatan.net/turkiye-israil-savunma-is-birligi-anlasmasi-1996/>, (Accessed: April 17, 2024).

Arrow II GBAD and Green Pine radar system.<sup>167</sup> The primary reason for choosing the Arrow II system was its development against Scud missiles and Iran's Shahab missiles, which are derived from the Scud. However, this sale, which could only occur with U.S. approval, initially faced restrictions from the U.S. The efforts resumed in 2001 when the administration of George W. Bush redefined missile defense as a strategic priority and the U.S. lifted the restrictions. Together with Israel, Türkiye began developing a ballistic missile defense system (BMDS) targeted at protecting Türkiye. Initially, the plan involved setting up an early warning radar system, followed by the potential placement of either Patriot or Arrow missile systems in Türkiye. However, two significant events in 2001, the economic crisis in Türkiye and the Sept. 11 attacks, slowed down the development process of Türkiye's missile defense systems. Due to economic issues, the purchase of expensive weapon systems was postponed.

With the resolution of the crisis, Türkiye began negotiations with the U.S. to meet its air and missile defense system (Air Defense System-ADS) needs, which continued intermittently until 2006. On June 30, 2006, the Defense Industry Executive Committee decided on the 'T-LORAMIDS' project. T-LORAMIDS, "Türkiye Long Range Air and Missile Defense System project," is a defense initiative launched to enhance Türkiye's own air and missile defense capabilities. This project is designed to modernize Türkiye's air defense systems and create a strategic defense infrastructure. The T-LORAMIDS project involves a bidding process with various international defense technology firms aimed at providing Türkiye with long-range missile defense systems. During the bidding process, major defense companies like the Raytheon/Lockheed Martin consortium from America, Rosoboronexport from Russia, Eurosam from Italy & France, and CPMIEC from China have made serious offers.<sup>168</sup> This process represents a strategic step toward enhancing Türkiye's long-range missile defense capabilities and is considered part of a broader effort to modernize Türkiye's defense infrastructure and meet its strategic defense needs.

167Arieh O'Sullivan, "Defense Ties with Turkey Bolstered," *The Jerusalem Post*, December 9, 1997.

168 "The First Decisions of Turkish Defence Industry Executive Committee of 2013 Were Announced," *Defence Turkey*, January 6 2013, <https://www.defenceturkey.com/en/content/the-first-decisions-of-turkish-defence-industry-executive-committee-of-2013-were-announced-882>, (Accessed: April 17, 2024).



During the T-LORAMIDS bidding process, the American companies Raytheon and Lockheed Martin consortium offered the Patriot air defense systems, the Russian company Rosoboronexport offered the S-300 systems, the Italian & French company Eurosam offered the SAMP/T Aster 30, and the Chinese company CPMIEC offered the FD-2000 (the export version of HQ-9).<sup>169</sup> This bidding involved detailed evaluations of technical specifications, strategic compatibility, and cost-effectiveness, and was accompanied by extensive discussions. Türkiye's need for compatibility with NATO added further complexity to the process. During the bidding, opportunities for technology transfer and costs for each system were evaluated, while the compatibility of the systems with NATO standards and their integration capabilities with this major defense alliance was particularly highlighted.

In parallel with these developments, Türkiye has supported the missile defense alliance efforts of NATO and America. In 2010, with the votes of Türkiye and other NATO members, the establishment of a missile defense system in Europe was approved.<sup>170</sup> However, during this period, unlike NATO, Türkiye did not perceive Iran and Syria as threats to itself. This was clearly seen in June 2010, when Türkiye voted "No" on a U.N. Security Council resolution that proposed new and stricter sanctions against Iran.<sup>171</sup> The reasons for this include not only the agreements made between Türkiye, Brazil, and Iran but also Türkiye's belief that marginalizing the Iranian administration was pushing Tehran to accelerate its nuclear weapons and missile programs.<sup>172</sup> Simultaneously, as part of the NATO missile shield program, the AN/TPY-2 radar, a powerful radar system, was installed at the Malatya Kürecik base, transforming it into a radar base.<sup>173</sup>

169 "Turkey Could Adopt Chinese Air Defense Missile System HQ-9 FD-2000 for T-Loramids Program 2606133," *Army Recognition*, June 26, 2013, <https://www.armyrecognition.com/news/army-news/army-news-2013/turkey-26-june-2013-news-uk>, (Accessed: April 17, 2024).

170 "Fact Sheet: Implementing Missile Defense in Europe," *The American Presidency Project*, September 15 2011, <https://www.presidency.ucsb.edu/documents/fact-sheet-implementing-missile-defense-europe>, (Accessed: April 17, 2024).

171 "Türkiye ve Brezilya İran'a Yaptırımı 'Hayır' Dedi," *Yeni Şafak*, June 9 2010.

172 Julian Borger, "Text of the Iran-Brazil-Turkey Deal," *The Guardian*, May 17 2010.

173 "Malatya Radar System to Be Commanded from Ramstein," *Hürriyet Daily News*, (February 5, 2012), <https://www.hurriyetdailynews.com/malatya-radar-system-to-be-commanded-from-ramstein---13013>, (Accessed: April 17, 2024).

As developments continued, the Syrian civil war began in 2011. In 2012, the tension spread to Türkiye. On June 22, 2012, Syria shot down a Turkish Air Force RF-4E Phantom aircraft without any prior warning.<sup>174</sup> Also, in 2012, the first civilian casualty occurred in Türkiye due to the Syrian civil war.

Türkiye requested an air defense system from NATO and called for the application of NATO's Article 5.<sup>175</sup> As a result of these events, in January 2013, five different countries temporarily sent Patriot and SAMP-T systems to Türkiye. Evaluating these developments, Türkiye once again realized the urgency of its need for an air defense system.<sup>176</sup>

While the bidding process continued in 2013, Türkiye applied to its ally, the U.S., to purchase Patriot missiles. In its application, Türkiye expressed its desire to buy "technology transfer" and the software related to installation and operation. Türkiye's request to purchase Patriot missiles with technology transfer was rejected by the U.S. Congress. However, Lockheed Martin and Raytheon companies continued their involvement in the T-LORAMIDS process.

During the T-LORAMIDS bidding process, the scoring to select the highest quality system at the least cost was determined at the Defense Industry Executive Committee meeting on Sept. 26, 2013. The Chinese company CPMIEC, which ranked first in the scoring, was chosen to start contract negotiations for the joint production of the systems and missiles in Türkiye.<sup>177</sup> Following this development, the U.S.-owned Patriot systems deployed at the Syrian border in Türkiye were withdrawn.<sup>178</sup> The agreement with CPMIEC was canceled in November 2015 after approximately two years of negotiations, due to reasons including the lack of response to Türkiye's request for technology transfer. In 2016, negotiations began with Eurosam for the SAMP/T system.<sup>179</sup>

174 "Suriye Türk Savaş Uçağını Düşürdü," *Milliyet*, June 23, 2012.

175 "NATO 'Stands' With Turkey But Does Not Invoke Article 5," *Radio Free Europe Radio Liberty*, June 26, 2012, <https://www.rferl.org/a/turkey-syria-nato/24625900.html>, (Accessed: April 17, 2024).

176 "S-400: Türkiye'nin Rusya'dan Satın Aldığı, ABD'yle Krize Yol Açan Füze Savunma Sistemi," *BBC*, September 27, 2021.

177 "Dev İhale Çin'in," *TRT Haber*, September 26, 2013.

178 "U.S. to Withdraw Patriot Missile System From Turkey," *Radio Free Europe Radio Liberty*, August 16, 2015, <https://www.rferl.org/a/turkey-patriot-missiles-withdrawal/27191917.html>, (Accessed: April 17, 2024).

179 "Çin Füzesi İptal," *Yeni Şafak*, November 16, 2015.

After the coup attempt in Türkiye on July 15, 2016, there were rapprochements between Russia and Türkiye. On Aug. 9, 2016, Russian President Vladimir Putin and Turkish President Recep Tayyip Erdoğan held a meeting.<sup>180</sup> During this meeting, Erdoğan announced that negotiations had started for the Russian Air Defense System S-400. This development further heightened tensions between Türkiye and the U.S. The inclusion of a Russian air defense system by a NATO member state into systems that are NATO-compliant and integrated sparked significant debates. In December 2017, Türkiye announced that it had signed a contract with Russia for the purchase of four S-400 batteries. Sergey Chemezov, the CEO of the Russian Defense Industry Company Rostech, stated in an interview with *Kommerstant Newspaper* that Türkiye paid \$2.5 billion.<sup>181</sup>

While Türkiye faced intense criticism for its decision to purchase the Russian air defense system, the U.S. State Department approved the purchase of a Patriot system estimated at \$3.5 billion.<sup>182</sup> However, tensions escalated further as Türkiye had already made payments for the S-400s and did not cancel the deal. These developments, which led to various issues for Türkiye, the first NATO country to purchase the S-400 missile defense systems, also contributed to Türkiye being removed from the F-35 fighter jet program. In October 2020, Türkiye conducted tests of the S-400 air defense systems in Sinop. Ultimately, after many developments and discussions, Türkiye acquired the S-400 Air Defense System for medium to long range.<sup>183</sup>

The perception of a serious missile threat among many ESSI member countries began with the annexation of Crimea and especially escalated with Russia's attacks on Ukraine in 2022. However, as described earlier, the situation for Türkiye has been different. Türkiye has been aware of its need for an air defense system since the late 1990s, and thus the developments have unfolded somewhat differently compared to other ESSI member countries.

180 Tom Karako, "Coup-proofing? Making Sense of Turkey's S-400 Decision," *CSIS*, July 15 2019, <https://www.csis.org/analysis/coup-proofing-making-sense-turkeys-s-400-decision>, (Accessed: April 17, 2024).

181 Hande Fırat, "Turkey, Russia to Ink \$2.5 Billion Anti-Missile Loan Deal," *Hurriyet Daily News*, December 29, 2017).

182 "ABD'den Türkiye'ye Patriot Satışına Onay," *Anadolu Ajansı*, November 16, 2015.

Aaron Mehta, "Turkey Cleared by US for \$3.5 Billion Patriot Missile Deal, Despite S-400 Row," *Defense News*, December 19, 2018, <https://www.defensenews.com/global/europe/2018/12/19/turkey-cleared-by-us-for-35-billion-patriot-missile-deal-despite-s-400-row/>, (Accessed: April 17, 2024).

183 "Türkiye S-400 Denemelerine Sinop Açıklarında Başladı | Reuters," *Euronews TR*, October 16, 2020.

This process has also caused several crises, as mentioned. Nevertheless, Türkiye has made significant advancements in this area. In 1988, under a license obtained from the U.S. government, Türkiye became the largest participant, with a 40.5% share, in the Stinger European Joint Production Program. Within the scope of this program, over 4,800 Stinger missiles have been supplied initially for the Turkish Armed Forces (TSK).<sup>184</sup> The launch and flight engines of these Stinger missiles were produced at ROKETSAN facilities in Türkiye. This program has significantly contributed to the development of the Turkish defense industry and greatly enhanced Türkiye's air defense capabilities. In 2013, the Sungur/PorSav (Portable Defense), a very low-altitude air defense system, was developed under the auspices of the Presidency of Defense Industries (SSB) in collaboration with ROKETSAN.<sup>185</sup> The Sungur system is planned to replace the aging Stingers and to strengthen and expand the system infrastructure. The Sungur system, which entered the inventory in 2022, has more advanced features in terms of altitude, range, and guidance compared to the FIM-92 Stinger.<sup>186</sup> Sungur is also being integrated on various land, air and naval platforms for extended concepts of operation Türkiye's inventory also includes Russian-made MANPADS: the SA-18 Grouse IGLA 9K38, and the Igla-S.<sup>187</sup>

Türkiye has developed various solutions for short and very short-range air defense systems. The first national air defense system of Türkiye, the Kaideye Monteli Stinger (KMS), was initiated in 1989 by ASELSAN to meet specific needs. After feasibility and Research and Development (R&D) efforts, it entered mass production in 2001. KMS is built on two main platforms called ATILGAN and ZIPKIN. The ATILGAN air defense system features the Stinger missile system mounted on the armored/

184 "Turkey & Stinger MANPADS Missile Procurement," *Defence Turkey*, November 2020, <https://www.defenceturkey.com/en/content/turkey-stinger-manpads-missile-procurement-4253>, (Accessed: April 17, 2024).

185 "SUNGUR Alçak İrtifa Hava Savunma Sistemi," *Millisavunma.com*, July 2 2020, <https://www.millisavunma.com/sungur-alcak-irtifa-hava-savunma-sistemi/>, (Accessed: April 17, 2024).

186 "SUNGUR Hava Savunma Füzesi Envanter Girdi," *Savunma SanayiST*, (July 24, 2022), retrieved April 17, 2024, from <https://www.savunmasanayist.com/sungur-hava-savunma-fuzesi-envanter-girdi/>, (Accessed: April 17, 2024).; "5'inci Nesil Portatif Hava Savunma Sistemi SUNGUR'un İlk Kafilesi KKK'na Teslim Edildi!" *Defence Turkey*, July 25 2022, <https://www.defenceturkey.com/tr/icerik/5-inci-nesil-portatif-hava-savunma-sistemi-sungur-un-ilk-kafilesi-kkk-na-teslim-edildi-5169>, (Accessed: April 17, 2024).

187 "SA-18 Igla 9K38 Man-Portable Air Defence Missile System," *Army Recognition*, March 20 2024, [https://armyrecognition.com/russia\\_russian\\_army\\_light\\_heavy\\_weapons\\_uk/sa-18\\_grouse\\_9k38\\_igla\\_man-portable\\_missile\\_technical\\_fact\\_sheet.html](https://armyrecognition.com/russia_russian_army_light_heavy_weapons_uk/sa-18_grouse_9k38_igla_man-portable_missile_technical_fact_sheet.html), (Accessed: April 18, 2024).

tracked M113A2 vehicle as the carrier platform. The other configuration, the ZIPKIN System, has been developed to protect the fixed installations and units of the army, navy, and air force. Both systems can effectively defend against fixed-wing aircraft, helicopters, UAVs, and cruise missiles up to a range of 8 kilometers.<sup>188</sup>

The KMS systems operate integrated with the National IFF (Identification Friend or Foe) Mod-5 systems, significantly enhancing the air defense capability of the Turkish Armed Forces (TSK). To date, more than 150 KMS systems have been delivered to the (TSK).<sup>189</sup> KMS has also won various tenders. In 2005, it outbid two German companies in a tender opened by the Netherlands and supplied to the Dutch army.<sup>190</sup>

ASELSAN developed the ASELSAN NSPA Stinger Launch System to meet the needs of the NATO Procurement and Supply Agency (NSPA). This system includes two STINGER Missiles (Basic, RMP, Block-1) and is suitable for integration with highly mobile land vehicles in the inventory.<sup>191</sup> The NSPA SFS system was purchased by Greece and its acceptance tests were completed in 2019.<sup>192</sup>

The IGLA and IGLA-S missiles are equipped with a launch system. The IGLA FFS can operate autonomously or integrate with allied Air Defense Command and Control Systems. Missile launch systems have endowed MANPADS with various capabilities.<sup>193</sup> MANPADS offer short reaction times, higher firepower, the ability to fire while moving, and high accuracy. Additionally, their ability to integrate with other systems, thermal and day-time vision cameras, automatic alignment to target coordinates assigned by the Command Control Center, Laser Range Finder, and Friend/Foe identification capability have transformed MANPADS into a comprehensive

188 "Atılğan ve Zıpkın Hava Savunma Sistemi," *Millisavunma.com*, March 17 2017, <https://www.millisavunma.com/atilgan-ve-zipkin-hava-savunma-sistemi/>, (Accessed: April 18, 2024).

189 "Milli IFF Mod-5 Sistemleri KMS Platformlarında," *Savunma SanayiST*, August 4 2020, <https://www.savunmasanayist.com/milli-iff-mod-5-sistemleri-kms-platformlarinda/>, (Accessed: April 18, 2024).

190 "ASELSAN'dan Hollanda'ya 100 Milyon Dolarlık Füze," *Bigpara Hürriyet*, July 16, 2005.

191 "NSPA," *ASELSAN*, <https://www.ASELSAN.com/tr/savunma/urun/136/nspa>, (Accessed: May 25, 2024).

192 Anıl Şahin, "ASELSAN'dan Yunanistan'da Stinger Başarısı," *Savunma SanayiST*, October 1 2019, <https://www.savunmasanayist.com/ASELSANdan-yunanistanda-stinger-basarisi/>, (Accessed: April 18, 2024).

193 "IGLA," *ASELSAN*, <https://www.ASELSAN.com/tr/savunma/urun/135/igla>, (Accessed: April 18, 2024).

air defense system for very short and short ranges. At short and very short ranges, Türkiye employs various air and missile defense systems including the Korkut SSA, Korkut KKA, 35 mm Modernized Armored Cannon, and Air and Missile Artillery systems.

Developed by ASELSAN and ROKETSAN in 2007, the HİSAR Project is a significant low and medium-altitude air defense system in Türkiye's inventory, with two main variants: HİSAR-A and HİSAR-O.<sup>194</sup>

HİSAR-A is designed for low-altitude air defense needs. It is a short-range system that can be integrated into mobile platforms and has a tracking range of 25 kilometers and an interception range of 15 kilometers. The system is tasked with providing air defense for armored, mechanized, and mobile units, featuring quick reaction times, the capability to operate in challenging terrains, and rapid repositioning abilities.<sup>195</sup>

HİSAR-O is a medium-altitude air defense system that offers a broader scope of protection against threats and is effective in defending larger and more strategic areas. It has a tracking range of 60 kilometers and an interception range of 25 kilometers.<sup>196</sup>

In 2011, ASELSAN and ROKETSAN were designated as the main contractors for the T-MALADMIS (Turkish Medium Altitude Air Defense Missile System) and T-LALADMIS (Turkish Low Altitude Air Defense Missile System) project, with TÜBİTAK-SAGE (Scientific and Technological Research Council of Türkiye- Defense Industry Research and Development Institute) and Meteksan Defense as subcontractors.<sup>197</sup> The HİSAR project was further developed under this contract. Both systems are equipped with 360-degree rotating launchers, modern radar and electro-optical sensors, a command and control (C2) center, and IFF systems. The HİSAR systems also possess proprietary software capable of responding automatically or manually to various air threats. As

194 "HİSAR Savunma Sistemi Nedir, Özellikleri Neler? HİSAR Hava Savunma Sistemi'nin Menzili Ne Kadar?" *Milliyet*, March 3, 2020.

195 "HİSAR A+," ASELSAN, <https://www.ASELSAN.com/tr/savunma/urun/134/HISAR-a>, (Accessed: April 19, 2024).

196 "HİSAR O+," ASELSAN, <https://www.ASELSAN.com/tr/savunma/urun/133/HISAR-o>, (Accessed: April 19, 2024).

197 Merve Seren, *Türkiye'nin Füzeye Savunma Sistemi: İhale Süreci, Temel Dinamikler ve Aktörler*, SETA, İstanbul, 2015.

of July 2021, all components of the HİSAR A+ System have been delivered to the Turkish Armed Forces.<sup>198</sup> The HİSAR O+ was fully delivered in 2022.<sup>199</sup>

Türkiye is well positioned in terms of both domestically produced and purchased air defense systems at very short, short, and medium ranges. In addition to possessing medium-long range systems like HİSAR O, and S-400, Türkiye continues to work on both procurement through purchase and development of its own capabilities.

Negotiations for the SAMP/T system, which began in 2016, continued intermittently. In 2022, President Erdoğan announced at the G-20 Summit a positive discussion about the SAMP-T air defense systems with the Italian prime minister.<sup>200</sup> In 2023, the former head of the Turkish Defense Industry, İsmail Demir, said: “The positive atmosphere at the higher levels has not turned into action at the companies. If they approach us positively, we will discuss the matter. Our focus is currently on developing our own products.” However, negotiations for SAMP/T did not continue.<sup>201</sup> The future of an agreement remains uncertain, but based on current developments and statements, it can be inferred that Türkiye may not rely on external procurement in the short term. Türkiye plans to meet its medium long-range air defense system needs with the SİPER system, which is being developed in collaboration between ASELSAN, ROKETSAN, and TÜBİTAK SAGE.<sup>202</sup>

The SİPER project consists of various blocks, each offering different ranges and capabilities. The first block, SİPER Block-1, has successfully conducted test firings and has been confirmed to have a range of over 100 kilometers. SİPER

198 Anıl Şahin, “HİSAR-O+ Tüm Unsurlarıyla Teslim Edildi,” *Savunma SanayiST*, January 29, 2022, <https://www.savunmasanayist.com/HISAR-o-tum-unsurlariyla-teslim-edildi/>, (Accessed: April 19, 2024).

199 Ahmet Alemdar, “HİSAR A+ ve HİSAR O+ Tüm Unsurlarıyla TSK Envanterinde,” *Defence Turk*, January 21 2024, <https://www.defenceturk.net/HISAR-a-ve-HISAR-o-tum-unsurlariyla-tsk-envanterinde>, (Accessed: April 19, 2024).

200 Sertaç Aksan, “İtalya’dan SAMP/T İçin Yeşil Işık; Hava Savunmada Yeni Adres Avrupa Mı?” *TRT Haber*, November 18, 2022.

201 “Türkiye’nin SAMP/T Programında Son Durum,” *Savunma SanayiST*, March 25 2023, <https://www.savunmasanayist.com/turkiyenin-samp-t-programinda-son-durum/>, (Accessed: April 19, 2024).

202 Kadriye Elif Cantürk, “SİPER Hava Savunma Sistemi Hava Kuvvetleri Envanterine Giriyor!” *Defence Turk*, November 23 2023, <https://www.defenceturk.net/siper-hava-savunma-sistemi-hava-kuvvetleri-envanterine-giriyor>, (Accessed: April 19, 2024).

Block-2 has also conducted its initial firing test.<sup>203</sup> Block-2 is expected to have a maximum range of 150 kilometers, and Block-3 is expected to exceed 180 kilometers.<sup>204</sup> In October 2024, Haluk Görgün, the President of the Turkish Defense Industry Agency, announced that the SİPER Block-1 system had entered the inventory.<sup>205</sup> The system stands out with its capability to operate under challenging weather conditions, multi-target engagement, sequential firing abilities, and advanced radar and missile tracking capabilities. It is also equipped with tactical data links and upper command control integration.<sup>206</sup> SİPER holds a significant place in Türkiye's air defense strategy, and its development using domestic and national resources enhances Türkiye's independence in the defense industry.

ASELSAN is developing a cutting-edge system that will feature capabilities specifically designed to address the complexities of each type of multifaceted air threat.<sup>207</sup> This system, named Çelik Kubbe (Steel Dome), previously Gökkuşbu, will ensure the seamless integration and adaptive utilization of various sensors and effectors, enabling it to provide a highly precise and effective defense against both symmetric and asymmetric threats in an optimal and modular manner.<sup>208</sup> The Çelik Kubbe system will include systems such as KORKUT, HİSAR-A+, HİSAR-O+, GÖKDEMİR, GÖKER, GÖKBERK, SUNGUR and SİPER, as well as radars like STR, KALKAN, MAR, and AKR.<sup>209</sup> As part of the air defense architecture, ASELSAN's İHTAR

203 "SİPER BLOK I Füzesi Hedefi Aştı," *Savunma SanayiST*, November 22 2022, <https://www.savunmasanayist.com/siper-blok-i-fuzesi-hedefi-asti/>, (Accessed: April 19, 2024); "SİPER Ürün 2 Füzesinin İlk Atışı Gerçekleştirildi," *Savunma SanayiST*, August 26 2023, <https://www.savunmasanayist.com/siper-urun-2-fuzesinin-ilk-atisi-gerceklestirildi/>, (Accessed: April 19, 2024).

204 Kadriye Elif Cantürk, "SİPER Hava Savunma Sistemi Hava Kuvvetleri Envanterine Giriyor!"

205 Zeynep Cangır, "ROKETSAN Genel Müdürü Murat İKİNCİ: 'SİPER Blok-2 Füzesi 150km Menzile Ulaşacak,'" *Defence Turkey*, June 2 2023, <https://www.defenceturkey.com/tr/icerik/roket-san-genel-muduru-murat-ikinci-siper-blok-2-fuzesi-150km-menzile-ulasacak-5579>, (Accessed: April 19, 2024).; "SİPER Ürün-1 Sistemi Envantere Girdi: Türkiye'nin Hava Savunma Gücüne Güç Katacak," *TSKGV*, October 28, 2024, <https://tskgv.org.tr/savunmasanayiigundem/siper-urun-1-sistemi-envantere-girdi-turkiyenin-hava-savunma-gucune-guc-katacak#>, (Accessed: January 17, 2025).

206 "SİPER," *ASELSAN*, <https://www.ASELSAN.com/en/defence/product/3022/siper>, (Accessed: April 19, 2024).

207 "GÖKKUBBE: Cutting-Edge Ground-Based Air Defense (GBAD) System with Unmatched Air Defense Proficiency," *ASELSAN*, July 25 2023, [https://www.wcdn.ASELSAN.com/api/file/IDEF23\\_ASELSAN\\_GOKKUBBE.pdf](https://www.wcdn.ASELSAN.com/api/file/IDEF23_ASELSAN_GOKKUBBE.pdf), (Accessed: April 19, 2024).

208 The name Gökkuşbu was changed as Çelik Kubbe.

209 Anıl Şahin, "ASELSAN'ın GÖKKUBBE'si C-RAM Görevlerine Hazır," *Savunma SanayiST*, September 12 2023, <https://www.savunmasanayist.com/ASELSANin-gokkubbesi-c-ram-gorevlerine-hazir/>, (Accessed: April 19, 2024); Anıl Şahin, "ASELSAN'ın GÖKKUBBE'si C-RAM Görevlerine Hazır," *Savunma SanayiST*, September 12 2023, <https://www.savunmasanayist.com/ASELSANin-gokkubbesi-c-ram-gorevlerine-hazir/>, (Accessed: April 19, 2024).



system is included as the lowest-tier component to counter unmanned aerial vehicles.<sup>210</sup> Designed primarily to counter all air threats, including RAM (Rocket, Artillery, and Mortar), Çelik Kubbe will specifically protect high-value areas such as military bases and critical civilian infrastructures. Furthermore, Çelik Kubbe is set to evolve to not only include ASELSAN products but also encompass all existing systems in future developments.

Figure 2 Steel Dome - Çelik Kubbe



Source: Anadolu Agency

## Türkiye's Possible Contributions to ESSI

Türkiye, as a strategic member of NATO, has been facing border and air security threats for many years. These threats have made Türkiye's relevant institutions and military elements experienced in this field. With this experience and knowledge, Türkiye has made and continues to make configurations and enhancements in various institutions and systems. In this context, Türkiye can provide significant contributions to the determination of ESSI's defense strategies. Türkiye holds a strategic geographical position at the intersection of Europe and Asia, making it a critical frontline point for early warning and rapid response to potential threats from the Middle East and

<sup>210</sup> "İHTAR 100," ASELSAN, <https://www.ASELSAN.com/tr/savunma/urun/2654/ihtar-100>, (Accessed: January 17, 2025).

the Caucasus for NATO. However, it would not be accurate to say that Türkiye's contribution based on geographic location is critical and valuable for ESSI, as the direct threat perception is Russia, with Kaliningrad city and the western border being direct threat points to Europe. Nevertheless, Türkiye could serve as an early warning point for some locations with its radars.

Türkiye has a long history of developing and integrating air defense systems. Particularly, Türkiye can contribute to meeting the very short and short-range air defense needs that many ESSI countries require. It has also reached the potential to contribute to medium-range systems. Especially with the HİSAR and SİPER projects, significant successes are being achieved in medium and long-range air defense systems using domestic and national resources. The development of these systems has increased Türkiye's potential to provide technological contributions to ESSI. In the medium and long term, this technological contribution can be supported with SİPER.

## Challenges and Criticisms for Türkiye

Türkiye's relationship with Russia is the most significant criticism regarding its potential membership in ESSI. While Türkiye's participation in ESSI has been seen as an intent to improve relations with Europe and the U.S., it has not been considered a turning point.<sup>211</sup>

This perception might be important more for the aims of ESSI than its capabilities, as ESSI has not yet shown significant operational or strategic progress. Membership in ESSI is seen as a policy of balance for Türkiye.<sup>212</sup> Another point of criticism is Türkiye's balanced and neutral stance in the Russia-Ukraine war, yet still being a member of ESSI.

Within ESSI, Sweden is present, which recently discussed membership with NATO and observed occasional setbacks but ultimately joined NATO with Türkiye's approval. Ankara's approval of Sweden's membership concluded with a trilateral memorandum resulting from bilateral negotia-

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211 Francesco Siccardi, "Turkey and the Ukraine War: Whose Side is Ankara On?" *Euractiv*, March 4 2024, <https://www.euractiv.com/section/global-europe/opinion/turkey-and-the-ukraine-war-whose-side-is-ankara-on>, (Accessed: April 19, 2024).

212 "Understanding the Energy Drivers of Turkey's Foreign Policy," *Carnegie Europe*, February 28 2024, <https://carnegieeurope.eu/2024/02/28/understanding-energy-drivers-of-turkey-s-foreign-policy-pub-91733>, (Accessed: April 20, 2024).

tions lasting over a year.<sup>213</sup> This memorandum addresses many of Türkiye's demands in various aspects.<sup>214</sup> The memorandum includes significant statements concerning counterterrorism, which is Türkiye's primary concern. One such statement is found in the memorandum, which stipulates that Türkiye and Sweden, alongside Finland, will convene annually at the ministerial level under a new bilateral Security Agreement in addition to the trilateral Permanent Joint Mechanism. Under this agreement, a roadmap will be developed "against all forms of terrorism and demonstration."<sup>215</sup> One of the most crucial parts of this memorandum is the emphasis on Sweden not supporting the Gülenist Terror Group (FETÖ), which orchestrated the coup attempt on July 15, 2016, that resulted in the deaths of 253 Turkish citizens, and the PKK terrorist organization and its Syrian affiliate, the YPG/PYD.<sup>216</sup> The memorandum further specifies that this counterterrorism cooperation will continue after Sweden joins NATO.

Additionally, it highlights NATO's commitment to becoming more active against all forms of terrorism and the significant decision to establish the "Special Coordinator for Counterterrorism," a position long requested by Türkiye and created for the first time in NATO history. The memorandum also includes statements aimed at enhancing bilateral relations between the two countries. This is evident from the agreement between Türkiye and Sweden to strengthen economic cooperation through the Türkiye-Sweden Joint Economic and Trade Committee (JETCO) and to seek ways to maximize opportunities for bilateral trade and investment. However, Greece, which has experienced various tensions with Türkiye, is also an ESSI member. The ongoing diplomatic problems among member states are a general issue, but for Greece-Türkiye, it is a direct challenge that needs to be overcome. How-

213 "Press Statement," *NATO*, July 10 2023, [https://www.nato.int/cps/en/natohq/news\\_217147.htm](https://www.nato.int/cps/en/natohq/news_217147.htm), (Accessed: July 13, 2024)

214 "3'lü Zirveden 'Mutabakat' Çıktı: Türkiye İsteddiğini Aldı," *TRT Haber*, July 10, 2023

215 "Türkiye'den İsveç'in NATO Üyeliğine Yeşil Işık: Zirve Öncesi Nasıl Anlaşma Sağlandı?" *BBC*, July 11 2023

216 Cem Duran Uzun, "The Evidence Against Fetullah Gülen Behind Coup Attempt," *SETA*, July 23 2017, <https://www.setav.org/en/law-and-human-rights/the-evidence-against-fetullah-gulen-behind-coup-attempt>, (Accessed: July 13, 2024).;

Mert Hüseyin Akgün, "Gülenist Infiltration of Turkish Military: How and Why," *SETA*, September 2 2020, <https://www.setav.org/en/opinion/gulenist-infiltration-of-turkish-military-how-and-why>, (Accessed: July 13, 2024).

ever, since Türkiye faces similar issues within NATO, it has a lot of experience in negotiating solutions to potential similar problems.

There has not been direct criticism of ESSI within Türkiye; however, radars and military bases under NATO in Türkiye have been the subject of intense criticism for many years. These criticisms have ranged from political views advocating for Türkiye's withdrawal from NATO to calls for the closure or restriction of bases. An example is the Kürecik Radar Base, criticized since its decision to be established in 2011 by various political camps. The local population near Kürecik has opposed the base's establishment and conducted various protests.<sup>217</sup> These debates intensified after the Israel-Palestine conflict on Oct. 7, 2023. Particularly, some political parties have claimed that the Kürecik base provides information to Israel and must be immediately closed.<sup>218</sup>

On April 1, Israel conducted an airstrike on the consulate building within the Iranian embassy compound in Damascus, killing seven Iranians, including two generals of the Revolutionary Guards, and six Syrians. Following this, Iran launched a retaliatory attack against Israel on the night of April 13, using ground-to-ground missiles and kamikaze drones.<sup>219</sup> After Iran's attack, especially those supporting Iran or those directly opposed to Israel in Türkiye demanded the closure of the Kürecik base over incorrect speculative statements that it was providing information to Israel.<sup>220</sup> Establishing a similar base for ESSI in Türkiye could bring similar criticisms. Moreover, a problem similar to the tension initially created with Iran during Kürecik's establishment could also occur in relations with Russia. Therefore, such a system or initiative could cause significant setbacks in Türkiye's relations with Russia. However, we can say that such an initiative would not be within the scope of ESSI, and even if requested, Ankara would make decisions without denying its relations with Russia.

217 "Malatya'da Füze Kalkanı Protestosu," *TRT Haber*, October 2 2011.

218 Osman Nuri Cenet, "Temel Karamollaoğlu: ABD Artık Müttefikimiz Değil, Kürecik Üssü Kapatılmadı," *Sputnik TR*, October 26 2023, <https://anlatilaninotesi.com.tr/20231026/temel-karamollaoğlu-abd-artık-müttefikimiz-değil-kurecik-ussu-kapatılmadı-1076754364.html>, (Accessed: April 20, 2024).

219 Arda Mevlütoğlu, "Gösterişli Bir Hiçbir Şey: İsrail-İran Müşterek Fırlı Atışlı Hava Savunma Tatbikatı," *Sputnik TR*, April 17, 2024, <https://www.siyahgribeyaz.com/2024/04/gosterisli-bir-hicbir-sey-israil-iran.html#more>, (Accessed: April 20, 2024).

220 Yeniden Refah Partisi, X.com (Twitter), <https://twitter.com/rprefahpartisi/status/1782010920530547177>, (Accessed: April 21, 2024).

In general, Türkiye's membership in ESSI reflects a range of interactions that affect both its domestic political dynamics and regional and global strategic partnerships. However, in general, these criticisms and challenges are not difficult to resolve. Thus, the criticisms made do not pose a level of obstacle that would prevent Türkiye from benefiting from ESSI's strategic and limited operational capacity. However, the lack of significant progress since the establishment of ESSI still leaves unanswered questions on how feasible this initiative could be.

# LESSONS LEARNED AFTER UKRAINE - RUSSIA WAR

The Russia-Ukraine war has led to significant changes in the priorities and strategies of many countries, especially European nations, resulting in alterations in various policies and action plans ranging from economics to sociology. Russia's ongoing attacks, which began with the launch of over 160 missiles, have involved more than 500 missile strikes and the use of over 10,000 missiles. These assaults, carried out through air-to-ground or ground-to-ground missiles by warplanes, have posed a significant threat. This situation has led countries to reassess their defense policies and develop new strategies. The steps taken to strengthen defense capacities and be more prepared for potential threats are seen as indicators of this reassessment. Consequently, air defense, a mechanism for protection against missile and air attacks that were known but not previously focused on so intensely, has entered a significant development phase. The emergence of initiatives like ESSI reflects advancements not only in defense-orient-

ed but also in offensive-oriented policies of countries. It has been observed that many countries, especially in Europe, have allocated substantial budgets and undertaken efforts to enhance their armament and missile systems, including air-to-air, air-to-ground, and ground-to-ground missiles. As a result, countries have increased the number of munitions in their inventories.

Regarding the Russia-Ukraine war, in terms of ammunition and missile quantities, Moscow's missile attacks, while not directly classifiable by type of action, strategy, or the type of ammunition used, have been analyzed through statements from Ukraine and Russian defense ministries. Analyses such as the "Composition of Missile Attacks and Air Defense Performance by Threat Type have been conducted." These analyses suggested that due to Russia's intense missile attacks, especially in the first six months of the war, a depletion of missiles might occur, potentially altering the course of the war.<sup>221</sup> In parallel, European and Western countries have attempted to disrupt Russia's military supply chains, particularly by imposing restrictions on the export of electronic components.<sup>222</sup>

Russia's ongoing attacks throughout the war have clearly demonstrated that expecting the depletion of Russia's missile stockpiles is unrealistic. Despite sanctions and export controls, Russia has been able to continue producing or procuring long-range attack capabilities through other means. While stockpiles have decreased due to consumption not matching production, they have not been exhausted. Additionally, there are claims that Russia will or has already procured new missiles and ammunition with support from China and other states.<sup>223</sup>

An important conclusion to draw from this situation is that under conditions of intense conflict and attacks, inventories and stockpiles may not be depleted even under various restrictions and sanctions. Despite using its

221 Svitlana Morenets, "Russian Missiles Blown Up in Crimea," *The Spectator*, March 21 2023, Rebevva Robinson, "Russia Actively Stockpiling Weapons to 'Overwhelm Ukrainian Missile Defences'," *Express*, April 13 2024, <https://www.express.co.uk/news/world/1887306/russia-stockpiling-weapons-overwhelm-ukrainian-defences>, (Accessed: July 15, 2024); George Allison, "Russian Long-Range Missile Stock 'Limited,' Say Britain," *United Kingdom Defence Journal*, October 1 2022, <https://ukdefencejournal.org.uk/russian-long-range-missile-stock-limited-say-britain/>, (Accessed: July 15, 2024).

222 "Avrupalı Yetkililer: Rusya'nın İran Yapımı SİHA Stoğu Tükeniyor," *Şarkul Asvat Türkçe*, February 28 2023, <https://turkish.aawsat.com/home/article/4173376/avrupalı-yetkililer-rusya'nın-iran-yapımı-siha-stoğu-tükeniyor>, (Accessed: July 15, 2024).

223 Tim McNulty, "US Warned Russia's Weapon Stockpile 'Not Running Out Anytime Soon' as China Steps In," *Express*, December 6, 2022.

ammunition intensively and facing multiple sanctions, Russia has managed to maintain sustainability during this period. On the other hand, in the context of the Russia-Ukraine war, although Ukraine's air defense systems have been rendered ineffective multiple times against Russia's attacks, Ukraine has achieved significant successes under various challenges.

Despite Ukraine's significant successes in air defense, its frequent inability to intercept missiles, resulting in human casualties and various infrastructure, military, logistical, and social losses, can be attributed to the lack of a comprehensive and advanced air defense strategy, especially at the beginning of the war. Additionally, the gradual addition of the necessary systems and ammunition to Ukraine's inventory throughout the war has prevented the establishment of a fully developed air defense network. This has been a significant factor in the casualties experienced. Therefore, the second important conclusion to be drawn here is that a comprehensive and advanced air defense strategy must be ensured through the acquisition of the necessary inventory.

It is well known that countries such as Russia, the U.S., and China allocate significant portions of their defense budgets to missile expenditures. For instance, in March 2023, the U.S. Department of Defense requested a total budget of \$842 billion for 2024 with \$45.4 billion allocated for missile and missile defense expenditures.<sup>224</sup> This represents approximately 5.39% of the total budget.<sup>225</sup> Similarly, the Defense Advanced Research Projects Agency (DARPA) has numerous missile systems or sub-component systems included within its project-based total request of \$4.388 billion for research, development, and testing in 2024.<sup>226</sup> Continuing with the U.S. example, the requested defense budget for 2023 was \$773 billion, with \$32 billion allocated for missile expenditures. The proportion of missile and missile de-

224 "United States Department of Defense Fiscal Year 2024 Budget Request Budget Briefing," *U.S. Department of Defense*, (March 2023), [https://comptroller.defense.gov/Portals/45/Documents/defbudget/FY2024/FY2024\\_Budget\\_Request.pdf](https://comptroller.defense.gov/Portals/45/Documents/defbudget/FY2024/FY2024_Budget_Request.pdf), p. 2, (Accessed: July 15, 2024); "United States Department of Defense Fiscal Year 2024 Budget Request," *U.S. Department* p. 5.

225 "United States Department of Defense Fiscal Year 2024 Budget Request," *U.S. Department* p. iv, (Accessed: July 15, 2024).

226 "Department of Defense Fiscal Year (FY) 2024 Budget Estimates Defense Advanced Research Projects Agency Defense-Wide Justification Book Volume 1 of 5 Research, Development, Test & Evaluation, Defense-Wide," *U.S. Department of Defense*, March 2023, [https://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2024/budget\\_justification/pdfs/03\\_RDT\\_and\\_E/RDTE\\_Vol1\\_DARPA\\_MasterJustification-Book\\_PB\\_2024.pdf](https://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2024/budget_justification/pdfs/03_RDT_and_E/RDTE_Vol1_DARPA_MasterJustification-Book_PB_2024.pdf), (Accessed: July 15, 2024)..



fense spending in the 2023 defense budget was 4.14%. It is evident that the proportion of missile expenditures, whether viewed by specific programs or within the total defense expenditures, has been increasing within the defense budget.

Similarly, Germany, a founding member of ESSI, has shown fluctuations in its defense expenditures from year to year until 2024, with an overall upward trend. Germany's defense expenditures, which were 47.72 billion euros (approximately 1.3% of the GDP) in 2019, increased to 51.49 billion euros (\$53.2 billion) in 2020.<sup>227</sup>

According to Germany's Finanzbericht report, the general defense budget for 2023 was planned at 50.1 billion euros and was expected to remain at this level until 2026.<sup>228</sup> However, the general defense budget for 2024 increased by 1.83 billion euros, reaching 51.95 billion euros.<sup>229</sup> At the request of German Defense Minister Boris Pistorius, there will also be an increase in the defense budget for 2025.<sup>230</sup>

One notable factor in the increase in Germany's defense budget after 2022 is not just the rise in the official defense budget but the increase in special fund expenditures. This is due to the German Federal Cabinet's approval of a 100-billion euro special fund in 2022, following the Russia-Ukraine war, to be utilized by 2026. In 2023, 8.5 billion euros from this fund was spent, raising the total defense expenditure to 71.62 billion euros for that year.<sup>231</sup> For 2024, with an expected 18 billion euros from the special fund and 14 billion euros for NATO criteria and/or expenditures by ministries

227 Nan Tian, Aude Fleurant, Pieter D. Wezeman, and Siemon T. Wezeman, "Trends in World Military Expenditure, 2019," *SIPRI Fact Sheet*, Vol. 2020, No. 4 April 2020, pp. 1-8; Statista Research Department, "Military Spending in Germany from 1995 to 2022," *Statista*, (January 2023), <https://www.statista.com/statistics/575153/military-spending-germany/>, (Accessed: July 19, 2024).

228 "Explainer: The Proposed Hike in German Military Spending," *Stockholm International Peace Research Institute*, March 25, 2022, <https://www.sipri.org/commentary/blog/2022/explainer-proposed-hike-german-military-spending>, (Accessed: July 15, 2024).

229 "Verteidigungsetat 2024 Wächst um 1,7 Milliarden Euro – NATO-Quote Wird Erreicht," *Bundesministerium der Verteidigung*, July 7, 2023, <https://www.bmvg.de/de/aktuelles/gruenes-licht-im-kabinett-verteidigungsetat-2024-5648648>, (Accessed: July 15, 2024).

230 Matthew Karnitschnig, Nette Nöstlinger and Jürgen Klöckner, "Germany's Scholz Averts Coalition Melt-down Over Budget," *Politico*, July 5, 2024, <https://www.politico.eu/article/germany-leaders-olaf-scholz-preliminary-agreement-budget/>, (Accessed: July 15, 2024).

231 "Germany's Defense Budget and Special Funds Not Enough to Meet 2 Percent Target in 2024," *IFO Institute*, August 9, 2023, <https://www.ifo.de/en/press-release/2023-08-09/germanys-defense-budget-and-special-funds>, (Accessed: July 15, 2024).

other than the defense ministry, the total defense budget is expected to reach 85.5 billion euros.<sup>232</sup>

Germany's former Defense Minister Christine Lambrecht emphasized the importance of military power in protecting freedom in Europe amid the war in Ukraine. She stated that there is a cost to security and equipping the Bundeswehr, and noted that the special fund is intended for enhancing the defense and alliance capabilities of the Bundeswehr.<sup>233</sup>

Additionally, it was stated that the special fund would be used specifically for executing complex, multi-year defense projects. Although the exact amount allocated for missiles and air defense within this fund is not specified, it is highlighted as a significant area covered by this fund, which finances crucial defense equipment.<sup>234</sup>

The report specifies that air and missile defense systems, along with other strategic defense measures, are part of the Bundeswehr's modernization and procurement plans. In this context, expenditures include the modernization and enhancement of missile defense capabilities, as well as the renewal of existing systems.<sup>235</sup>

The Finanzbericht report has allocated a budget of over 8 billion euros for the modernization and procurement of new weapon systems, vehicles, devices, and ammunition.<sup>236</sup> In this context, the financing of various defense equipment, including missile systems, has been planned.

When examining missile and missile defense expenditures through Poland, which is considering membership in ESSI, numerous discussions and plans are evident. Just two of these orders highlight the increasing spending in this area: a \$3.5 billion order for AGM-158B-2, AIM-9X Sidewinder Block II Tactical Missiles, and 745 AIM-120-8 (AMRAAM) missiles, as well

232 Johannes Stern, "German Government Decides on War Budget for 2024," *WSWS*, February 4 2024, <https://www.wsws.org/en/articles/2024/02/05/eusr-f05.html>, (Accessed: July 15, 2024).

233 "Kabinett Einigt Sich Auf Mehr Geld und Sondervermögen für Die Bundeswehr," *Bundesministerium der Verteidigung*, (March 3, 2022), <https://www.bmvg.de/de/aktuelles/deutlich-aufgestockt-verteidigungshaushalt-5372564>, (Accessed: July 15, 2024).

234 "Finanzbericht 2023," *Bundesministerium der Finanzen*, (August 2022), [https://www.bundesfinanzministerium.de/Content/DE/Downloads/Broschueren\\_Bestellservice/finanzbericht-2023.pdf?\\_\\_blob=publicationFile&cv=3](https://www.bundesfinanzministerium.de/Content/DE/Downloads/Broschueren_Bestellservice/finanzbericht-2023.pdf?__blob=publicationFile&cv=3), p. 14, (Accessed: July 15, 2024).

235 "Finanzbericht 2023," *Bundesministerium der Finanzen*, (August 2022), p. 25.

236 "Finanzbericht 2023," *Bundesministerium der Finanzen*, (August 2022), p. 98.

as a \$735 million order for long-range missiles. These examples clearly demonstrate the rising expenditure in this sector.<sup>237</sup>

When examining other countries, it is evident that this situation applies to many of them as well.<sup>238</sup> Within the escalating arms and defense expenditures,<sup>239</sup> the proportion allocated to missile and air defense systems is increasing. This highlights the importance and necessity of the European Sky Shield as a significant conclusion to be drawn.

The increase in intense missile attacks during the Russia-Ukraine war has boosted missile and air defense expenditures not only in terms of armament but also in research and development and the production of new technologies. This trend is clearly reflected in official defense budget reports and in the statements made by defense industry companies regarding future concepts and trends. Additionally, this increase is evident in the policies of governments. Ongoing projects have gained momentum alongside these developments. Changes in defense policies, long-term strategic planning, and budget adjustments play a significant role in this context. As seen in other conflict situations, the Russia-Ukraine war has acted as a catalyst for the rapid development and adaptation of military technologies, especially in missile and air defense.

Sensor technologies used in the stages of detection and warning, communication, tracking and identification, and kill assessment are rapidly advancing. Developments in these sensors will endow both offensive and air defense systems with unique capabilities. With the increase in radar and electronic

237 Norbert Neumann, "Poland Secures Mega Missile Order for \$3.5 Billion on 25th NATO Anniversary," *Shephard*, March 13 2024, <https://www.shephardmedia.com/news/air-warfare/poland-secures-mega-missile-order-for-35-billion-on-25th-nato-anniversary/>, (Accessed: July 15, 2024); "Poland to Buy \$735M of Long-Range Missiles From US," *The Defense Post*, (May 28, 2024), <https://www.thedefensepost.com/2024/05/28/poland-buy-missiles-us/>, (Accessed: July 15, 2024).

238 "After Eurofighter, Germany OKs Iris-T Missile Sale to Saudi Arabia," *The Defense Post*, January 11 2024, <https://www.thedefensepost.com/2024/01/11/germany-missile-sale-saudi/>, (Accessed: July 15, 2024); Anges Helou, "Saudi Arabia, Qatar See Sharp Jump in Military Spending in the Middle East: Report," *Breaking Defense*, April 28 2023, <https://breakingdefense.com/2023/04/saudi-arabia-qatar-see-sharp-jump-in-military-spending-in-the-middle-east-report/>, (Accessed: July 16, 2024); Joe Saballa, "Iraq Eyes South Korea's M-SAM-II Air Defense System for \$2.6B: Report," *The Defense Post*, June 4, 2024, <https://www.thedefensepost.com/2024/06/04/iraq-air-defense-system-2/>, (Accessed: July 15, 2024); Pierre Tran, "French Parliament Approves €413 Billion Defense Budget for 2024-30," *Defence-Aerospace.com*, June 8 2023, <https://www.defence-aerospace.com/french-parliament-approves-e-413-billion-defense-budget-for-2024-30/>, (Accessed: July 15, 2024).

239 "Global Military Spending Surges Amid War, Rising Tensions and Insecurity," *Stockholm International Peace Research Institute*, April 22 2024, <https://www.sipri.org/media/press-release/2024/global-military-spending-surges-amid-war-rising-tensions-and-insecurity>, (Accessed: July 15, 2024).

warfare capacities, more resilient systems against jamming are expected to be developed. Significant advancements are also anticipated in early warning and detection systems. These developments can be seen as a natural part of the process where offensive and defensive systems mutually advance.

In addition to the strengthening of sensor technology, research on artificial intelligence (AI) and fully autonomous systems is also of great importance. In Russia, efforts related to AI and missile guidance were at a noteworthy level even before the war. Russia maintains a closed policy in its defense R&D projects and expenditures. However, it is known that Tactical Missiles Corporation, one of Russia's most prominent defense industry organizations, is working on AI-guided missiles. The company's CEO, Boris Viktorovich Obnosov, stated at the MAKS-2017 International Air Show that they observed Americans using AI-guided missiles in Syria and mentioned that their company has achieved successful results. However, he also emphasized that they need to continue working for a few more years.<sup>240</sup>

Studies have shown that AI-guided missiles will have a lower miss distance, achieve high success against maneuverable air targets, and perform better against countermeasures like electronic warfare. These advancements in offensive missile systems are pushing countries to focus more on air defense systems and invest in technological advancements in this field. New-generation air defense systems are being developed to provide more effective and comprehensive protection, and their integration is forcing critical updates in national defense strategies. Thus, it is evident that the development of defense and offense continues hand in hand. From this, it can be concluded that keeping strategies and technologies up-to-date is the third important takeaway.

When summarizing all these developments, three main conclusions can be drawn:

1. Even under sanctions and restrictions, a sustainable air attack threat always remains,
2. Air defense strategy should be comprehensively structured, with a layered design consisting of many components in the air defense architecture,

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<sup>240</sup>"Russia to Develop Missiles Based on Artificial Intelligence," *TASS*, July 19 2017, [https://tass.com/defense/957049?utm\\_source=thenextweb.com&utm\\_medium=referral&utm\\_campaign=thenextweb.com&utm\\_referrer=thenextweb.com](https://tass.com/defense/957049?utm_source=thenextweb.com&utm_medium=referral&utm_campaign=thenextweb.com&utm_referrer=thenextweb.com), (Accessed: July 15, 2024).

3. Keeping strategies and technologies up-to-date is crucial for long-term success and security.

From the perspective of ESSI, considering these conclusions, it is evident that despite the likelihood of missile attacks causing significant damage to Europe's air defense systems, the chance of these systems being completely depleted is very low, especially during active conflict. This underlines the importance of countries cooperating to enhance their defense capacities and integrate their systems. Given the existing system deficiencies, this cooperation becomes even more critical.<sup>241</sup>

Countries should structure both their individual and collective air defense strategies comprehensively, creating a layered design for the air defense architecture that comprises multiple components. This layered structure will enable different defense systems to work together, allowing threats to be detected and neutralized at various stages. Establishing an architecture that is reinforced with both action plans and technical infrastructure will provide a robust defense system. For example, the integration of existing defense systems like IRIS-T SLM, Patriot, and Arrow 3, which currently lack integration and a unified strategy, would significantly enhance Europe's air defense capacity and provide effective protection against threats of varying ranges.

Such cooperation and strategic structuring will ensure preparedness against both current and future threats. By continuously integrating technological advancements into defense systems, this collaborative effort will perpetually renew and strengthen itself in response to increasing and evolving threats.

Although the European Sky Shield Initiative (ESSI) was established to address Europe's challenges against air threats, it has not yet fully achieved this goal. However, it has the potential to provide the aforementioned contributions. It is crucial to reiterate the need to address the previously mentioned issues. While these issues vary in significance, it can be said that, in terms of security, they are not insurmountable obstacles. Consequently, despite Europe's increased efforts since 2022, its weak air defense infrastructure can be strengthened through ESSI.

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241 Rafael Loss, Angela Mehrer, "Striking Absence: Europe's Missile Gap and How to Close It," *European Council on Foreign Relations*, November 21 2023, <https://ecfr.eu/article/striking-absence-europes-missile-gap-and-how-to-close-it/>, (Accessed: July 15, 2024).

## Annex A: Comparison of NASAMS, IRIS-T SLM, and SAMP/T Air Defense Systems

Feature	NASAMS	IRIS-T SLM	SAMP/T
Primary Developer	Raytheon Technologies and Kongsberg Defense	Diehl Defense	Eurosam (MBDA Italy, MBDA France, Thales)
Operational Since	1998	2022	2011
Primary Interceptor	AIM-120 AMRAAM	IRIS-T	Aster 30
Other Missiles	AIM-9X Sidewinder Block II, AMRAAM Extended Range	None specified	Aster 15
Maximum Range	40 km	40 km	120 km
Altitude Range	16 km	20 km	20 km
Warhead Weight	20-22 kg	11.4 kg	20 kg
Radar Type	MPQ-64FI Sentinel	TRML-4D	Arabel
Radar Range	120 km	250 km	350 km
Targets Tracked	60	1500	350
Simultaneous Engagement	24	72	48
Battery Composition	12 missile launchers, 8 radars, one fire control center, one electro-optical camera vehicle, one tactical control cell vehicle	3 truck-mounted launchers, multi-functional radars, command post vehicle	6 transporter erector launcher (TEL) vehicles. Each TEL vehicle is equipped with eight Aster missiles., radar, command and control unit/ vehicle
Deployment Time	15 minutes	10 minutes	15 minutes
Cost per Battery	\$ 64 million	\$ 136 million	\$ 155 million
Cost per Missile	\$ 1.2 million	\$430 million	\$ 2 million

## Annex B: ESSI Member Air and Missile Defense Capabilities

Country	Very Short-Range (SAM & ADA)	Short-range SAM	Long-range/medium-Range SAM	Future Capabilities
<b>Austria</b>	MANPADS Mistral 35 mm anti-aircraft guns	-	-	Sky Shield, Iris-T additional Mistral Plans to acquire Patriot or Arrow
<b>Belgium</b>	MANPADS Mistral	-	-	Mistral, Modular GBAD project
<b>Bulgaria</b>	Zu-23-2, SA-7, SA-14, SA-16, SA-18, SA-24 (Operational status unknown)	2K12 Kub, 9K33 Osa (Operational status unknown)	S-125, S-300, S-200	Sky Shield
<b>Czech Republic</b>	MANPADS	2K12 Kub	-	Sky Shield, SPYDER (short range)
<b>Denmark</b>	-	-	-	Plans to acquire very short and short-range systems-Skyranger and Stinger
<b>Estonia</b>	MANPADS, Mistral			Sky Shield, Iris-T additional Mistral
<b>Finland</b>	ASRAD, Stinger, RBS-70, 23 mm, 35 mm ADA	Crotale, NA-SAMS	HAWK (training only)	Sky Shield, David's Sling
<b>Germany</b>	ASRAD, Stinger, MANTIS, 35 mm ADA	-	Patriot	Sky Shield, new short-range system development
<b>Greece</b>	FIM-92 Stinger, VELOS, CIWS (20 mm ADA, Rheinmetall Twin AA Gun MK-20 (20 mm ADA), Artemis 30 (30 mm ADA), Phalanx), 23- & 35-mm ADA	Tor-M1, Crotale NG, 9K33 OSA	S-300, Patriot PAC-2 (GEM-T), Evolved Sea Sparrow Missile (ESSM)	Sky Shield
<b>Hungary</b>	MANPADS Mistral	2K12 KUB, NASAMS		Sky Shield, plans to acquire Skyranger 30,
<b>Latvia</b>	Stinger, RBS-70, 40 mm			Sky Shield, IRIS-T (with Estonia).
<b>Lithuania</b>	Singer, RBS-70	NASAMS		Skyshield, IRIS-T, additional NASAMS, and RBS-70

<b>Netherlands</b>	Stinger MANPADS	NASAMS	Patriot	Sky Shield, plans to replace short/medium-range systems with a modern system by 2026
<b>Norway</b>	MANPADS	NASAMS		Sky Shield, plans to upgrade NASAMS with new and more mobile versions by 2026-2027
<b>Romania</b>	GDF-003, MANPADS 9K31 Strela 1, 9K32 Strela 2, M 1980/77 (35 mm ADA), Oerlikon (35 mm ADA), Gepard (35 mm ADA), 14.5 mm, 57 mm ADA	9K33 Osa, 2K12 Kub	MIM-23 Hawk, S-75, Patriot	Sky Shield, additional Patriot
<b>Slovakia</b>	MANPADS, MANTIS, SA-7, SA9, SA-16 (end of service life)	2K12 (outdated)	S-300PMU	Sky Shield, BARAK MX Integrated Air Defense System, plans to procure Piorun MANPADS from Poland, the potential acquisition of Patriot
<b>Slovenia</b>	SA-24 9K338 Igla-S MANPADS		IRIS-T SLM	Sky Shield, plans to procure more IRIS-T SLM systems
<b>Sweden</b>	MANPADS Mistral, 35 mm ADA		Patriot PAC-3+, I-HAWK	Sky Shield, additional SHORAD systems
<b>Switzerland</b>	FIM-92 Stinger MANPADS, Oerlikon GDF, Oerlikon Skyguard	Rapier, Sparrow, Aspide	BL-64 "Bloodhound"	Plans to acquire Patriot PAC-3 MSE, potential IRIS-T SLM
<b>United Kingdom</b>	Stormer HVM, Starstreak Missile System, Rapier FSC	Enhanced Modular Air Defense Solutions (EMADS)	SKY-Sabre (GBAD system), Type 45 (Destroyer -Sea Viper, Sampson radar, Phalanx Gatling Gun, Sea Wolf)	Sky Shield, AUKUS, collaboration in advanced technology programs and system-level analyses with the USA, Joint GDAP Future Unified Missile with Poland
<b>Türkiye</b>	Sungur/PorSav, Stinger, SA-18 Grouse IGLA 9K38, Igla-S, ATILGAN, ZIPKIN, Korkut SSA, Korkut KKA, Ihtar, ALKA	HİSAR-A,	HİSAR-O, S-400,	Sky Shield, SİPER system (Blok 1,2,3.) Çelik Kubbe integrated system



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# EUROPEAN SKY SHIELD INITIATIVE Capacities, Criticisms, and Türkiye's Contribution

SİBEL DÜZ, MUHAMMED SEFA KOÇAKOĞLU

The European Sky Shield Initiative (ESSI), spearheaded by Germany, emerged in response to escalating missile threats, particularly from Russia, following Moscow's aggressive actions in Ukraine. ESSI's central objective is to establish a unified, ground-based air and missile defense system across Europe to bolster collective security. Proposed by Chancellor Olaf Scholz in 2022, the initiative now includes 21 member countries, including recent entrants like Türkiye and Greece. ESSI is designed to enhance NATO's air defense capabilities through the deployment of multi-layered systems capable of addressing both short and long-range missile threats. However, the initiative must navigate several strategic, technical, and political challenges to achieve its full operational potential and effectively counter emerging threats, particularly Russia's advanced missile systems like the Iskander and Kinzhal.

Türkiye's accession to ESSI in February 2024 significantly strengthens the initiative, given its strategic geographic location and advanced air defense capabilities. Over the past decade, Türkiye has made substantial investments in developing indigenous air defense systems, including the HİSAR and SİPER projects, which address short to long-range missile threats. These systems, which leverage domestic technology and innovation, fill critical gaps in ESSI, particularly in the area of short-range defense, a key necessity for many member countries. Türkiye's longstanding experience in managing complex security environments on its borders, combined with its sophisticated air defense infrastructure, positions it as a valuable contributor to the initiative. However, its historically delicate relations with Russia introduce a layer of complexity to its role within ESSI, especially given its balanced stance in the Russia-Ukraine conflict.

Despite the promise of ESSI, it faces critiques from within Europe, particularly from France, which argues that the initiative overly relies on non-European defense systems, thereby undermining the continent's strategic autonomy. The lack of a coherent, integrated strategy across member states, coupled with varying system requirements, has also been identified as a significant obstacle to ESSI's success. Moreover, political challenges, including the management of leadership and coordination within the initiative, require careful handling to ensure its effectiveness. While ESSI represents a major step forward in strengthening Europe's air defense, these challenges must be addressed to ensure the initiative delivers on its promise of enhanced collective security.