

Technological Advances in the Turkish Defence Industry

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Introduction

Over the past two decades, Türkiye has emerged as a key player in the global defence industry, transitioning from an importer of technology to an innovator and producer. This remarkable evolution has been driven by strategic investments in technology, robust public-private collaborations, and a forward-looking national defence strategy. Türkiye's integration of artificial intelligence (AI), advanced robotics, and cutting-edge weapon systems has not only bolstered its military capabilities but also elevated its position on the global stage.

Additionally, the industry's rapid growth has had a profound economic and diplomatic impact. By ex-

porting defence technologies to over 180 countries in 2024 with exports of more than 7.1B USD (Defense News, 2025), Türkiye has generated billions in revenue, contributing to GDP growth while strengthening geopolitical alliances. This dual focus on economic prosperity and strategic influence reflects Türkiye's broader aspirations for global leadership. This chapter delves into the technological milestones achieved by Türkiye's defence sector, focusing on the role of AI, autonomous systems, and digital infrastructure in transforming military operations. It also examines the contributions of leading defence firms, the integration of ethical principles in AI-driven systems, and Türkiye's ambitions to shape the future of warfare.



(Ali Atmaca - Anadolu Agency)

Foundations of Technological Advancements in Defence

Historical Context and Milestones

Türkiye's defence industry has evolved through a series of historical milestones that have shaped its trajectory toward self-reliance and technological innovation. The Ottoman Empire laid the groundwork for military advancements, with its expertise in artillery and siege technology exemplified by innovations such as the Basilica cannon. This self-sufficient production of materials like gunpowder and cannonballs established a precedent for minimising reliance on external suppliers, a principle that would influence the Republic's defence strategy centuries later.

With the establishment of the Republic, Mustafa Kemal Atatürk emphasised the importance of science and technological advancement in securing the country (Karagözoğlu, 1985). Early institutions such as the Turkish Aeronautical Association, founded in 1925, and TÜBİTAK, established in 1963, underscored this commitment. These organisations played pivotal roles in fostering technical expertise and research capabilities, particularly in aviation and defence-related fields. Türkiye's strong emphasis on aviation and aeronautical engineering, deeply ingrained in its national institutions and culture, has significantly contributed to the country's celebrated expertise in developing unmanned aerial vehicles (UAVs). The focus on industrialisation in the mid-20th century further bolstered Türkiye's defence sector. Key developments such as the Turkish Petroleum Corporation and Erdemir Steel Plant provided essential infrastructure for military production, while centralised economic planning ensured that resources were allocated to support both industrial and defence goals.

The 1980s marked a turning point with economic liberalisation policies under Turgut Özal, which integrated global technologies into Türkiye's defence framework (Öniş, 2004). Advancements in telecommunications and satellite technology, such as the adoption of GSM systems and the launch of TÜRKSAT, enhanced military command, control, and communication capabilities. These developments laid the groundwork for modernising Türkiye's defence sector and enabling greater technological independence. Another key moment came during the 1990s when Türkiye intensified efforts to reduce foreign dependency by establishing major joint ventures and forming defence

agreements with international allies. These collaborations accelerated the transfer of critical technologies, laying the groundwork for today's indigenous production.

The turn of the millennium, marked by the rise of the AK Parti government under Recep Tayyip Erdoğan in 2002, brought a renewed focus on defence self-sufficiency. The establishment of the Presidency of Defence Industries (SSB) centralised efforts to oversee indigenous defence projects and align them with national security objectives. Under the SSB's guidance, Türkiye achieved significant milestones in defence technology, including the development of UAVs such as the Bayraktar TB2 and ANKA drones. These systems, recognised for their operational effectiveness in various conflicts, became symbols of Türkiye's technological capabilities and bolstered its position as a leading global supplier of UAVs.

Other key projects, such as the MILGEM naval program (Nugent, 2023) and the development of the ALTAY main battle tank and HISAR air defence systems, reflected Türkiye's commitment to indigenous production across all branches of defence. These efforts were supported by strategic policies that facilitated technology transfers while ensuring domestic control over production processes. By March 2024, Türkiye had become the 11th largest arms exporter globally, with defence products reaching markets in the Middle East, Africa, and Central Asia (Stockholm International Peace Research Institute, 2024; Daily Sabah, 2025). These exports not only enhanced the economy but also elevated Türkiye's geopolitical influence.

Strategic Policies and Vision

Türkiye's defence industry success is rooted in strategic policies and a regulatory framework that prioritised innovation, collaboration, and technological self-reliance (Yılmaz and Yorulmaz, 2023). The Presidency of Defence Industries (SSB) has been instrumental in coordinating these efforts, ensuring that projects align with national security objectives and fostering partnerships between government agencies, academia, and private firms. The *Technology Development Zones Law* (2001) facilitated the establishment of research hubs that became pivotal in advancing defence technologies, while tax incentives under *R&D Law No. 5746* (2008) encouraged private-sector investment in cutting-edge military systems (Yanıktepe and Tezcan, 2006).

The National Technology Initiative (NTI), launched in 2018, provided a structured framework for advancing high-tech industries, with particular focus on artificial intelligence (AI), cybersecurity, and advanced manufacturing (Coştu, 2022). Within the defence sector, the NTI emphasised reducing reliance on imported technologies and prioritising the development of critical platforms such as UAVs, naval vessels, and air defence systems. The 2021 launch of the National Artificial Intelligence Strategy (NAIS) further integrated cutting-edge technologies into Türkiye's defence industry (Presidency of the Republic of Türkiye, Digital Transformation Office, 2021); (Mohyidin, 2024). This initiative aimed to position Türkiye as a global leader in AI applications, including military domains such as autonomous systems, intelligence analysis, and advanced robotics. By fostering collaboration among government agencies, private enterprises, and academic institutions, the NAIS ensured that Türkiye's defence systems leveraged the latest AI advancements to enhance operational efficiency and strategic decision-making. AI integration enabled the creation of autonomous systems, while advanced manufacturing techniques like 3D printing improved efficiency and reduced costs in military production. Cybersecurity also emerged as a critical focus, supported by public-private partnerships under initiatives like the Turkish Cyber Security Cluster (Organisation for Security and Co-operation in Europe, 2023). These efforts aimed to protect critical infrastructure and ensure resilience against emerging threats, aligning with Türkiye's broader goals of achieving technological self-sufficiency.

Export-oriented policies, such as *Law No. 5201 on the Control of Weapons, Ammunition, and Defence Equipment Exports*, enacted in 2004 (International Institute for Strategic Studies, 2024), streamlined licensing and compliance procedures, enabling Türkiye to expand its defence exports significantly (Organisation for Security and Co-operation in Europe, 2020). These regulations supported the global success of platforms like the Bayraktar TB2, MILGEM-class ships, and HISAR systems, solidifying Türkiye's position as a key player in the international arms market. Turkish companies like Baykar Makina, Roketsan, and Aselsan became major exporters, contributing not only to Türkiye's economy but also to its geopolitical influence. Private companies such as Baykar Makina and Turkish Aerospace Industries (TUSAŞ) leveraged these resources to produce groundbreaking platforms like the Bayraktar TB2 UAV and ANKA drone as mentioned above, which have become symbols of Türkiye's defence capabilities (LeGrone, 2022). Public-private partnerships (PPPs) were another cornerstone of the government's strategy to engage the private sector.

Through a combination of visionary leadership, strategic policies and a forward-thinking regulatory framework, Türkiye has transitioned from a dependency on foreign suppliers to becoming a self-sufficient producer and exporter of advanced military technology (Bastian, 2024). This transformation underpins the nation's broader ambition to align national security with technological innovation, ensuring that its defence industry remains a cornerstone of Türkiye's strategic aspirations in the 21st century.

Artificial Intelligence in Defence

Türkiye's transformation into a global leader in AI-powered defence technologies is the result of a comprehensive strategy combining government initiatives, private sector innovation, and international collaboration. The NAIS mentioned above serves as a cornerstone of these efforts, laying out a roadmap for achieving AI autonomy by fostering talent, innovation, and reducing dependency on foreign technologies. The strategy reflects Türkiye's broader commitment to technological self-sufficiency as part of its National Technology Initiative.

The Turkish government has actively supported the growth of AI applications in defence through financial incentives and regulatory frameworks. Laws like the *R&D Law No. 5746* provide tax exemptions and funding for private firms investing in cutting-edge technologies. Additionally, the 2001 Technology Development Zones Law es-

tablished innovation hubs to foster collaboration between academia and industry, creating an ecosystem conducive to high-tech advancements (Republic of Turkey, 2001). As a result, Türkiye now boasts nearly 1,200 AI firms, a dramatic increase from just five in 2000, with the AI sector projected to grow to 7.37 billion USD by 2030 (ERAI Turkey, 2024).

Key defence companies such as ASELSAN, HAVELSAN, and ROKETSAN have capitalised on these policies to develop groundbreaking AI-driven platforms. ASELSAN has introduced advanced radar systems, such as the AESA nose radar, which enhances combat aircraft capabilities with AI-enabled target recognition and multitarget tracking (Güngör, 2024). HAVELSAN developed the MAIN platform, prioritising data security for sensitive national operations, ensuring resilience against cyber threats. Additionally, through platforms like HAVELSAN's SimTech,

AI-driven wargames allow military personnel to train in hyper-realistic scenarios, enhancing decision-making and preparedness for complex operations (Defence Turkey, 2011). Additionally, as a member, Türkiye is leveraging AI to advance future soldier technologies as part of its focus on Emerging Disruptive Technologies (EDTs), aligning with North Atlantic Treaty Organisation (NATO)'s modernisation goals. BITES, a subsidiary of ASELSAN, developed the AI-powered Military Tactical Operation Kit (ATOK), enhancing battlefield situational awareness and personnel security with wearable integrated systems. Additionally, BITES employs AI in virtual and augmented reality training environments, providing realistic simulations for improved troop readiness. ASELSAN's Military Exoskeleton further integrates AI to deliver adaptive leg support, reducing physical strain and enhancing combat performance. These innovations demonstrate Türkiye's commitment to using AI to redefine modern warfighting capabilities.

AI applications extend beyond traditional defence platforms to space awareness and surveillance technologies. Universities and research centres, such as UZAY supported by TÜBİTAK, are employing AI for satellite tracking and real-time analysis, contributing to Türkiye's space defence capabilities. RobotEye AI, a private Turkish firm specialising in AI-driven surveillance, has developed autonomous border security systems that enhance situational awareness in challenging environments, further exemplifying the private sector's contributions to national security even at a startup level (Defence Arabia, 2024).

Participation in European Union (EU)-funded AI projects has strengthened Türkiye's position in the global AI landscape, facilitating knowledge exchange and cross-border innovation (European External Action Service, 2024). These partnerships complement the country's robust export strategy, supported by streamlined licensing under *Law No. 5201 on the Control of Weapons, Ammunition, and Defence Equipment Exports* (Herdem Attorneys at Law, 2024). Turkish defence products, including UAVs, radar systems, and advanced weaponry, have gained international recognition, solidifying the country's geo-political influence. Furthermore, it is of significant importance that ethical considerations appear to be central to Türkiye's AI strategy (Council of Higher Education (YÖK), 2024). The government emphasises transparency, accountability, and fairness in AI development, aligning with global norms to build trust in its AI-driven systems. This approach not only ensures responsible deployment but also reinforces Türkiye's reputation as a reliable and innovative player in defence technologies. The results of these efforts are evident in the growing prominence of Turkish defence firms on the global stage.

AI Powered Turkish Drones (UAVs)

Türkiye's UAV sector has seen significant advancements, establishing itself as a global leader in drone technology. A historic milestone was achieved with the Bayraktar TB3, developed by Baykar, which became the first UAV to autonomously take off and land on the TCG Anadolu, Türkiye's flagship amphibious assault ship (Baykar, 2024a). This innovation enhances the Turkish Navy's operational flexibility, particularly in naval operations. Further strengthening its capabilities, Türkiye has integrated air-launched ballistic missiles, such as the UAV-230, into its high-altitude, long-endurance AKINCI drone (Baykar, 2025). These advancements expand the mission profiles of Turkish UAVs, offering greater versatility in strike operations. Additionally, Turkish Aerospace Industries achieved a breakthrough with the ANKA-3, a flying wing-type stealth UAV that completed its maiden flight in December 2023 (Turkish Aerospace Industries, 2025). It has since undergone successful live-fire tests, showcasing its operational readiness.

On the international stage, Türkiye continues to expand its influence. Croatia recently approved an 86 million EUR purchase of Bayraktar TB2 drones, underscoring the growing demand for Turkish UAVs in Europe (Öztürk, 2024). Similarly, Albania announced plans to acquire Turkish kamikaze drones (Presidency of the Republic of Türkiye, 2024), and Türkiye has engaged in discussions with Serbia about potential joint drone production, signalling its deepening defence collaborations in the Balkans (RFE/RL's Balkan Service, 2024). To further solidify its UAV leadership, Baykar announced a 300 million USD investment to develop indigenous jet engines over the next five years, reducing reliance on foreign technology and enhancing UAV performance, particularly for advanced platforms like the Bayraktar Kızılelma, which is nearing serial production (Sezer, 2024).

These developments reflect Türkiye's commitment to innovation and its strategic approach to partnerships, exports, and self-reliance. This has enabled the country to contribute to regional and global security also. One notable success story involves the Akıncı drone's role in locating critical targets during a regional conflict. In May 2024, a Turkish Bayraktar Akıncı drone played a pivotal role in locating the crash site of a helicopter carrying Iranian President Ebrahim Raisi and Foreign Minister Hossein Amir-Abdollahiyan (Baykar, 2024b). The helicopter had gone down in the mountainous part of Azerbaijan under adverse weather conditions. Upon receiving a request for assistance, Türkiye deployed the Akıncı UAV, which successfully identified a heat source suspected to be the wreckage and promptly

shared the coordinates with Iranian authorities, as reported by European media (Öztürk, 2024). This collaboration exemplified the operational capabilities of Turkish drones in search and rescue missions and underscored the importance of international cooperation in crisis situations.

AI Driven Space Surveillance and Reconnaissance

AI-driven systems have been pivotal in Türkiye's space initiatives, significantly enhancing capabilities in satellite tracking, space object identification, and overall space awareness. A prominent example is the project led by professors at the Turkish Aeronautical Association University, which utilised AI technologies, including deep learning, to track spacecraft and objects traversing Turkish airspace. By integrating orbital mechanics with AI, this initiative enabled real-time identification and monitoring of satellites and other space objects. The rapid analysis provided by these AI-driven systems is crucial for maintaining national security, as it allows Türkiye to detect and respond to potential threats, such as spy satellites, while ensuring comprehensive surveillance of activities in orbit.

Another notable example is Türkiye's use of AI to predict and analyse the dynamics of space objects. By employing AI models trained on extensive datasets of orbital behaviour, Türkiye has developed systems capable of

anticipating potential collisions or interactions between satellites, contributing to safer and more efficient space operations. These systems enhance Türkiye's capacity to protect its assets in orbit and maintain uninterrupted access to critical space-based services. AI applications have also extended to the development of satellite technologies. Turkish firms and research institutions, such as TÜBİTAK UZAY, have incorporated AI algorithms into satellites for improved navigation, data processing, and communication. For instance, AI-driven software is used to process high-resolution images from Earth observation satellites, enabling quicker and more accurate interpretation for applications ranging from environmental monitoring to disaster response (TÜBİTAK Uzay, 2025).

These advancements are bolstered by collaborative efforts between academia, industry and governmental organisations. As noted above, national institutions like TÜBİTAK have played a central role in fostering partnerships that integrate AI expertise into space technologies, creating a robust ecosystem for innovation. In addition, Türkiye has leveraged its AI expertise to support global space missions. Collaborations with European Space Agency (ESA) initiatives have allowed Turkish engineers to contribute to AI algorithms used in asteroid tracking and planetary defence simulations (European Space Agency, 2021)

Advanced Defence Platforms and Systems

Directed Energy Weapons, Radar Technology and Smart Ammunition

Türkiye has made significant strides in directed energy weapons (DEWs), with ROKETSAN leading the charge in the development of cutting-edge systems like the ALKA laser weapon (Roketsan, 2022a). The ALKA system is specifically designed to neutralise asymmetric threats, including drones, missiles, and other aerial or ground-based targets. This capability is increasingly vital in modern warfare, where the use of swarms of drones or improvised explosive devices (IEDs) by non-state actors presents complex challenges. ALKA employs advanced artificial intelligence (AI) algorithms to detect, track, and engage multiple targets simultaneously, ensuring rapid response times and

precise targeting. The system can be deployed on a variety of platforms, from stationary defence installations to mobile units, providing comprehensive protection for critical infrastructure, military bases, and urban centres. Its ability to engage targets without expending traditional ammunition offers a cost-effective and sustainable solution for prolonged operations. Furthermore, ALKA's use of electromagnetic and laser technologies enhances its efficacy against threats at different ranges, contributing to Türkiye's layered defence strategy.

In next-generation radar technology advances, ASELSAN, one of Türkiye's leading defence contractors, has revolutionised radar technology with its Active Electronically Scanned Array (AESA) radar system (Güngör, 2024). This state-of-the-art technology integrates advanced AI algorithms to detect, track, and analyse multiple targets

in real time, offering unparalleled situational awareness. The AESA radar is a significant leap in Türkiye's air and ground defence capabilities, enhancing combat readiness across a range of platforms, including fighter jets, UAVs, and ground-based air defence systems. Its AI-powered capabilities allow it to adapt dynamically to changing battlefield conditions. For instance, the radar can prioritise high-threat targets, filter out irrelevant data, and provide operators with actionable insights, thereby reducing cognitive load and improving decision-making. This real-time adaptability is crucial in complex combat scenarios, where quick and accurate information can determine the outcome of engagements. The integration of this technology into platforms like the Akıncı and ANKA UAVs further enhances Türkiye's aerial capabilities. Beyond its immediate defence applications, the AESA radar's dual-use potential makes it valuable for civilian purposes, including air traffic control, weather monitoring, and border surveillance. This versatility demonstrates Türkiye's ability to develop technologies that address a wide array of needs, both military and civilian.

Türkiye has also emerged as a leader in smart ammunition and missile technology, with ROKETSAN at the forefront of these developments. One of the most notable innovations in this domain is the METE mini-missile (Roketsan, 2022b), renowned as the world's smallest precision-guided missile. The METE missile incorporates advanced AI algorithms to enhance targeting accuracy, making it particularly effective in urban and asymmetric warfare scenarios. The METE missile's compact size and precision capabilities allow it to be deployed in environments where collateral damage must be minimised. This makes it an invaluable asset for special operations forces, counterterrorism missions, and operations in densely populated areas. The missile's guidance system, powered by AI, enables it to adapt to dynamic conditions in real time, ensuring high levels of accuracy even against moving targets.

In addition to the METE missile, Türkiye has developed a range of other smart munitions that integrate AI for enhanced performance (Baykar, 2024c). These include laser-guided bombs, air-to-ground missiles, and stand-off weapons capable of engaging targets at extended ranges. The HGK, for example, is a GPS/INS guidance kit developed by TÜBİTAK-SAGE that converts conventional unguided bombs into precision-guided munitions. This system enhances the accuracy of air-to-ground munitions, allowing for effective engagement of targets with minimal collateral damage. Similar systems have been designed to function seamlessly with Türkiye's advanced UAVs and fighter jets, creating a cohesive and interoperable arsenal.

Indigenous Propulsion Systems

Türkiye's commitment to achieving technological sovereignty in defence has also driven significant advancements in the development of indigenous propulsion systems. The country focused on reducing dependency on foreign suppliers, ensuring uninterrupted access to advanced propulsion technologies. Tusaş Engine Industries (TEI) has been a leader in these efforts, developing key systems like the TEI-TF6000 turbofan engine, which delivers 6,000 pounds-force of thrust and powers advanced trainer aircraft, light combat aircraft, and UAVs (Defence Turkey, 2024). Building on this success, TEI is also developing the TF10000, a more powerful variant with afterburner capability for supersonic performance. In the rotary-wing domain, the TS1400 turboshaft engine, designed for Türkiye's domestically produced T625 GÖKBAY helicopter, demonstrates the ability to produce high-reliability engines for challenging environments (Aviation Turkey, 2020). It replaced the previously used LHTEC CTS800-4A turboshaft engines, produced by the Light Helicopter Turbine Engine Company (LHTEC), a joint venture between Rolls-Royce, a British company, and Honeywell, an American company, marking a significant step towards self-reliance (Anadolu Agency, 2015). UAV programs mentioned above have benefitted from domestically developed engines like the TEI-PD170, which enable high-altitude, long-endurance missions (TEI, 2024).

ROKETSAN has also further advanced propulsion systems for missiles and rockets, developing solid-fuel and hybrid technologies for tactical missiles and space launch vehicles (Defence Turkey, 2021). These advancements are underpinned by innovations in high-temperature materials, advanced manufacturing techniques, and additive manufacturing (3D printing), which have enhanced production efficiency and reduced costs. Türkiye's indigenous propulsion systems have far-reaching strategic implications, ensuring the seamless integration of engines into platforms like fighter jets, UAVs, and helicopters while strengthening operational reliability and independence. These advancements also position Türkiye as a competitive exporter of propulsion technologies, contributing to its global defence influence.

Cybersecurity and Digital Defence

The increasing digitisation of defence systems has created an urgent need for robust cybersecurity measures to protect critical military data domestically. Türkiye has risen to this challenge by integrating advanced AI-driven technologies into its secure communication platforms (Anadolu

Agency, 2024). One standout example is HAVELSAN's MAIN (Multifunctional Artificial Intelligence Network) platform, which prioritises data security through AI-powered encryption and anomaly detection systems (Havelsan, 2025). By operating within closed networks and utilising proprietary algorithms, MAIN ensures that sensitive information remains protected against unauthorised access, espionage, and cyberattacks.

AI-driven encryption technologies used in MAIN enhance the robustness of data transmission by continuously adapting to evolving cyber threats. These systems employ dynamic algorithms that can reconfigure encryption protocols in real time, making it exceptionally difficult for adversaries to breach. This capability is particularly vital for military operations, where the interception of communication could compromise missions or national security. MAIN's anomaly detection features further bolster security by identifying unusual patterns or behaviours within the network that may signal potential cyber threats. Using machine learning, these systems learn from historical data to differentiate between benign anomalies and genuine threats, enabling rapid and effective responses. HAVELSAN's focus on secure communication extends to integrating AI into data classification and access control measures. By categorising data based on its sensitivity, MAIN ensures that only authorised personnel can access specific information. AI-powered audit trails provide a transparent record of all data interactions, increasing accountability and minimising the risk of insider threats. These features are critical in maintaining the integrity and confidentiality of communication across Türkiye's defence systems.

Beyond defence infrastructure, Türkiye's investments in AI-powered cybersecurity tools are used to protect Türkiye's civilian critical infrastructure such as energy grids, transportation systems, and communication networks (Özker, 2022). For instance, machine learning models monitor sensor data from power grids to detect anomalies indicative of cyber intrusions targeting critical infrastructure. By demonstrating an ability to protect sensitive systems and data, Türkiye not only strengthens its own technological resilience but also enhances its geopolitical position as a reliable partner in international digital security collaborations.

Blockchain Technologies and Cloud Computing

Blockchain technology is increasingly being utilised in cybersecurity for its ability to ensure secure, tamper-proof, and transparent data management, particularly in defence and critical infrastructure. In Türkiye, blockchain is inte-

grated into defence communication systems to secure the transmission of sensitive data, eliminating single points of failure and ensuring that military communications remain confidential and authentic. For instance, blockchain is being explored for securing UAV-C2 links (Riyaz, Khan and Rehmani, 2023).

Türkiye is making significant strides in developing a robust and secure cloud infrastructure to bolster its defence capabilities and enhance national security (Bulut, 2023). Recognising the critical role of cloud computing in modern military operations and defence systems, the country is focusing on building advanced data centres and leveraging partnerships with global and domestic cloud service providers to support its defence strategy.

The establishment of state-of-the-art data centres equipped with cutting-edge technologies is central to Türkiye's efforts to secure and manage sensitive defence data. These facilities provide localised data storage and processing, ensuring data sovereignty and reducing vulnerabilities associated with cross-border information transfers. By minimising latency and fortifying cyber defences, the infrastructure supports real-time decision-making and operational efficiency, critical for modern warfare and surveillance systems. Moreover, the integration of secure cloud solutions enables advanced applications such as AI-driven analytics, secure communication networks, and autonomous system management. With these investments, Türkiye is not only reinforcing its defence infrastructure but also positioning itself as a leader in the adoption of secure, high-tech solutions for military and national security purposes, ensuring resilience against evolving cyber and physical threats.



(CSSB - Anadolu Agency)

Global Impact and Future Prospects of Türkiye's Defence Industry

Türkiye's defence industry has emerged as a global leader, leveraging technological advancements to strengthen its capabilities and influence. International collaborations have played a pivotal role in this transformation. Partnerships with global technology leaders like Microsoft and IBM have facilitated the transfer of knowledge and access to cutting-edge AI technologies, enhancing Türkiye's research and development ecosystem. Participation in EU-funded projects has further solidified its standing in the global defence landscape, focusing on ethical AI development and cross-border cooperation. These initiatives not only highlight Türkiye's commitment to responsible innovation but also align with its ambitions to lead in the global defence sector.

As a member of NATO, Türkiye's defence industry has positioned itself as a vital contributor to the alliance's collective defence capabilities. The export of defence systems to NATO member states has set benchmarks for Turkish companies, showcasing their ability to meet stringent quality and performance standards. Recent NATO-led joint exercises demonstrated the effectiveness of Türkiye's defence technologies. For instance, the Bayraktar TB2 UAV played a pivotal role in surveillance missions, earning recognition for its precision and cost-efficiency compared to Western counterparts. These contributions reinforce Türkiye's standing as a critical player within NATO. Cooperation with European nations has emerged as a strategic priority for the industry. The establishment of a ROKETSAN office in Skopje exemplifies this focus, enabling the Turkish defence firm to better serve the Balkan region. By offering cost-effective, high-quality solutions that align with NATO

requirements, the Turkish defence industry has demonstrated its adaptability to diverse global demands.

This growing recognition is underscored by the presence of seven Turkish defence firms on the prestigious Defence News Top 100 list by 2020 (Anadolu Agency, 2020). This achievement reflects Türkiye's increasing competitiveness in the international defence market, showcasing its ability to develop innovative, reliable, and cost-effective solutions that rival established global players. From UAVs to missile systems and cybersecurity platforms, Turkish defence products are shaping the future of warfare and gaining recognition for their effectiveness and ingenuity. However, while the Turkish defence sector is dynamic and rapidly evolving, marked by significant achievements, it is still facing challenges that require strategic solutions. One pressing vulnerability is its reliance on commercial semiconductors. Energy security is another area of concern. Addressing the shortage of skilled professionals is equally vital, as it poses a threat to sustained growth and innovation.

Looking ahead, Türkiye's defence industry is poised for transformative growth through strategic investments in research and development. The semiconductor dependency has prompted national efforts to develop and produce military-grade alternatives domestically to reduce foreign dependency and enhance operational security. The Turkish government and the energy sector are both investing heavily in domestic energy sources to ensure reliable operations in critical production environments. Initiatives such as various defence technologies academies have been launched to equip young engineers and scientists with ex-

pertise in AI, cybersecurity, and advanced manufacturing, reflecting a broader strategy to strengthen the workforce and meet the demands of emerging technologies and global competition. An example is the Defence Technologies Application and Research Centre, based in Atilim University, with the expressed purpose of meeting “the changing needs of the Turkish Armed Forces with original and domestic designs and free of foreign contributions” (Atilim University, n.d.). These efforts align with the recently announced Defence Vision 2023-2053, a long-term strategy that seeks to achieve full self-sufficiency, double defence exports, as well as position the country among the top 10 global defence exporters (TASAM, 2016). Despite current challenges, the defence sector’s adaptability, innovation, and commitment to self-reliance provide a strong foundation for realising these ambitious goals and sustaining its role as a competitive player on the global stage.

Expanding defence export markets is another key pillar of Türkiye’s future strategy. With a vision to double its defence exports by 2030, Türkiye is capitalising on its reputation for reliability and innovation (Presidency of the Republic of Türkiye, 2023). It appears to be well on its way to achieving this target: Türkiye’s defence and aerospace

industry has achieved record-breaking export revenues, reaching 5.8 billion USD (TL 201.55 billion), a month before the end of 2024 (Daily Sabah, 2023). Data from the Turkish Exporters Assembly (TIM) revealed exports from January to November rose 19 percent year-over-year, totalling nearly 5.76 billion USD. Over the past 12 months, the sector’s exports increased by 18.4 percent compared to the previous year, amounting to 6.48 billion USD.

Strategic trade agreements and technology transfer partnerships will facilitate this growth, enabling Turkish defence firms to expand their global footprint and foster new alliances. By offering tailored solutions to meet diverse operational needs, Türkiye continues to strengthen its position as a trusted partner in the global defence ecosystem. Türkiye’s integration of cutting-edge technologies, strategic international collaborations, and investment in human capital reflects its ambitious vision for the future. As it continues to push the boundaries of defence innovation, Türkiye is not only solidifying its role as a key global player but also shaping the future of defence technologies in an increasingly interconnected and technologically driven world.

Conclusion: From Projects to Posture

The recent delivery of Türkiye’s “Steel Dome” architecture (28 August 2025) is more than a procurement milestone; it is a declaration of posture (Associated Press, 2025). A decade of indigenous R&D, dispersed programs, and firm-level breakthroughs is now hardening into an integrated, national defence stack: missiles, sensors, electronic warfare, command-and-control, and unmanned systems fused into a single operating picture. That “system-of-systems” shift matters: it turns impressive platforms into a resilient network, elevates deterrence from point defence to layered coverage, and signals that Türkiye intends to compete in the world league not as a buyer of kits, but as a designer of architectures.

Institutionally, the scale of new facilities, workforce expansion, and production uplift points to enduring capacity rather than episodic success. Economically, the same integration logic that strengthens air defence also underwrites export credibility: partners do not just seek a drone, a radar, or a missile, instead, they seek interoperability, sustainment, and doctrine. Türkiye’s value proposition increasingly sits at that junction of hardware, software, and concept of operations, where “drone diplomacy,” naval as-

sertiveness and the KAAN ecosystem can be bundled as coherent, scalable solutions.

Strategically, Steel Dome crowns a broader pursuit of autonomy within alliances: interoperable with NATO where interests converge, self-reliant where supply chains or politics fray, and outward-looking where markets and partnerships multiply. It reinforces Ankara’s bid to anchor the Middle Corridor, to hedge in a fragmenting order, and to translate technology into leverage without surrendering decision-making to external dependencies.

None of this obviates the hard work ahead. Domestic semiconductors, energy resilience, deepening the engineering talent bench, and hardening cyber-physical links across the force. But the trajectory is clear. Türkiye has moved from assembling platforms to composing systems, from episodic exports to repeatable solutions, from offset recipients to standard setters. If sustained, that evolution will define not only how Türkiye defends its skies, seas, and data, but also how it shapes the next chapter of defence: at home, across its neighbourhood, and in the wider global market.

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