Defense and Security

AT THE FOUNDATIONS OF EUROPEAN DETERRENCE

A CIRCUMSCRIBED CAPABILITY ANALYSIS

DECEMBER 2025

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Focus report by

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Introduction

Russia's war of aggression against Ukraine, launched on 24 February 2022, has vividly reasserted the possibility of a large scale, high intensity conventional conflict on European soil. The sheer mass of equipment, materiel and weapon systems deployed, employed and lost by both belligerents; the volume of ammunition of every type, calibre and range expended; as well as the enormous rate of human and material attrition endured by both sides, combined with the catastrophic level of destruction generated by nearly four years of hostilities, have demonstrated, beyond any reasonable doubt, the fundamental importance for European countries of possessing an adequate military instrument for deterrence and defence. The Russian invasion and the violent continuation of the fighting taking place just beyond the eastern flank of the Atlantic Alliance, together with what now appears to be an increasingly articulated hybrid campaign against its Member States, have underscored the tangible nature of the threat posed to the security of the Old Continent by a severely deteriorated strategic environment, marked by competitive dynamics and prone to conflict escalation.

In this context, the in depth analysis of the lessons identified and learned from the Russo-Ukrainian battlefield, essential for updating the doctrine, organization, capabilities and technologies of European Armed Forces in order to address new potential operational scenarios, and in particular the return of high intensity conventional warfighting, has been complemented by a positive and significant reassessment of the crucial enabling role played by a European Defence Technological and Industrial Base (EDTIB) capable of innovating and producing rapidly and at scale. These are two intimately complementary adaptation processes, essential for renewing a continental military-industrial sector that, as a whole, has for over thirty years been sized and oriented to the planning and conduct of low intensity out of area missions, at most against asymmetric opponents. However, due to financial, industrial, acquisition, and training factors, these processes tend to require extended timelines, thereby necessitating an assessment of the potential readiness of a European military apparatus to deter, and, as

an extrema ratio, to delay, halt, and repel hostile acts of limited duration and scope by a peer competitor.

The industrial mobilization toward a wartime economy implemented by the Russian Federation to support the war effort in Ukraine provides indeed all the conditions for Moscow to rebuild, within three to five years, a combat power reinforced by the significant operational experience gained over four years of hostilities, suitable for sustaining local offensive operations against limited objectives within what the Kremlin perceives as its Western strategic periphery. This possibility, if coordinated with Russia's reiterated willingness to challenge and test Euro-Atlantic resolve through active measures, including misinformation, disinformation, cyberattacks, suspicious overflights of critical infrastructure, sabotage, and blatant violations of allied airspace, is far from marginal. In this scenario, the explicit strategic posture review long underway in the United States, primarily focused on the Indo-Pacific region and the near continent security of the Americas, makes the European segment of Atlantic deterrence even more critical.

Nevertheless, the prospect of a military confrontation with a peer competitor entails capability requirements suitable for disrupting and degrading the main components of the adversary's overall combat power. Likewise, denying and interdicting enemy capabilities, particularly in the initial phases, would be vital for the conduct of subsequent operational stages. In the specific case of NATO's European members, the most concrete and plausible territorial-proximity threat to integrated security is represented by an actor capable of projecting military capabilities heavily centred on the predominant employment of land forces. As a result, it is assumed that the adversary would possess an overwhelming quantitative superiority in this domain, to which the response, from a doctrinal standpoint, would unfold in accordance with the tenets of Air-Land Battle and its subsequent evolutions, which are characterized by the tactical centrality attributed to the air domain. According to this approach, the best chances of success lie in restoring air superiority, which enables the operational denial of the adversary (A2/AD – Anti-Access/Area Denial), and then exploiting the resulting advantage to conduct long range strikes deep into enemy territory, neutralizing High Value Targets (HVT).

A realistic assessment of capability requirements, based on current doctrinal paradigms and applied to a potential air-land engagement against a peer competitor, together with the most informed possible comparison between them and the qualitatively and quantitatively measurable combat power currently deployable by European Armed Forces, makes it possible to identify areas of shortfall or excessive dependence on U.S. military assets. The purpose is to highlight those domains in which existing delays should be addressed as a priority within the broader process of updating and strengthening Europe's deterrence and defence posture. With this aim in mind, the present Focus Report concentrates specifically on the set of capabilities that enable the imposition of an uneven confrontation on the adversary, allowing for its dislocation and degradation prior to close-contact manoeuvre and contributing in shaping the battlespace to the advantage of friendly forces.

I The requirement of information superiority

A detailed, real time understanding of the adversary's military apparatus and intentions constitutes a fundamental prerequisite for planning and conducting operations. In this context, the ability to access, operate, and exploit the space domain assumes a primary role, as it enables not only secure communications via military satellite systems (SATCOM – Satellite Communications) but, above all, a substantial increase in the depth and continuity of intelligence collection. From this perspective, satellites serve as exemplary stand-off enablers, allowing for the reconstruction of a comprehensive understanding of the adversary's military and infrastructural assets (IPOE – Intelligence Preparation of the Operational Environment). Considering this, the 47 satellites currently in orbit operated by NATO's European members are predominantly divided between 20 systems with SATCOM capability and 24 satellites for Intelligence, Surveillance, and Reconnaissance (ISR).

Figure 1 - Military satellites used for stand-off intelligence gathering and for communications in a conflict area.

There is also a marginal component of three platforms dedicated exclusively to signals collection and analysis (SIGINT – Signal Intelligence), and in particular electronic emissions (ELINT – Electronic Intelligence). An analysis of NATO's overall satellite capabilities, however, reveals a significant contribution from the United States,

which individually operates a number of dedicated satellites five times greater than that offered by the European allies. This shortfall is driving the acceleration of European industrial activation processes, promoting various national and multinational programs aimed at meeting future space domain requirements.

Figure 2 – Tanker aircraft engaged in flight refuelling.

While information collected through ISR systems in general, and SIGINT and ELINT in particular, deployed in space serves as a functional precursor for the initial planning of operations and as a support to their conduct, these systems also contribute in shaping the IPOE in subsequent phases, alongside numerous other systems employed for intelligence collection in the air domain. Unlike satellites, however, airborne platforms often operate their sensors in a stand-in mode, i.e. in relative proximity to the battlefield, thus being exposed to risks arising from enemy action and electromagnetic spectrum interference. Within this context, the airborne assets available to NATO European countries can be distinguished between platforms specifically developed for ISR missions and multirole aircraft that can be configured for ISR through dedicated payloads, albeit with substantial operational limitations in terms of sensors and collection endurance. Dedicated platforms, although more capable, are limited in number and predominantly consist of Unmanned Aerial Vehicles (UAVs) rather than

crewed aircrafts. As a matter of fact, the approximately 47 crewed aircrafts are complemented by a fleet of several hundred UAVs of varying sizes. These UAVs, however, exhibit a marked capability divide between short range ISR assets and medium to long range systems, with the latter facing greater employment criticality.

In this respect, NATO European Countries possess a limited number of aircraft, approximately 149, compared to the Alliance's overall capacity, which includes roughly 1,050 U.S. aircrafts. The significance of these figures is further highlighted by the fact that remotely piloted aerial systems capable of target detection and engagement during Medium-Altitude (MALE) and High-Altitude Long Endurance (HALE) flights are particularly suited to conduct counter-intelligence operations (C-ISR – Counter-ISR), which enable the neutralization of adversary acquisition capabilities. The UAV inventories of the European countries in these categories amount to approximately 67 systems, compared to about 421 deployable by the U.S. Armed Forces, and reveal an almost complete absence of operational HALE assets.

Figure 3 – Tornado ECR engaged in Suppression and Destruction of Enemy Air Defenses activities.

Despite this, European initiatives aimed at strengthening unmanned ISR and C-ISR fleets are noteworthy, including the European program for the development of the MALE Eurodrone (20 systems ordered, totalling 60 drones) and numerous procurement and modernization activities

related to current fleets, focused on variants of the U.S. *MQ-9 Reaper* and the Turkish *Bayraktar TB2* and *Akinci* drones.

Within the IPOE framework, highly specific stand-in SIGINT and ELINT activities also assume significant importance, as they enable the reconstruction of the Electronic Order of Battle (EOB) during hostilities, providing an updated tactical picture of the adversary's force disposition and command and control (C2) capabilities. Such information is highly valuable, as it enables Early Warning and Target Acquisition (EW/TA) functions, supporting tactical and operational planning for Allied air and ground components. This highlights the need for an adequate inventory of airborne platforms primarily specialized in SIGINT and ELINT activities. Currently, however, this capability is limited to only nine operational aircraft and is inevitably dependent on approximately 71 dedicated U.S. assets. Nevertheless, consistent with the renewed dynamism of the European military-industrial sector, development continues for the introduction into service of several specialized platforms, including the Hensoldt *PEGASUS* and Dassault *Archange*, which are expected to become operational over the next three years.

The natural evolution of the confrontation would then extend into the realm of Electronic Warfare (EW), whose employment has repeatedly proven decisive in disabling enemy assets in the context of the Russo-Ukrainian war. Among NATO's European countries, this capability can be provided both by platforms specifically designed for EW missions, of which only about 38 aircraft are currently in service, and by assets equipped with complementary EW functionalities, whether integrated or supplied through external systems such as EW pods for multirole aircraft and EW payloads for tactical transport aircraft, including the Leonardo EC-27J Jamming and Electronic Defence Instrumentation (JEDI). Overall, although numerous aircraft in service within European NATO states are compatible with the aforementioned configurations, current data indicates that only three Countries possess the necessary modular systems, specifically those related to the ECM AN/ALQ-131 type. Enhancing this capability spectrum is the *F-35 Lightning II*, which integrates by design high performance electronic attack and protection systems, ensuring significant multirole and multi-mission employability. At the same time, within the European market there is a growing

demand for aircraft designed and specialized for the conduct of electronic warfare. However, considering the gradual retirement of Italian and German *Tornado ECRs*, concerns arise regarding the direction taken, which appears oriented more towards the quantitative replacement of these assets than towards enlarging existing fleets.

Figure 4 – F-35 aircraft engaged in adversary airspace penetration activity.

II The pursuit of air superiority

The transition from IPOE to battlefield shaping then gives rise to additional specific enabling capability requirements for three dimensional control of the battlespace. Platforms capable of performing early warning and air control functions (AWACS – Airborne Warning and Control System), based on long range airborne radar sensors integrated with advanced C2 suites, are instrumental in achieving effective situational awareness, multi-domain coordination, as well as in performing threat tracking and identification. Due to the extreme specialization of these aircrafts, the European allied States collectively operate only 25 deployable platforms of this kind. In an integrated perspective, it should be noted that the United States maintains a fleet three times larger, part of which is under NATO control and therefore shared among allies. Similarly, multiple and massive air sorties in a selective targeting scenario require substantial logistical and operational support, which can be provided by tanker aircrafts. The European shortfall in this segment is consistent with and inherent to the traditional structure of its National Air Forces. Continental security geography, combined with the type of missions and operations traditionally conducted by European Armed Forces, has never required a particularly extensive power projection capability. In contrast, the U.S.

Figure 5 – An AWACS aircraft being refuelled mid air during the execution of its activities.

Air Force has a fleet of refuelers three times larger than the combined total of equivalent platforms operating globally. This directly stems from the United States' structured presence across all global regions, consolidated over several decades and characterized by recurring operations far from national territory.

In detail, overall European availability amounts to just over 41 tanker aircrafts, including tactical transports configurable and adaptable through dedicated kits. This results in a significant constraint on the number of sustainable air sorties, with a potential impact on the volume of fire that can be projected in high-intensity warfighting scenarios. The consequent shortage of operational persistence would therefore require air strikes to be concentrated within narrow time windows, reducing operational tempos and potentially undermining the ability to impose initiative on the adversary. The staggered scheduling of air sorties would thus require extensive reliance on nearby airfield infrastructures, where the disruption of rear-area support would damage or invalidate the close logistics needed to sustain them. In this perspective, the implementation of distributed employment procedures, including operations from semi-prepared airstrips, and the simultaneous reinforcement of airfield protection acquire paramount importance.

Parallel to long-endurance flight capabilities, a second decisive component for supporting sortie generation is the availability of aerial munitions. This component is particularly relevant for ensuring an intense and sustained fire capability from the third dimension, which is essential to effectively disrupt and degrade the adversary's military apparatus. The legitimate confidentiality maintained by individual Countries regarding the actual numerical composition of their arsenals prevents the development of a fully transparent and realistic picture, although it is possible to infer that these stockpiles are likely inadequate to sustain the consumption rate imposed by high-intensity warfighting. Historical precedents have already highlighted similar shortcomings, as occurred during Operation *Odyssey Dawn* in Libya in 2011, when several European countries were forced to reduce the number of air sorties due to shortages in guided munition stockpiles. Despite this, the mobilization of the European military-industrial sector is moving toward

an expansion of the production capacity for munitions and strike systems, aimed at meeting the new requirements of the Armed Forces in the medium to long term.

With regard to the specifications of the munitions and weapon systems present in continental arsenals, it is nevertheless possible to draw several considerations on the state of interoperability among the European NATO Countries. First, concerning air-delivered bombs, a predominant presence of laser-guided systems can be observed, followed by satellite/inertial-guided systems (GPS/INS) and hybrid (laser and GPS/INS) systems, while only one Country employs electro-optically guided munitions. Specifically, among laser-guided assets, *Paveway* ordnance constitutes a significant share, with the *GBU-10*, *GBU-12*, *GBU-16 II* and *GBU-24 III* being the most widely adopted, for a total of 24 user States. In parallel, among GPS/INS-guided systems, a leading role is played by the *Joint Direct Attack Munitions* (JDAM), which are reported as being widely held in the *GBU-31* (6 Countries) and *GBU-38* (4 Countries) variants. In addition to these, *GBU-39 Small Diameter Bombs* (SDB) and *AGM-154 Joint Stand-Off Weapons* (JSOW) are also quite widespread, in service respectively in 4 and 2 States. Among hybrid systems, the most widely adopted type is the *GBU-54* Laser JDAM, employed by 4 Countries. Alongside these eight categories of ordnance, however, there is a heterogeneous set of at least 17 additional strike vectors, each operated by individual States. From this perspective, the composition of European arsenals reveals a marked variety which could negatively affect the interoperability of different air platforms. Likewise, continental missile arsenals display significant diversification in their constituent systems. Among InfraRed-guided (IR) and Imaging InfraRed-guided (IIR) air-to-air missiles, the various *AIM-9 Sidewinder* variants (used by 15 Countries) and the *InfraRed Imaging System Tail-Thrust Vector Controlled* (IRIS-T) missiles (in service in 6 Countries) are widely employed. Similarly, regarding Active Radar Homing (ARH) and Semi-Active Radar Homing (SARH) air-to-air and air-to-surface missiles, inventories tend to concentrate on different variants of a limited number of systems: specifically, the *AIM-120 Advanced Medium-Range Air-to-Air Missile* (AMRAAM) and the *Meteor* in the ARH category, and the *AIM-7 Sparrow* in the SARH category.

In the broader segment of air-to-surface systems, the various *AGM-65 Maverick* and *AGM-114 Hellfire II* missile variants predominate, adopted by 7 and 6 States respectively. Overall, the same heterogeneous landscape observed for air-delivered bombs is reflected in missile inventories, which comprise an additional 19 different types of strike vectors, each operated by a small number of Countries. This results in a fragmented military posture that affects those tactical air-operation capabilities that are crucial in the early stages of a confrontation, such as the Suppression and Destruction of Enemy Air Defenses (SEAD/DEAD). These missions enable the shaping of the battlespace by selectively neutralizing enemy air and missile defenses, specifically the entire network of sensors, including fixed and mobile radars, and the kinetic effectors consisting of surface-to-air missile (SAM) launchers. The execution of such tasks requires the employment of Anti-Radiation Missiles (ARM), which, however, are scarcely present in European inventories, with only 4 Countries possessing them.

Figure 6 – A Tornado in flight, armed with air to surface cruise missiles.

SEAD/DEAD roles can also be reconfigured through a capability decomposition in which ELINT platforms identify targets and then relay the information to strike aircrafts tasked with conducting attacks using conventional munitions. This approach, however, lengthens the kill

chain, increasing the exposure of a larger number of platforms crociera to enemy fire.

At present, European States would be able to deploy a dedicated fleet of just over 30 *Tornado ECR* aircrafts, specialized in SEAD/DEAD missions, to which must be added a large number of multirole aircraft such as the *F-16 Viper*, *Eurofighter Typhoon*, *Dassault Rafale*, *Mirage 2000D*, *F/A-18 Hornet*, *F/A-18E/F Super Hornet* and the *F-35 Lightning II*. Configuring these airplanes with EW pods, dedicated sensors and anti-radiation missiles would indeed allow SEAD/DEAD missions to be distributed among platforms originally conceived for other operational roles. Among the aircrafts mentioned, the principal asset suited for these functions is the *F-35 Lightning II*, equipped with high-end stealth characteristics and an integrated top-tier sensor suite, which is also undergoing upgrades enabling it to employ advanced ARMs such as the *AGM-88G Advanced Anti-Radiation Guided Missile – Extended Range* (AARGM-ER). Overall, however, the limited number of aircrafts natively dedicated to SEAD/DEAD remains a significant shortfall for European NATO Countries and constitutes a capability gap compared to the United States, which possesses a fleet of more than 150 *EA-18G Growlers* specifically developed for these missions.

III Maximizing the operational value of the air domain

Following the suppression and degradation of the adversary's air defence system, conditions would be created to conduct Air Interdiction (AI) operations, primarily aimed at striking the enemy or disrupting activities carried out in the depth of their territory, in order to hinder their advances and the subsequent ability to transfer firepower along the Line of Contact (LoC). The aircrafts best suited for these tasks are strike fighters and multirole aircraft, appropriately configured for ground-attack missions and featuring reduced observability, allowing penetration and evasion of enemy air defences, including any still-operational SAM batteries. Quantitatively, European NATO Countries possess a significant fleet of approximately 1,161 specialized aircraft, yet this represents an undersized proportion compared to the 2,500 platforms of the same category fielded by the United States. While the numerical disparity is generally manageable, the qualitative divergence is more pronounced. Indeed, the NATO Countries analysed are able to deploy only 158 fifth-generation aircrafts (all *F-35* variants), compared to the more than 700 in the United States' inventory.

At the same time, it is important to highlight that the success and effectiveness of AI operations also depend significantly on other factors, such as the composition of munitions stockpiles, the availability of an adequate number of aerial tankers, and the presence of a widespread ISR capability, both at close-range and at the theatre level, for locating and validating targets to be struck. To this framework must be added the role of Airborne Control assets, which make a substantial contribution in directing air incursions, enabling reduced use of onboard radars by the aircraft involved in the attacks and consequently limiting their exposure to enemy countermeasures. This set of factors influences not only the conduct of AI activities but also that of Offensive and Defensive Counter-Air operations (OCA/DCA), aimed at neutralizing the adversary's air and missile potential, including launch platforms and related infrastructure. These operations pursue two complementary objectives, but together serve to achieve and maintain air superiority; indeed, while OCA seeks the preventive destruction of enemy assets or their destruction immediately after take-off, DCA is oriented towards

defending the already-controlled airspace by neutralizing hostile vectors approaching it.

Within this tactical framework, the optimal employment involves specialized assets such as air-superiority fighters and interceptors, which, depending on the type of mission, may also be accompanied by multirole platforms. The total inventory of NATO European Countries in terms of aircrafts primarily designed for OCA/DCA activities amounts to approximately 498 specialized fighters, a figure that quantitatively exceeds the U.S. contribution to the Atlantic Alliance, which stands at 351 assets. The European fleet, however, is predominantly centred on the advanced fourth-generation *Eurofighter Typhoon*, which possesses limited stealth features and overall inferior performance compared to the 185 fifth-generation *F-22 Raptors* operated by the U.S. Air Force. Nevertheless, although the American air component is technologically more advanced than its European counterpart, it is important to highlight that, in the event of a conflict, the potential adversary faced would not be able to deploy an air fleet comparable in mass or performance to that of the United States.

Once the enabling conditions for achieving air supremacy, or, in any case, a more credible degree of air superiority, have been established, it becomes possible to employ one's capabilities in support of operations conducted by forces in the land domain, thereby ensuring a high level of protection for them. Within this context, particular relevance is assumed by Close Air Support (CAS) missions conducted by fixed wing aircraft and Close Combat Attack (CCA) missions conducted by rotary wing platforms, both aimed at delivering high volumes of fire from airborne vectors against hostile targets located near friendly forces operating on the ground. A common feature of these two specific capabilities is the high level of coordination required between air units and ground forces to avoid accidental engagements among allied units. This aspect is especially critical for CAS, which generally involves the employment of fixed-wing aircraft whose crews, flying over the battlefield at relatively high speeds, possess limited situational awareness. For this reason, responsibility for target designation and firing authorization is delegated to personnel on the ground (JTAC – *Joint Terminal Attack Controller*). Conversely, CCA activities rely primarily on

rotary-wing platforms capable of slow and hovering flight, whose crews can therefore directly observe the battlefield situation and autonomously assess whether or not to initiate engagement.

In this context, platforms capable of performing CAS missions can be distinguished between those specifically dedicated to ground-attack and multirole aircraft equipped with air to surface capabilities. Within NATO European Countries, in particular, the number of the first type is relatively limited, totalling approximately 159 aircrafts, mostly in the process of being retired, and represented by the *Tornado IDS* and *AV-8B/TAV-8B Harrier II*. From a comparative perspective, the CAS capability gap with the United States is less pronounced than in other segments. Although the dedicated U.S. fleet, composed of approximately 215 *A-10C Thunderbolt II* aircrafts, exceeds the European fleet by about one quarter, it is also undergoing progressive retirement, with a reduction to 168 aircraft expected by 2026 and full retirement by 2029. Consequently, in the coming years, Close Air Support is likely to rely increasingly on suitably equipped multirole platforms, including the *Eurofighter Typhoon*, *F-16 Viper*, *F-35A/B Lightning II*, *Rafale*, *F/A-18 Hornet*, *JAS 39 Gripen*, and *Mirage 2000*, for which the combined fleet remains substantial.

Figure 7 – Multi-component formation of fixed-wing aircraft assigned to a Combat Air Patrol activity.

CCA activitis, on the other hand, although almost exclusively assigned to specialized rotary-wing aircraft such as attack helicopters, sometimes also fall to multirole or transport helicopters adequately adapted for such missions. From the perspective of specialized systems, the European NATO landscape features an overall availability of roughly 330 platforms, corresponding to approximately less than half of the U.S. contribution to the Atlantic Alliance. Nevertheless, a limited European dynamism aimed at strengthening CCA capabilities can be observed, not only exemplified by Poland's order of 96 *AH-64E* Apache helicopters and by Italy's future replacement of the *AW-129 Mangusta* with the *AW-249 Fenice*, but also by the gradual retirement and lack of programmed replacement of the attack-helicopter fleets of some Countries. This trend becomes particularly significant in light of the evolution of the Russia–Ukraine conflict, in which attack helicopters have often been unable to conduct CCA operations due to the high level of airspace contestation and the widespread presence of drones and loitering munitions on the battlefield. Consistent with technological and doctrinal developments, although attack helicopters retain an important role for CCA missions in contexts such as Counter-Insurgency (COIN) operations, in a high-intensity confrontation their role could become progressively marginalized.

IV Integrated long range targeting

Kinetic activities conducted from the air domain can be complemented, starting from the phase of suppression and destruction of enemy air defences, by the employment of land based means and systems capable of carrying out long-range engagements. This refers in particular to the ability to strike and neutralize targets at distances exceeding the standard range, around 30 kilometres, of 155 mm towed or self-propelled tube artillery. It therefore concerns systems that can be employed in various specific activities aimed at destroying objectives located deep within enemy territory, a factor that makes them fully complementary to the primary contribution delivered by the fire from the third dimension. Furthermore, the dependence of land-based systems on information acquired from airborne stand-in platforms and stand-off satellites for target identification highlights, even more clearly, the pervasive nature of multi-domain effects generation.

In this context, self-propelled and autonomous munitions constitute the first element to be examined, as they not only make it possible to extend the range of traditional artillery systems up to 70-80 kilometres, but also significantly improve their accuracy, enabling them to perform functions that would otherwise require the use of more expensive aerial or missile assets. In this specific segment, the European NATO Countries possess only two precision GPS/INS-guided extended-range munitions: the *M982 Excalibur* and the *Vulcano*. Other systems, by contrast, focus solely on extending operational range, such as the specialized *Assegai* munitions, or on reducing the Circular Error Probability (CEP) through Precision-Guidance Kits (PGK), such as the *M1156*, which constitute a relevant solution for converting standard 155 mm projectiles into smart munitions. Examining the *M982 Excalibur* and *Vulcano* ammunitions, it is important to highlight that the latter has encountered some operational and fielding difficulties compared to the former. As a result, since the United States only employ the *M982 Excalibur*, they can rely on more robust and proven capabilities in the use of self-propelled and autonomous munitions than their European counterparts. Despite the absence of official quantitative data regarding the availability of such munitions in European NATO Countries, it is nonetheless plausible that a gap exists with the United States, due both to the recent introduction

of these systems and to the traditionally limited strategic stockpiles held in continental arsenals as a result of over three decades of reduced threat perception.

For this reason, in the event of a high-intensity conflict, land-based fire missions within the 30- to 80-kilometre range from the frontline would fall predominantly on rocket artillery systems (MRL – Multiple Rocket Launcher, MLRS – Multiple Launch Rocket System, and GMLRS – Guided Multiple Launch Rocket System), which are capable of delivering overwhelming firepower within short time windows and across variable distances. When analysing the artillery capabilities of NATO's European member States, it is necessary to distinguish between the availability of platforms and that of rockets and, where applicable, longer-range missiles. As far as the first aspect is concerned, approximately 849 MRL platforms are currently in service across Europe, compared to around 669 in the United States. Nevertheless, the technological uniformity of U.S. assets, consisting exclusively of *M142 High Mobility Artillery Rocket Systems* (HIMARS) and *M270 MLRS*, stands in contrast to the marked heterogeneity of those operated by European States, which collectively field around 13 different systems.

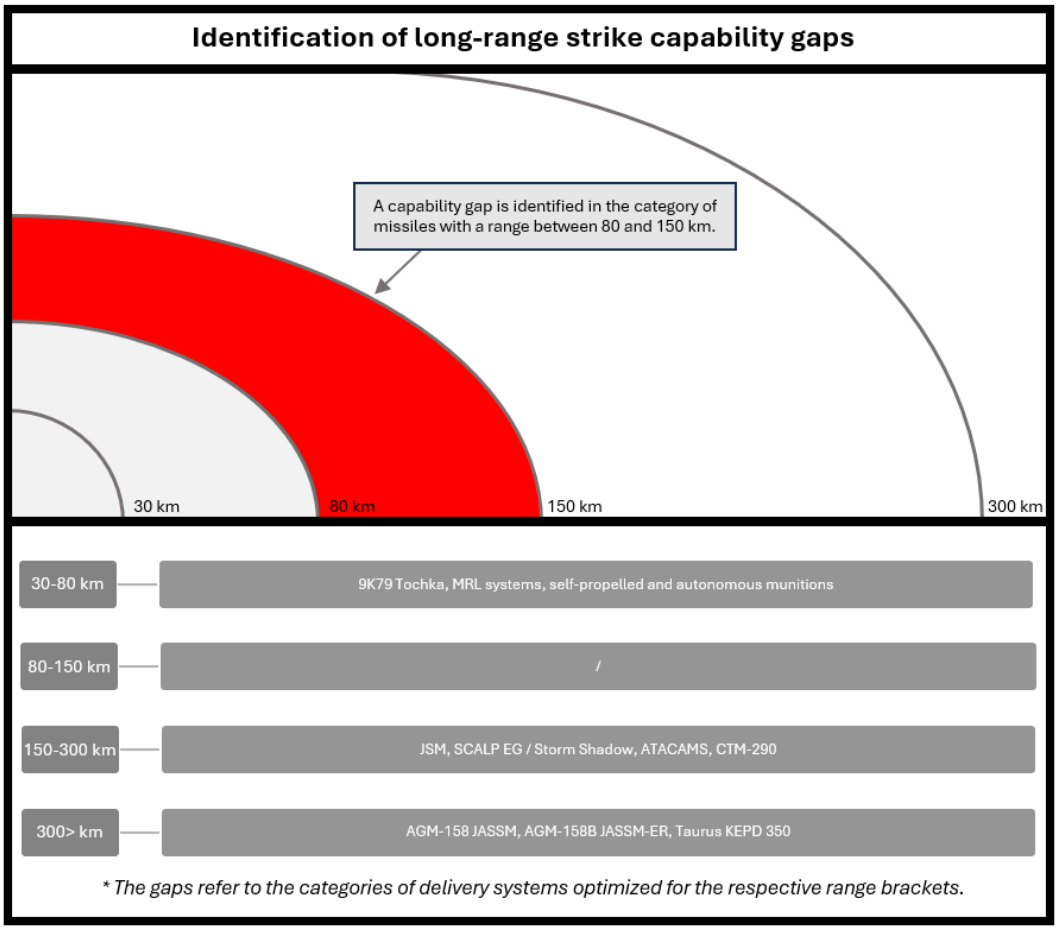
Figure 8 – Rocket artillery systems used for long range fire activities.

The type of system employed also determines the missile and rocket vectors it can launch. From this perspective, European arsenals are characterized, on the one hand, by a gradual increase in the quantity of rockets available for employment within the 30 to 80 kilometres operational range, and, on the other hand, by a persistent shortage of long-range missile vectors.

In this regard, it is worth noting that European countries would, in principle, be capable of employing Tactical Ballistic Missiles (TBM), particularly through the 225 *M142* and *M270* currently in service and potentially compatible with these vectors, to further extend their operational reach.

To strike targets deep within enemy territory, the availability of ballistic and cruise missiles, whether air-launched or ground-based, constitutes a fundamental requirement. At present, however, the European NATO Countries lack ground-launched cruise missiles, although programs for the development and acquisition of such capabilities are underway. This situation creates, in the current strategic environment, a clear gap with the United States, which possess a vast arsenal of Tomahawk Land Attack Missiles (TLAM). Consequently, Europe's ground-based stand-off missile component today consists solely of a limited number of ballistic missiles in service with only a few States, mainly *Army Tactical Missile System* (ATACMS) tactical ballistic missiles, and, to a lesser extent, a small stock of *9K79 Tochka* systems.

The situation is different about air launched platforms deployable from fixed wing aircrafts. Specifically, in the European NATO Countries this component consists solely of Air Launched Cruise Missiles (ALCMs), of which, however, there is a sufficient availability. Among the approximately seven different types of operational systems, the most widespread are the *Storm Shadow/SCALP EG*, *Taurus KEPD 350*, and *AGM-158 Joint Air to Surface Stand-off Missile* (JASSM), which have an average range of roughly 560 kilometres. A significant exception is represented by the *AGM-158B Joint Air to Surface Standoff Missile Extended Range* (JASSM-ER), capable of striking targets at distances approaching 1,000 kilometres. Overall, European strategic stockpiles of ALCMs are likely to amount to several hundred units, less than one third of the corresponding U.S. inventory. This disparity inevitably affects the volume of engagements sustainable in a prolonged campaign and the ability to conduct stand-off attacks without relying on ground-based platforms or on the massive employment of air assets.



The emerging picture highlights the variety of assets that can potentially be employed by artillery and long-range strike components, requiring an integrated analysis in order to identify possible capability gaps within specific operational segments. First, the wide availability of systems capable of striking targets up to 30 kilometres from the front line is accompanied by a fair number of systems with strike capabilities of up to 80 kilometres, primarily consisting of MRL systems armed with rockets and, secondarily, of various autonomous and self-propelled munitions. A significant shortfall, however, appears in the category of land-based systems with a maximum range between 80 and 150 kilometres, which are entirely absent from European NATO arsenals. On the other hand, despite the limited stockpiles of TBMs, the more substantial inventories of ALCMs allow for effective engagement of targets both within the 150–300-kilometer operational range and, though to a more limited extent, beyond 300 kilometres from the Line of Contact, albeit with vulnerabilities regarding multi-domain redundancy, operational resilience, and the ability to generate dilemmas for the adversary.

V Integrated Air and Missile Defense

Ultimately, the entire cycle of activities aimed at disarticulating and degrading the enemy's military apparatus prior to the initiation of contact operations cannot disregard the requirement to protect both friendly forces and allied territory from enemy strikes. Within this framework, Integrated Air and Missile Defence (IAMD) assumes a central role. In this field, ground-based assets can be employed synchronously with air-based systems, generating a multi-domain concentration of fire that primarily supports DCA missions, and, under specific conditions, OCA missions as well. Beyond their coordinated action with aircrafts in flight, the various air defence systems can be categorized along an ascending scale based on their engagement range and intercept altitude, as well as the primary type of threat they are designed to counter.

In the first segment, anti-aircraft artillery retains an operational value that is difficult to replace in a high-intensity warfighting environment, especially in terms of protection against low-end threats within the context of saturating attacks. The increased proliferation of small tactical drones, including First Person View Unmanned Aerial Vehicles (FPV UAVs), as well as loitering munitions, underscores the utility of anti-aircraft artillery, which is more economically sustainable than guided missiles for neutralizing a large number of targets. Among the anti-aircraft artillery assets in service across Europe, both self-propelled and towed systems emerge, with the latter still representing the majority share. Overall, however, a notable heterogeneity of systems is apparent, with approximately 14 types of towed artillery and 6 types of self-propelled artillery, reflecting once again the recurring intra European trend toward a multiplicity of platforms and systems. In the specific segment of countering artillery shells, mortar rounds, and rockets (C-RAM – Counter-Rocket, Artillery and Mortar), the U.S. anti-aircraft artillery component is centred on the 20 mm *Land Phalanx Weapon System* (LPWS), whereas the European component shows a clear shortfall precisely in its C-RAM capabilities.

This gap, however, is currently subject to increasing procurement initiatives by individual European States. Finally, regarding short range Surface to Air Missile systems (SAMs), the European military sector

possesses a larger number of batteries compared to the United States, although the latter once again exhibits a strong degree of homogeneity and standardization in its assets.

Figure 9 – Aircrafts engaged in Offensive Counter Air operation.

With regard to medium and long range air and missile defence, the dedicated capabilities of the European NATO Countries are strongly influenced by the availability of specific SAM platforms equipped with specialized radars and sensors, as well as long range missile interceptors. Concerning the former, in particular, the European flank can rely on an overall stock of approximately 373 platforms, 274 of which are long range, compared to the 468 fielded by the United States, all featuring long range capability. Furthermore, European arsenals remain centred on a substantial variety of ground-based missile interceptors, which comprehend five medium range systems, namely *Aster 15*, *IRIS-T SLM*, *AIM-9X Sidewinder* and *AIM-120 AMRAAM-ER*, the latter two integrated within the *National Advanced Surface to Air Missile System* (NASAMS), as well as the *MIM-23 Hawk*, and six long range systems, namely *Patriot PAC-2/PAC-3/PAC-3 MSE*, *Aster 30*, *S-200* and *S-300PMU*.

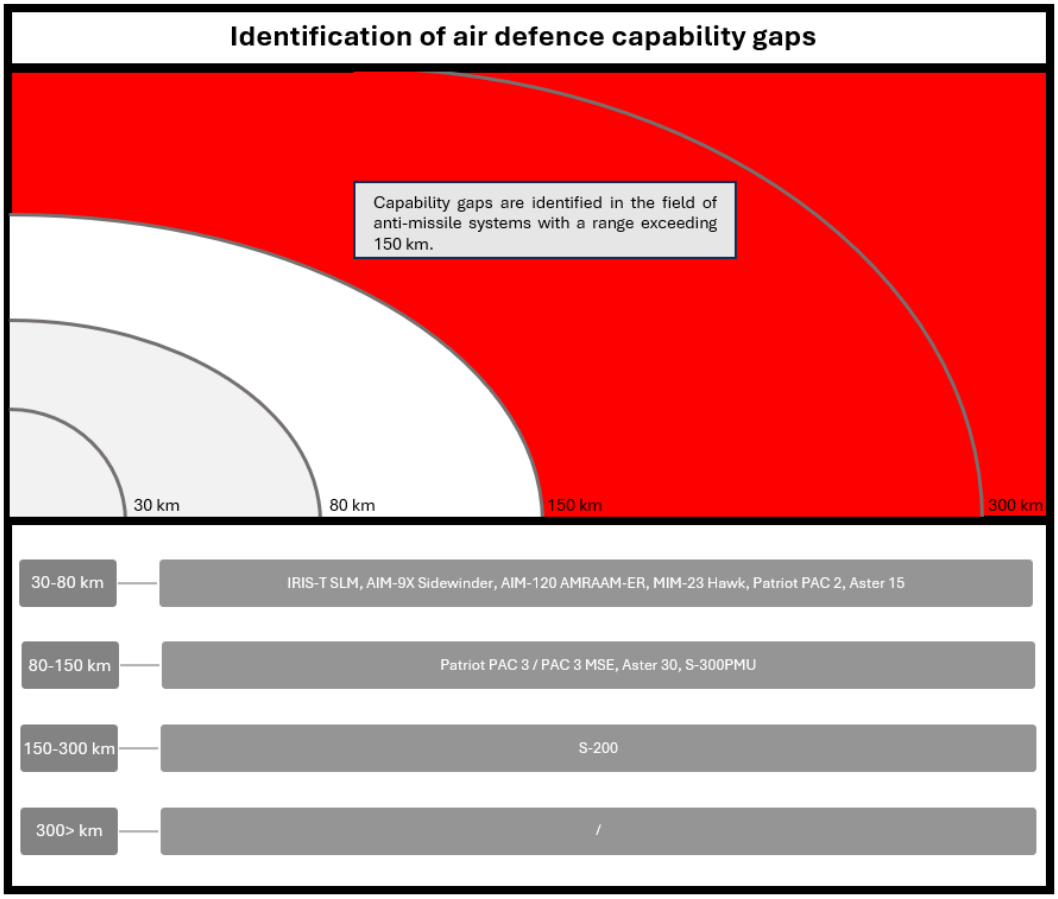
Among these, the *Patriot* and *Aster* families constitute the most widely deployed vectors. The depth of European missile inventories, notwithstanding the understandable confidentiality surrounding the actual number of deployable interceptors, appears nonetheless to be a plausible critical point. The expansion of strategic stockpiles is, not coincidentally, one of the central objectives of current European rearmament plans, driven by the need to ensure a higher degree of readiness, resilience, and operational capacity.

In the specific segment of Ballistic Missile Defence (BMD), NATO's European countries remain heavily dependent on the assets provided by the United States. The main area in which a degree of European autonomy, albeit limited, exists is solely that of ballistic missile defence during the terminal phase of flight, enabled by dedicated interceptors (ABM – Anti-Ballistic Missile) from the *Patriot* and *Aster* families, whose operational effectiveness has been well demonstrated. Regarding BMD in the earlier phases of the descending trajectory, however, the European posture can only rely on assets owned by NATO or the United States.

Figure 10 – A SAM battery during an interceptor launch.

These include, first and foremost, the Terminal High Altitude Area Defence (THAAD) systems, developed to intercept and destroy ballistic

missiles during atmospheric re-entry through direct kinetic impacts without an explosive warhead (hit to kill). The highly specialized and exclusive capability of these systems makes them scarce in number and operated solely by the United States, which are also their producer. At present, within the rest of NATO's military apparatus, there are no equivalent interceptors in service, nor any acquisition or development programs aimed at replicating the capabilities of such systems.



NATO can also rely on the Aegis Ashore systems, which integrate the Aegis BMD architecture with *Standard Missile-3* (SM-3) interceptor missiles to detect, track, and destroy hostile ballistic missiles during the exo atmospheric phase of flight. With specific reference to the European continent, two Aegis Ashore installations located in Deveselu (Romania) and Redzikowo (Poland) are currently operational as part of the Allied BMD posture and were built with direct support from the United States, which retain authority over their activation. As a result, the employment and contribution of these integrated capabilities would be limited exclusively to operations conducted under Allied C2 and therefore cannot be exercised independently by individual European States. At

the same time, however, within the framework of the *European Sky Shield Initiative* (ESSI), the acquisition of exo atmospheric interception capabilities has been planned also through the *Arrow 3* missile systems, which are currently undergoing an advanced procurement process by several Countries. Finally, about long range defence potential, NATO's European members possess a significant number of systems that can be employed between 80 and 150 kilometres from the frontline. By contrast, assets capable of operating beyond that distance are limited to a small number of Russian made systems (*S-200*).

Conclusions

The Overall, the construction of a hypothetical scenario intended to highlight the specific capabilities required to sustain a high intensity military confrontation against a peer competitor proves useful for determining the operational requirements underpinning credible European deterrence and, in the extreme case, the effective defence of the continent. The general under-sizing of Europe's military instrument, in aggregate, compared to that of the United States, and the corresponding dependencies within the NATO framework, are justified by the deep geostrategic differences between the two sides of the Atlantic. However, this does not in any way obviate the need for greater European autonomy, first and foremost in operational terms. At present, across the various capability segments analysed, the main vulnerability that emerges concerns the limited mass of available platforms and, even more critically, of strike vectors, which are markedly insufficient to sustain the rate of expenditure which characterizes a high intensity conventional conflict, even if localized and temporally constrained. At the same time, the excessive diversification that characterizes European arsenals significantly undermines the effectiveness of the continent's combat power, hindering interoperability, creating fragile industrial supply chains, and causing substantial economies of scale losses.

In detail, the limited number of military satellites available to European NATO Countries, particularly those specifically dedicated to SIGINT and ELINT activities, represents a major critical issue in a context where the space domain is becoming increasingly important. Airborne ISR and EW capabilities, especially through HALE and MALE UAVs, are also insufficient, largely due to the need for constant battlespace coverage as well as high-altitude intelligence penetration into hostile depth. Equally significant is the limited availability of platforms dedicated to C2 and air operations support, primarily AWACS aircrafts and aerial refuelling tankers, which constitute essential enablers for achieving and maintaining air supremacy and for sustaining a continuous high sortie rate. At the same time, although the fleets of aircrafts specialized in AI, OCA, and DCA missions are generally well structured and technologically advanced, the shortage of available munitions,

particularly long range and specialized types, tends to undermine the sustainability and resilience of third dimension firepower, which is central in Air-Land Battle to disrupt the adversary through multiple and precise effects on its force structure. Additional significant shortcomings relate to the land domain, specifically to the capabilities for striking deep into enemy territory, which are essential to complement air delivered attacks. In this area, within the range between 80 and 150 kilometres from the front line, the engagement potential is limited both in the types of vectors available and in their quantities, while in the range extending to 300 kilometres there is a substantial dependence solely on air launched assets such as ALCMs. Deep strike capabilities beyond this range, into the adversary's territorial depth, are virtually non existent due to the insufficient or total absence, first, of launchers, but above all ballistic or cruise missiles in the inventories of European Countries. Regarding European IAMD capabilities, including ballistic missile defence at medium, intermediate, and especially long range, dependence on U.S. assets and their related C2 remains almost absolute.

Overall, the scenario nevertheless highlights the significant adaptation processes currently underway within European institutional and industrial Defence Systems. The related national, European, and trilateral allied initiatives aimed at strengthening the EDTIB in terms of innovation and production capacity, acceleration of procurement procedures, and improvement of the operational readiness of the Armed Forces, particularly in relation to a high-intensity conventional warfighting environment, are fundamental in this regard. The prioritized development of the capability segments that are simultaneously characterized by absolute doctrinal centrality in a plausible employment scenario against a peer competitor and by significant shortages in availability, namely dependence on U.S. assets, allows for an optimization of the development, modernization, and readiness processes of the European military instrument as a whole, which is potentially necessary to achieve a more effective and credible defence and deterrence posture within a short timeframe.

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