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RETHINKING THE IRAN CHALLENGE FROM THE PERSPECTIVE OF NATO

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Is NATO Reconsidering Its Stance on Iran?

NATO's recent Vilnius Summit Communiqué has underlined the Iran threat posed to Euro-Atlantic security. Apart from the Islamic Republic's nuclear ambitions, NATO leaders also voiced other important threat perceptions, such as the Iranian ballistic missile proliferation and Tehran's drone warfare assets pouring into the Russian military amidst the invasion of Ukraine.

The communiqué signaled that Iran's ballistic missile activity was "inconsistent with" the United Nations Security Council Resolution 2231 – the resolution that endorsed the nuclear deal (the Joint Comprehensive Plan of Action) –, and yet it failed to stress the same violation as to Iran's drone and loitering munitions transfers to the Armed Forces of the Russian Federation. The document also failed to address the Revolutionary Guards' systematic state-sponsoring of various terrorist groups and Iran's systematic attacks on international maritime traffic, nor did it mention the merger between Iranian and Russian defense technological and industrial bases. Nevertheless, in the aftermath of the NATO Summit communiqué highlighting a multi-dimensional threat stemming from Iran, there is a need to reconsider the outlook on Tehran and its possible ramifications for Turkiye as the only NATO country sharing a border with Iran.

The Unspoken Dimension: Turkish – Iranian Military Balance as a NATO Agenda

The Euro-Atlantic strategic community has associated Turkiye's quest for the F-16V modernization with a set of political-military themes, including Sweden's accession to NATO, Turkish – Greek showdown in the Mediterranean, as well as inextricably complicated divergences between the Biden administration and Ankara on the Syrian security agenda. Nevertheless, Western experts overlook one critical aspect of the overall threat landscape pertaining to Turkiye's capability development plans: Iran.

While being a balanced and well-researched paper in essence, the US Congressional Research Service (CRS) report assessing the Turkish F-16V acquisition plans, for example, does not emphasize Iran even in one single sentence – let alone allocate a specific chapter to analyze the Turkish – Iranian military strategic balance. Iran, however, time and again, vocally threatened to hit important NATO facilities in Turkiye.

To fill the missing part in the current findings, this paper will offer a meticulous analysis of the Iran dimension in NATO's new threat calculus. It will also shed light on Turkiye's military modernization efforts, including the long-debated F-16V saga, to address the Iran challenge along the frontiers and at its very source.

The paper has three major findings: First, long-neglected, Iran is becoming a more problematic threat to NATO. Second, Iran's recent capability development efforts in building a long-range strike regime constitute the core threat. Its acquisition of the Su-35 air-superiority fighters from Russia, married to mushrooming underground basing architecture is a complicating factor. A response to this evolving threat landscape would be to enhance the core capabilities of the only allied nation bordering Iran. Boosting Turkiye's ongoing ballistic missile program is a non-starter due to the Missile Technology Control Regime restrictions. There are two areas for improvement: The F-16V modernization (since a quick return to the F-35 is not politically feasible), as well as fostering Turkiye's anti-ballistic missile capabilities, including exo-atmospheric interception edge.

Iran's Rising Long-Range Strike Regime: Missile Warfare and Drone Warfare Capabilities

At present, there are two possible ways that Iran can direct threats to Turkish national security. The first challenge stems from militancy through Revolutionary Guards-harvested paramilitaries in Syria and Iraq, as well as the PKK terrorist network as a useful proxy. Iran boldly played the militancy card to hamper the Turkish military's Syria expeditions to date.

The second categorical challenge revolves around Iran's burgeoning aerial and missile warfare prowess that this paper focuses on.

Iran's Missile Warfare Sets the Bar High

Over the last two months, the Islamic Republic has unveiled two important missiles, Khorramshahr-4 and Fattah, both capable of targeting NATO territories in Europe. More importantly, these systems manifest the sophistication of Iran's design and manufacturing capabilities, while showcasing the future trajectory of the Revolutionary Guards' missile proliferation efforts.

Based on the North Korean nuclear-capable, intermediate-range ballistic missile Musudan, the Khorramshahr baseline is a product of the defense cooperation between Pyongyang and Tehran. The Khorramshahr-4 marks a new and more dangerous episode in the Iran missile challenge. The challenge is multi-faceted, emanating from a set of interrelated technological aspects. It is a troublesome threat across the spectrum.

According to initial technical assessments, the missile can accelerate up to Mach-16 and re-enter the atmosphere at Mach-8. A group of small vernier engines attached to the missile's re-entry vehicle allows exo-atmospheric course correction

for the warhead. With the lethal combination of very high velocity, exo-atmospheric flight regime with course correction features, and improved maneuverability, the Khorramshahr-4's design philosophy does not bode well for existing upper-layer missile defenses in the Middle East, such as the Arrow family and the US THAAD system. When flying at high speeds in the exo-atmospheric flight path, even small shifts in the course would translate into erratic deviations in the final trajectory of the missile.

The warhead design of the Khorramshahr-4 contains sub-munitions that would home onto the target area at hypersonic speeds upon entering its final phase. The IRGC Aerospace Forces Commander General Ali Hajizade unveiled the system, claiming that the missile will strike the adversary by destroying 80 targets at a time – referring to the number of sub-munitions in the warhead. While the number was probably exaggerated, a hypersonic rain down of submunitions would stress principal endo-atmospheric defenses, such as the Patriot variants, which form the second line after the exo-atmospheric interceptor air and missile defenses.

Khorramshahr-4 has a shortened launch cycle thanks to its advanced fuel technology. While the Khorramshahr baseline is a family of liquid-propelled missiles, the latest variant of the line, Kromsahr-4, uses hypergolic fuel. Hypergolic fuel technology requires smaller tanks compared to legacy liquid missile fuels, which translates into less space needed in the motor section. But there is a more important advantage it can provide. The hypergolic fuel configuration will drastically shorten the launch preparation cycle of the Khorramshahr-4, with some writings estimating around only 12 minutes. This addresses a fundamental setback of liquid-propelled missiles. A shortened launch cycle would be tantamount to a more pressing surprise strike by decreasing the early-warning time elapsed with preparations before the missile launch.

The other threat is the Fattah. Portrayed as a hypersonic missile by Iranian sources, the Fattah travels at speeds between Mach 13 and 15. It has 1,400 kilometers of operational range.

In essence, the Fattah is the recent variant of Iran's solid-propellant Fateh-110 / Fateh-313 / Zolfaghar / Hajj Qassem baseline of solid-propellant missiles. The Revolutionary Guards have been actively combat-deploying the baseline since the Deir ez-Zor strike in Syria in 2017. Most likely, the Fattah's maneuverable reentry vehicle is what made the Iranians portray it as a hypersonic weapon – as the system in question does not fall into the existing hypersonic flight regime segments of glide vehicles or endo-atmospheric hypersonic flight-capable cruise missiles –. Apart from ballistic missiles, Iran has an ambitious cruise missile proliferation program too. Strategic systems, such as the Soumar missile derived from the Soviet-Russian Kh-55 missile, and shorter-range tactical systems, such as the Quds-1 that saw their combat debut in the Middle East, loom large as potent threats.

Turkiye as NATO's Defense Wall Against Iranian Missiles

Over the years, Iran has built a formidable missile arsenal at NATO's doorstep. At present, Iranian missile proliferation efforts have successfully crossed a critical threshold, as showcased by the Fattah and Khorramshahr-4 cases.

Western writings often consider Iran's hostile missile proliferation a primarily Middle Eastern threat, directed at the Gulf Arab states and Israel. Turkiye, nevertheless, is a frontier for NATO buffering potential Iranian aggression. After all, the Iranian Revolutionary Guards threatened Ankara numerous times in the past when the latter decided to host critical NATO ballistic missile defense components.

Turkiye hosts an integral part of the Allied missile defense architecture of the Alliance, the AN/TPY-2, forward-deployed X-band radar in Kurecik, Malatya. The radar is located some 500 kilometers from Iran.

The system remains at the very heart of NATO's ballistic missile defense architecture, together with already placed and planned ashore interceptor systems in Romania and Poland. From a military viewpoint, the combat efficiency of the Aegis Ashore in protecting NATO nations would rely on engaging-on-remote (EOR) capability. In this network-centric approach, ballistic missile defense batteries do not require to solely use their 'organic' radars to receive data to intercept incoming threats. Rather, the interceptors can utilize target information cued by different sensors, situated in more advantageous positions to track the opposing force's missiles. Due to the position of the system, a Europe-bound ballistic missile launched from Iran could not go undetected through the Turkiye-deployed radar. More importantly, without the AN/TPY-2 X-band radar in Turkiye, other Europe-deployed missile defense sites would have a significantly degraded capability to protect the Allied territory and populations.

Iran's Rising Long-Range Strike Regime and Its Drone Warfare Systems

In its 2019 'Iran Military Power' report, the United States Defense Intelligence Agency concludes that aerial drones make the most rapidly advancing air power capability of the Islamic Republic. Iran's drone warfare programs are rapidly transitioning from ISR (intelligence, surveillance, and reconnaissance) platforms to strike capabilities. This marks a valuable telltale indicator showcasing the trajectory of Tehran. The Mohajer baseline is a solid example of the transition trend. Mohajer-1, the first member of the family, saw its combat debut back in 1986 during the Iran – Iraq War. Its main duty was monitoring the Iraqi positions. At the time, only a few Mohajer UAVs were modified to carry RPG-7 munitions with limited combat efficacy. Later on, the early variants of the Mohajer family flew ISR sorties over Afghanistan, the Strait of Hormuz, and Iran's Sistan and Baluchistan

provinces. The most recent variant, Mohajer-6, however, is a textbook strike asset. In the absence of adequate deterrents in place, Iran has already become a combat drone supplier to the world's second-largest arms exporter, the Russian Federation. Geopolitically, this manifests the Islamic Republic as both an eastern and southern challenge to NATO. At present, Iran's drone and missile proliferation edge stands on the eve of passing a critical threshold. Lessons-learned from Yemen and Ukraine now offer an unprecedented accumulation of defense technological and military doctrinal input to the Revolutionary Guards.

Tehran has established a competent defense technological and industrial base (DTIB) boosting its long-range capabilities. At the top of the drone warfare assets manufacturing pyramid, there sit state-owned giants, such as the Iran Aircraft Manufacturing Industries and the Quds Aviation Industries, which are directly connected to the Ministry of Defense and Armed Forces Logistics. To spark inter-agency competition, the Revolutionary Guards have supported the establishment of associate companies, such as Oje Parvaz Mado Nafar Company (the MADO Company), Paravar Pars Company, Fajr Aviation and Composites Industry, and Shahed Aviation Industries. The latter, for example, provides the Russian military with the infamous Shahed-131 and Shahed-136 (Geran-1 and Geran-2) loitering munitions frequently used in the ongoing invasion of Ukraine.

It would be wrong to assume that Iran has been developing missile and drone warfare capabilities just because its defense economics and supply network cannot sustain a modern air force. Iran's drones and missiles are doing a doctrinally different job than manned aircraft. These assets are designed, and merged within doctrinal consistency, to function as the Revolutionary Guards' long-range strike regime.

From the 2019 Aramco attack to the proxy Yemeni missile and drone warfare campaign against the United Arab Emirates and Saudi Arabia, Iran and its proxies are developing mixed strike packages, combining ballistic and cruise missiles as well as loitering munitions and combat drones. Using these assets with drastically different characteristics and trajectories overwhelm not only interceptors but also sensor architectures. On January 17th, 2022, for example, the Iran-backed Houthi militia of Yemen launched a sensational attack on the United Arab Emirates (UAE). Open-source intelligence suggests that a mix of Sammad-3 drones with explosive warheads, Quds-2 cruise missiles, and at least one Zolfaghar ballistic missile targeted the Musaffah oil refinery, Abu Dhabi Airport, and Dubai Airport. In a subsequent round, on January 24th, al-Dhafra Airbase was also targeted. Iranian military planners have been drilling extensively to integrate ballistic missiles, cruise missiles, loitering munitions, and unmanned aerial systems (UAS) within the same strike packages to execute complex offensive missions. Tehran's doctrinal approach to the operational merger of missile warfare and drone warfare assets is also visible in the Revolutionary Guards' propaganda activity. Televised by the

state outlets, Iran's critical facilities were seen hosting both unmanned systems and missiles together in subterranean settings protected by tunnel complexes carved in the mountains. Furthermore, the Artesh (Iran's conventional military), which generally takes a back seat in employing high-end weaponry in contrast with the IRGC, has recently been developing cruise missile and combat drone capacity as well.

With its defense technological and industrial base reaching a dangerous level of maturation in producing offensive weapons Iran has acquired the capability to support a thorough, long-range strike regime.

The Iranian Air Warfare Deterrent is Getting Stronger: The Su-35 and Eagle-44

Apart from missiles and drone warfare systems, the Iranian military capacity development efforts have also extended to advanced Russian combat aircraft. Taking advantage of the Kremlin's growing reliance on low-cost Iranian drones for its invasion campaign in Ukraine, Iran has opportunistically secured a noteworthy procurement. The Iranians are now set to receive dozens of Su-35 aircraft. Concerning Iran's obsolete air warfare arsenal, and the fact that Iran has not concluded any major combat aircraft procurement for decades, the Su-35 is a very strategic leveler for Tehran. At present, Iran has not yet received its Su-35 fleet. It is possible that the Russian government would consider the Israeli response before finalizing the deal. Nevertheless, the deal is in progress and the delivery within this year is not beyond the realm of possibility.

The Su-35 is a Russian 4,5th generation air-superiority fighter, hailing from the Flanker baseline. Compared to the ancestor of the Flankers, the Su-27, the platform in question enjoys a better thrust-to-weight ratio. The Su-35 is super-maneuverable, meaning that it is capable of performing controlled maneuvers that would otherwise be impossible via regular aerodynamics. The Su-35's thrust-vectoring engines, the nozzles of the Saturn AL-41FS turbofans, are capable of independently pointing in different directions, allowing the platform to pursue very high angles-of-attack. This kinematic feature makes the Su-35 capable of moving in one direction when its nose points to another.

The aircraft enjoys potent agility and Mach 2,25 maximum speed. The R-73 missiles, which Iran will probably buy alongside, can be fired "off-boresight" at enemy platforms outside the frontal cone of the aircraft via helmet-mounted sights. This weapon system configuration would enable at least seventy percent kill probability. Overall, the Su-35 is a beast at within-visual-range air warfare.

One should not take the Su-35 lightly in beyond-visual-range combat either. The aircraft's passive electronically scanned array (PESA) Irbis-E radar is highly

powerful. The official factsheet claims that the Irbis-E radar's detection range is between 350 and 400 kilometers for a target with a 3m2 radar cross-section which is comparable to a standard fourth-generation fighter with no low-observability features. The Su-35's radar configuration and the digital cockpit provide the pilot with good frontal-aspect awareness. The Irbis-E radar supports 'track-while-scan' (TWS) mode for up to 8 targets in long-range air combat. The TWS mode offers a trade-off between lower resolution (due to limited radar energy directed at targets) and being able to engage multiple targets at a time. Lessons learned from the ongoing air war in Ukraine showcased that when the Russian Su-35s launched R-77-1 beyond-visual-range (BVR) missiles, supported by the Irbis-E radar's TWS mode, the Ukrainian pilots did not receive any warning from their radar-warning receivers (RWR) for a long duration. This concept of operations is problematic for any 4th generation aircraft. While relying on TWS decreases the chances of a kill compared to single-target-track, it surely puts overwhelming pressure on the adversary within a large air theater.

Finally, Iran is not only buying the Su-35 aircraft from Russia. Probably in cooperation with Pyongyang, the Revolutionary Guards are building underground bases, like the Eagle-44, for the aerial and missile warfare deterrents of the country. Together with advanced offensive capabilities revolving around missiles and loitering munitions, underground basing and the Su-35 air-superiority fighter bear the potential of transforming Iran's military outlook at large.

Turkiye faces three chief predicaments in its military capacity that prevents it from counterbalancing Iran's long-range strike regime and disruptive military capabilities. First, Turkiye's ballistic missile program, self-restricted by the Missile Technology Control Regime, cannot match Iran's offensive missile warfare prowess. Second, while Turkiye's indigenous surface-to-air missile (SAM) systems have been on the right track, anti-ballistic missile capacity is a different ballgame that Turkiye needs collaboration. And third, the existing F-16 arsenal of the nation, especially in the absence of the F-16 Viper modernization package, will face its fair share of troubles against the Iranian Su-35s, should Iran manages to receive them.

Below, the paper concludes its defense technology findings for each abovementioned segment.

The Offensive Countermeasures Gap

Although Turkiye has a rising ballistic missile program, in terms of range, it cannot match Iran's profound arsenal, the largest in the Middle East. Being restricted by

the Missile Technology Control Regime, Turkiye cannot follow the Saudi way and off-the-shelf procure long-range ballistic missiles either. A closer look at Turkiye's ballistic missile deterrent explains the abovementioned geopolitical calculus.

Turkiye has already developed two short-range ballistic missiles, Bora and Tayfun. The nation's first medium-range ballistic missile, Cenk, is still underway. The Bora baseline (Khan as the export variant) has long formed the epicenter of Turkiye's missile proliferation.

Bora is a road-mobile missile that carries a 470 kg high-explosive warhead, has an operational range of around 280 km, and is reported to have a CEP (circular error probable) of down to 10 meters with all guidance options available. If true, this would make the missile one of the precise assets in its class. Bora saw its combat debut in May 2019 during Operation Claw in Northern Iraq. A road-mobile (enables better survivability on the battleground), solid-fuel (minimizes the launch cycle, supporting launch at short notice) tactical ballistic missile, carrying half a ton of high-explosive warhead with precision strike capability within 280 kilometers represents a solid warfighting performance at tactical settings. Still, Bora is not a strategic weapon system that can match the Iranian missile prowess.

Building on the lessons learned and the accumulated technical know-how from Bora, Roketsan developed the short-range ballistic missile (SRBM) Tayfun. The missile comes with an improved range of around 580 kilometers, more than double the range of its predecessor Bora. According to official sources, Tayfun successfully completed its test-fire off the Black Sea coast in October 2022. The missile was launched from a mobile naval platform and traveled an impressive distance of 560 kilometers before it hit the target area. Nevertheless, like Bora, Tayfun cannot be an offensive deterrent to counter the Iranian missile threat either.

Some sources claim that with a range of around 1,000 kilometers, Cenk will be Turkiye's first medium-range ballistic missile (MRBM), and probably the first two-staged missile. Publicly available information on the Roketsan-made missile remains limited. Still, Turkiye lags well behind Iran when it comes to medium-range ballistic missile proliferation too.

All in all, Iran has the upper hand against Turkiye in the ballistic missile segment due to three core reasons. Above all, Tehran can target anywhere in Turkish territory thanks to its missiles' range. Turkiye cannot do the same to Iran. Besides, Iran has more than 180 missile launchers dispersed over its territory. The Turkish ballistic missile acquisition, on the other hand, is still pursuing early steps with a limited number of launchers and launch sites. Finally, Iran, over the years, has developed a unique long-range strike regime with the involvement of mixed strike packages. Unlike the nation's vast know-how in drone warfare, Turkiye's missile warfare operations are still in progress in terms of battlefield record and CONOPS derived from real combat experience.

The Aerial Warfare Gap in the Making

In the air defense segment, Turkiye's DTIB has been fast overcoming the SAM challenge. The layered HISAR family will offer full protection against conventional air threats in the 2020s. While the short-range HISAR-A+ is designed against targets within a 15–20-kilometer range, the HISAR-O+ intercepts targets within a 25 kilometers range.

The most sophisticated variant in the family is SIPER. The long-range air defense system comes with an effective range of 150 kilometers. SIPER completed its final tests in May 2023, hitting its target with full precision. Praising the system as the "guardian of the Turkish skies," the nation's defense officials argue that SIPER has addressed the need for foreign alternatives such as the S-400, filling an important gap in Turkiye's security agenda.

The anti-ballistic missile tasks, however, continue to be a shortcoming. Thus, intrawar deterrence – namely, controlling the escalatory patterns within an ongoing conflict – is likely to stay as a chronic problem of Ankara's defense posture. Turkiye's lack of capabilities in anti-ballistic missile systems, married to the absence of a credible offensive strategic weapon systems deterrent, remains the chief reason for this gap. In the face of ballistic missiles and weapons of mass destruction proliferation in the Middle East, Turkiye still needs Western cooperation and the NATO umbrella in anti-ballistic missile roles, especially in exo-atmospheric interception. Iran, after all, enjoys robust offensive strategic weapons that can target critical national infrastructure, major population centers, and high-value military facilities deep inside Turkish territory. Detection of a missile launch in the initial stages of an attack, which requires advanced satellite and sensor capabilities, is yet another area of Turkiye's reliance on its NATO allies.

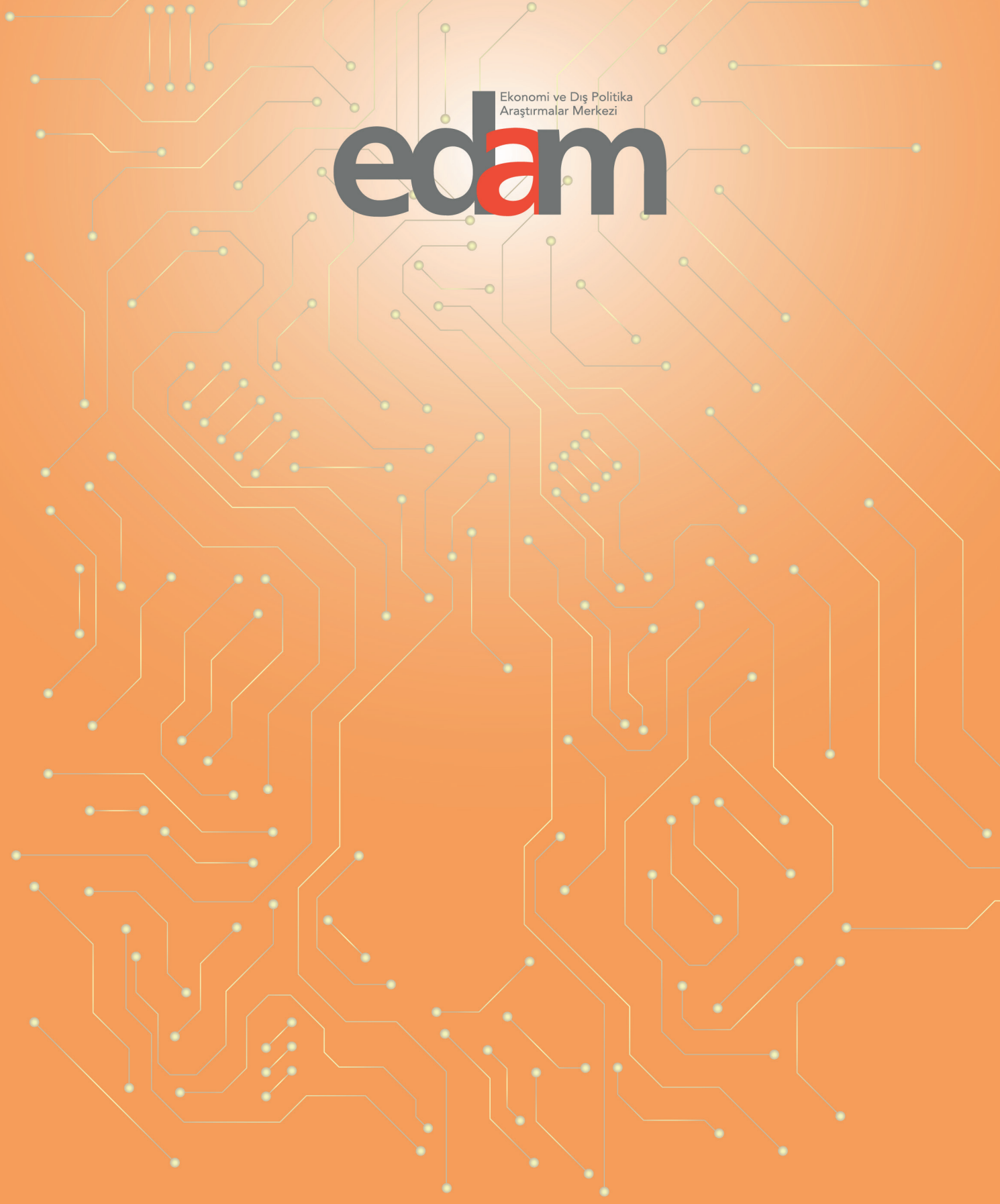
In addition to the NATO capacity the answer to closing the intrawar deterrence gap via defensive strategic weapon systems could be provided by a European solution, the SAMP/T baseline of EUROSAM.

Finally, the Turkish Air Force is facing a severe technological crisis. At a time when its NATO allies are shifting to the 5th generation tactical military aviation through the F-35 procurements, and at a time when Iran is potentially equipping itself with the Russian Su-35 combat aircraft, the Turkish Air Force still flies the older variants of the F-16 baseline.

Türkiye's opportunity to land the F-35 was forfeited after acquiring the Russian S-400 system. This development has squandered Turkiye's chances of flying a fifth-generation air force by the mid-2020s. Worse, the Turkish indigenous combat aircraft project, KAAN, will take at least one decade to enter the arsenal in meaningful numbers. Turkiye will fly the initial batch of the baseline with off-the-

shelf bought engines while hoping to develop an indigenous engine for later batches.

Available writings suggest that the F-16, especially without an AESA (active electronically scanned array radar) radar upgrade, cannot surely match, let alone outclass, the Su-35 in an aerial duel. There are two AESA-upgraded F-16 variants, the Emirati F-16 Block 60 with its AN / APG-80 radar, and the most recent Viper upgrade, F-16V with the AN/APG-83 radar. Along with other upgraded features, the F-16V modernization seems the only way forward for the Turkish Air Force to keep its upper hand against the Iranian air deterrent – noting that return to the F-35 Joint Strike Fighter would not be possible under current circumstances with the S-400 remaining unresolved.



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