CSIS BRIEFS

Europe's Missing Piece

The Case for Air Domain Enablers

By Colin Wall and John Christianson

APRIL 2023

THE ISSUE

*This brief is part of the CSIS project **Transforming European Defense**. The goal of the project is to leverage the strengths of CSIS in political-military analysis and defense industry engagement to create a plan of action to rationalize European defense. It will develop specific recommendations for European policymakers to reduce inefficiencies and seek creative joint endeavors for European security. The project also develops recommendations for actionable initiatives that U.S. policymakers can engage with and push European allies to implement. This project thus seeks to impact policy on both sides of the Atlantic.*

As European countries increase their defense spending after Russia's brutal, full-scale invasion of Ukraine, much attention has been paid to big-ticket military systems such as F-35s, tanks, and air and missile defense systems. This brief ventures off the beaten path to examine an under-explored but no less essential cross section of European military hardware: critical enabling capabilities in the air domain. These include strategic and tactical airlift; airborne tactical command and control (C2) and operational C2; air-to-air refueling; airborne intelligence, surveillance, and reconnaissance (ISR); and electromagnetic warfare and suppression of enemy air defenses. These capabilities allow next-generation fighters like F-35s to operate effectively. At the moment, however, European air enabling capabilities are lacking. This brief outlines the need for air enablers and details the gaps in European capabilities before providing recommendations for how to fill those gaps.

INTRODUCTION

In 2002, just a few years removed from its operation in Kosovo, NATO convened its heads of state and government in Prague for an alliance summit. The Kosovo intervention had revealed shortcomings in the alliance's "capacity to stage sustainable combat air operations," at least without the United States bearing a disproportionate burden.[1] NATO leaders were determined to address the matter. When they endorsed the summit declaration document, therefore, they noted among NATO's military capability gaps a few areas that often receive less attention than big-ticket items like fighter aircraft, missile defense, or frigates: "intelligence, surveillance, and target acquisition; air-to-ground surveillance; command, control, and communications; strategic air and sea lift; [and] air-to-air refueling."[2] Allies committed to filling these gaps and promised to pursue this goal "vigorously."[3]

Nine years later, in 2011, NATO was again called to conduct an air campaign, this time in Libya. But the promises of 2002 had not been fulfilled: again, it was revealed that European allies could not act without the United States providing key air enabling capabilities. After another 10 years, in August 2021, Europe's limitations were exposed yet again, as European

countries relied on the United States to evacuate their citizens from Afghanistan.[4]

In spite of appearances, however, Europe has made some progress over the past decade in closing this gap. Air enablers have become an area of tangible European defense cooperation, with NATO, the European Union, and their member states all working together. Nevertheless, European NATO allies and partners still do not possess sufficient air enabling capabilities for the security environment they face. Russia's experience in Ukraine demonstrates that it is not only a country's modern and sophisticated aerial capabilities that win fights, but the enablers that allow them to get to there, tell them where to go when they arrive, and minimize their exposure to enemy fire. Reports that, for example, Russia has held back from using its most sophisticated airborne systems because of their justifiable fear of Ukrainian air defense capabilities show that even with advanced fighter aircraft the inability to support those aircraft in the air can lead to mission failure.[5]

This brief will describe the most critical enablers in the air domain, make the case for why they are needed, outline the gaps in European capabilities, and provide some recommendations for how to fill those gaps.

THE NEED: THREAT PERSPECTIVE AND STRATEGIC ANALYSIS

Before discussing enabling capabilities in the air domain, it is critical to define terms and clarify what is considered an "enabling capability." Unfortunately, there is no distinct definition or list of air enablers in NATO doctrine, nor is one readily available in the doctrines of member states. The definitions of enablers to air operations in adjacent writings have ranged from the mundane, like staff functions, to future technology such as artificial intelligence.[6] For the purposes of this brief, the authors define enablers as those combat capabilities that allow air forces to conduct air-to-air combat and strike missions, whether that be deep interdiction or supporting ground forces. Taking that into consideration, key enabling capabilities are:

- Tactical Command and Control (C2): The direction and coordination of tactical forces to achieve operational objectives. In NATO and Western air forces, this is generally conducted by airborne C2 aircraft such as the E-3 AWACS (Airborne Warning and Control System) or ground-based deployable control facilities.
- Operational C2: The planning and coordination of operations to achieve strategic objectives. For the NATO air component, this is conducted at Air Operations Centers (AOCs).
- Airlift: The use of cargo aircraft to move personnel and supplies. This can either be strategic or tactical. The former involves the use of large airlifters to move material or personnel over a long range, usually from outside a theater of operations into the theater. The latter refers to transport that happens within a single theater of operations.
- Aerial Refueling: The use of tanker aircraft to refuel other aircraft in flight to extend their operational range.[7]
- Intelligence, Surveillance, and Reconnaissance (ISR): The coordinated acquisition, processing, and dissemination of accurate, relevant, and timely information and intelligence.[8]
- Electromagnetic Warfare (EW): The use of the electromagnetic spectrum, both offensively and defensively, to deny the adversary the use of the spectrum and protect allied use of it. The most commonly thought of case is the jamming of radar or communications.
- Suppression of Enemy Air Defenses (SEAD): The use of destructive or disruptive means to neutralize, destroy, or temporarily degrade adversary surface-to-air defenses.[9]

All these enablers are of importance to a NATO air campaign. While a conflict with Russia is of primary concern to NATO given recent events in Ukraine, Russia's failures in Ukraine also provide a valuable lesson on the importance of these enabling capabilities.

When Russia began its invasion of Ukraine in February 2022, the Russian Aerospace Forces (VKS) held a significant numerical and technological advantage over the smaller Ukrainian Air Force. In planning and execution, however, the VKS made several critical mistakes in the use of its airpower, which contributed to Russian setbacks.[10] Specifically, the VKS failed at SEAD and C2 in Ukraine, as well as at integrating intelligence.[11] This has led to neither side gaining air superiority and has further exacerbated Russian ground force struggles.

Russian S-400 Air Defense System

Source: ALEXANDER NEMENOV/AFP/Getty Images

This does not mean that NATO should assume the VKS is a hollow force. In fact, much of its higher-end aircraft still remain active and its doctrine for confronting NATO is still viable. Russia has long believed that they are at a disadvantage in the air in relation to NATO and Western air forces.[12] To counter this, they have invested heavily in advanced surface-based air defense (SBAD) systems to deny NATO aircraft the ability to fly in certain areas.[13] While the poorly planned invasion of Ukraine did not follow Russian doctrine, should Russia learn from its mistakes and refocus on its doctrine, its military performance would likely be much improved. For instance, in a conflict with NATO in an area such as the Baltics where there is already overlapping areas of coverage as a result of the Russian Oblast of Kaliningrad, Russian SBAD capabilities would present a significant challenge to the operation of NATO air power capabilities.[14]

To counter such a threat, NATO would need several enabling capabilities: ISR to quickly locate SBAD systems and other targets, EW and SEAD to degrade Russian SBAD capabilities, and tactical C2 to coordinate the effort. Furthermore, any large-scale operation also requires aerial refueling to provide aircraft with longer range and further coverage. Additionally, airlift may be required to enable the mobility of forces to complicate Russia's offensive missile targeting. Unfortunately, some of these capabilities are either lacking in depth or concentrated in one country—the United States.

This is not a new problem. In the last large-scale NATO air campaign, Operation Unified Protector over Libya, several capabilities were also sorely lacking. During that operation, NATO was dependent on the United States for ISR, C2, and aerial refueling.[15] This exposed limits in the alliance's ability to conduct air operations without major assistance from the United States. Once operations turned over to NATO, the United States was meant to be a supporting force, providing only unique capabilities—and yet, it still flew over 50 percent of the sorties, providing 80 percent of ISR and aerial refueling, virtually all of the SEAD, and 25 percent of the airborne C2.[16] In fact, in the early days of the campaign when the United States was attempting to be less involved, ISR was so lacking that a young U.S. officer working in the NATO AOC sent an impassioned and strongly worded email to their superiors bemoaning the state of affairs. This email quickly went viral in the halls of the Pentagon, and the United States soon allocated more support.[17]

A detailed RAND report from 2015 evaluating the air campaign in Libya recommended that NATO make a plan to address its reliance on U.S. enabling functions, such as ISR, Airborne C2, Aerial Refueling, and SEAD.[18] There has been little positive movement in the years since; in fact, things have trended the opposite direction. For example, NATO is now wholly dependent on the United States for SEAD capabilities.[19] These vignettes are just a few of the examples of enabling capability gaps that need to be addressed. The remainder of this report will examine these capabilities in depth and delineate where NATO countries need to invest for the future, particularly in situations where the forces of the United States might be heavily engaged elsewhere in the world.

THE STATE OF EXISTING EUROPEAN AIR ENABLING CAPABILITIES

To start, it will be instructive to give the lay of the land for native European air enabling capabilities as the situation stands today. This is a two-part endeavor: first, to tally significant capabilities in Europe, and second, to describe pertinent multinational efforts that share capabilities across nations. Some are NATO-led; others are comprised of separate groupings of countries.

NATO Boeing E-3A AWACS Airplane

Source: DANIEL MIHAILESCU/AFP/Getty Images

RELEVANT SYSTEMS IN EUROPE

- Tactical Command and Control (C2): NATO owns and operates 14 E-3A AWACS as part of its Airborne Early Warning and Control Force (NAEW&C Force).[20] The alliance's commonly funded military budget provides funds for the force.[21] This is the oldest version of the AWACS still in use, and NATO is actively studying replacing it with a newer system.[22] Some countries fly other planes to fulfill similar roles, such as variants of the EMB-145 (Greece), the Gulfstream G550 CAEW (Italy), or the E-3F Sentry (France), among others.[23] There is a total of 21 aircraft in this latter category.[24]
- Operational C2: NATO has two Combined Air Operations Centers (AOCs), located in Uedem, Germany and Torrejón, Spain.[25] This is in addition to the U.S. AOC at Ramstein AB in Germany; the UK Centre at High Wycombe; the NATO training AOC in Lyon, France; and the NATO deployable AOC stationed at Poggio Renatica, Italy.
- Airlift
  - Strategic Lift: European allies and partners fulfill the requirement for strategic lift with a few different aircraft. To start, they own and operate 11 C-17 Globemasters; eight belong to the United Kingdom and three to a NATO-led consortium.[26] Another consortium of European countries shares five AN-124-100 aircraft.[27] All the rest are "multirole" aircraft: air tankers that are capable of strategic transport as well as aerial refueling.[28] These constitute the vast majority of Europe's strategic lift capability. For example, seven countries fly the A400M, owning between them a total of 107 aircraft.[29] Additionally, NATO owns seven A330 MRTTs as part of its Multirole Tanker Transport Fleet; they are operated by a consortium of six allies.[30]

Figure 1: Tally of Select European Air Enablers

Capability	Europe	Comparable U.S. Total
Airborne C2 E-3A AWACS, EMB-145, Gulfstream G550 CAEW, E-3F Sentry, S-100 Argus, B-737 AEW&C	**35**	**125**
Airlift		
Strategic Lift C-17 Globemaster, AN-124-100, A330 MRTT, A400M	**145**	**232**
Tactical Lift C-130 Hercules, Transall C-160, C-127 Spartan	**165**	**282**
Aerial Refueling E.g., C-135FR, A330 MRTT, A400M	**156**	**447**

Note: All data compiled by CSIS is from the *IISS Military Balance 2023*, unless indicated otherwise. Figures do not account for current operability of platforms. In the Comparable U.S. Total column, U.S. figures count those capabilities assigned to reserve forces and do not factor for current operability of platforms.
Source: Author's analysis.

The United Kingdom flies ten more, and France five, for a total of 22 A330s.[31]

- Tactical Lift: There are a number of relevant aircraft, including different variants of the C-130 Hercules, the Transall C-160, and the C-127 Spartan. All told, European countries operate roughly 125 such aircraft, with the vast majority being C-130 variants.[32]

- Aerial Refueling: Relevant aircraft here include the A330 MRTT and A400M, as well as the A310 MRTT (a multirole aircraft for tactical lift), the KC-767, variants of the KC-130, and France's specially modified C-135FR Stratotankers. Altogether, Europe has 156 such aircraft. The A330 MRTT and A400M aircraft have been counted twice, both in this category and under strategic lift.[33] Without counting those multirole aircraft, there are only 27 dedicated refueling aircraft.

For the remaining enablers, it is less instructive to look at precise quantity, as they rely less on big-ticket platforms and more on small assets—including uncrewed vehicles, missiles, and aircraft that can fulfill one of the below functions but have other primary missions.

- Intelligence, Surveillance, and Reconnaissance (ISR): Relevant capabilities run from drones like the MQ-9A Reaper, RQ-1B Predator, and Turkey's many unmanned aerial vehicles (UAVs) to aircraft like the C-160, RC-235, or Beech 350.[34] Of aircraft suited to ISR tasks, European countries currently own and operate only roughly three dozen.[35] Of UAVs, the number is approximately 200.[36]

- Electromagnetic Warfare (EW) and Suppression of Enemy Air Defenses (SEAD): European air forces conduct EW primarily via the use of radar jammers and anti-radiation missiles. These are used for SEAD tasks as well, so they will be considered together. European capabilities are severely lacking here.[37] Only two countries field some variant of the AGM-88 High Speed Anti-Radiation Missile (HARM): Germany and Italy.[38] Both plan to retire their Tornado aircraft that are capable of shooting the HARM as early as 2025.[39] The United Kingdom retired its anti-radiation missile-capable Tornados in 2019.[40] No countries yet field the extended range variant of this missile, the AARGM-ER, nor do they possess the GBU-53B StormBreaker or the MBDA SPEAR 3 missiles.[41] Furthermore, no European countries appear to have any variation of another useful capability: the MALD-X air-launched decoy/jammer.[42] Currently, Europe's airborne EW capabilities focus on aircraft self-defense and they possess no offensive EW platforms.

Airbus A400M Multirole Aircraft

Source: BERTRAND GUAY/AFP/Getty Images

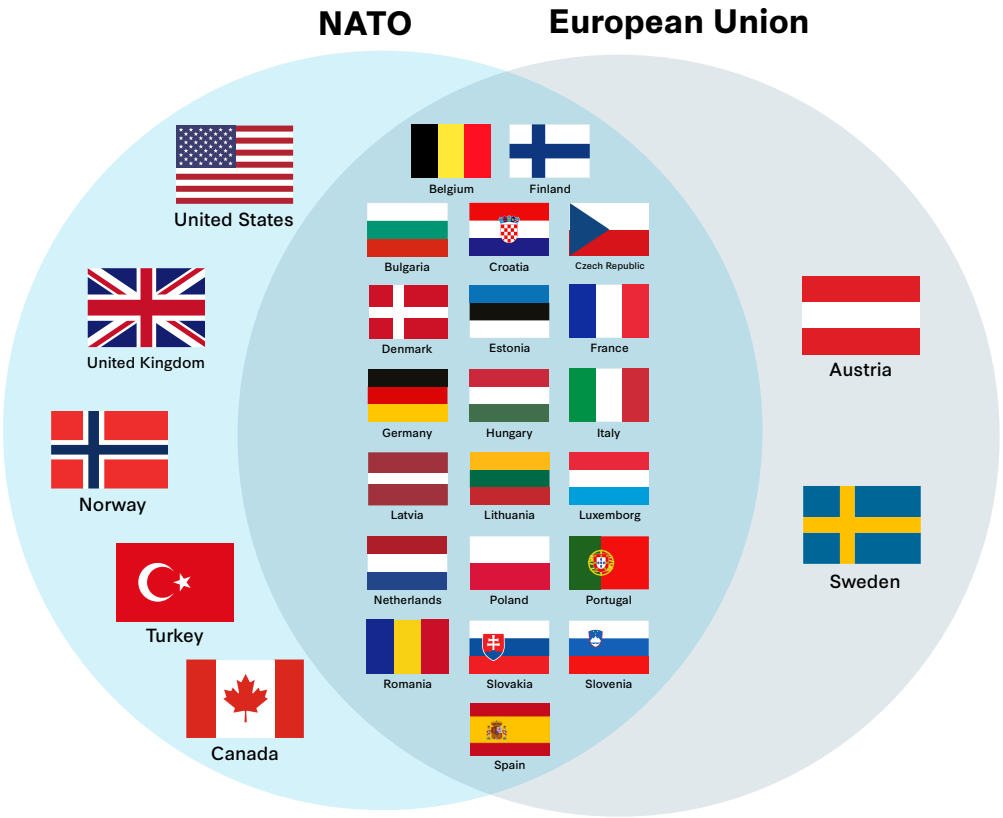
MULTINATIONAL INITIATIVES

For most of the systems above, quantity is lacking. In some cases, Europeans have attempted to address this by integrating, coordinating, or pooling and sharing assets. C2, strategic airlift, and aerial refueling are especially unusual in that collectively held assets are already quite common in these areas. NATO is the key player but not the only one. A few multinational initiatives are of note.

One is the NATO Airborne Early Warning and Control Force (NAEW&C Force), in which 19 allies participate. The 14 E-3A AWACS that comprise the force are unusual in that they are fully NATO-owned assets, as opposed to national aircraft made available for alliance operations. Their primary purpose is surveillance and battle management.[43] According to NATO, the AWACS have significant capability: "three aircraft operating in overlapping, coordinated orbits can provide unbroken radar coverage of the whole of Central Europe."[44]

A similar NATO-owned fleet is the Multinational Multi-Role Tanker Transport Fleet (MMF), which flies the seven A330 MRTTs mentioned above. These aircraft can conduct both strategic transport and aerial refueling missions. Although NATO owns the aircraft, they were acquired via the Organization for Joint Armament Cooperation (OCCAR), acting on behalf of the NATO Support and Procurement. The European

Figure 2: Movement Coordination Centre Europe Membership



Source: Author's analysis.

Defence Agency (EDA) led the overall initiative.[45] All six participating NATO allies can access the MMF capabilities.[46] The project demonstrates that European defense cooperation can help fill capability gaps.

Two similar initiatives are the Strategic Airlift Capability (SAC) and the Strategic Airlift International Solution (SALIS). Both are programs where capabilities are pooled and held collectively, as opposed to remaining national assets. The SAC consortium holds three C-17 Globemaster aircraft; it includes 10 NATO allies as well as Sweden and Finland.[47] NATO's Heavy Airlift Wing operates the aircraft and another NATO agency provides administrative support.[48] Despite NATO's role, however, participating countries can request the aircraft for national, EU, or even UN missions.[49]

SALIS holds five AN-124-100 aircraft.[50] Any consortium member can request access; the aircraft can be used for NATO missions, as well as EU or national ones.[51] The consortium consists of nine NATO allies.[52] It is coordinated, however, by a non-NATO entity: the Movement Coordination Centre Europe (MCCE), which comprises 28 member states from across the European Union and NATO.[53] The center considers itself "brokers for strategic lift issues."[54] It cannot direct its members to provide assets, however; it can only rely on their voluntary willingness to do so.

The MCCE resembles a smaller multinational body that coordinates air enablers: the European Air Transport Command (EATC). Its seven members not only coordinate their lift and aerial refueling assets—they pool them under a single joint command, which oversees joint operations.[55] The fleet includes 150 assets spread across seven national air bases.[56] A new Franco-German tactical air transport squadron will fly under the command of the EATC.[57]

This dizzying array of initiatives gives the impression that airlift and refueling are robust areas of defense collaboration. In a sense, this is true. More than in most areas, European nations have been willing to make concessions on absolute sovereignty over military assets, whether by making a national aircraft available to a multinational pool or even by allowing pilots to fly operations under a joint command.

And yet, the proliferation of agencies, entities, and centers seems motivated by—and in part obscures—the apparent fact that Europe lacks the needed number of relevant systems. At a recent CSIS workshop, a participant compared the bureaucratic activity to "moving the deck chairs on the Titanic."[58] The participant also noted that members designed these initiatives to reduce European reliance on the United States for crisis-management missions like Operation Unified Protector—not for conventional war against Russia. This may explain their emphasis on strategic airlift, as opposed to tactical lift within theater. To the extent that they increase efficiency, these coordinating bodies likely have value. But this value should not be confused with what is probably more necessary: closing the critical capability gaps by investing in the necessary quantity of systems.[59]

NOTABLE FORTHCOMING CAPABILITIES

There are some reasons for optimism. In the realm of strategic lift and aerial refueling, the A400M is an example of improvement. The number of operational A400M aircraft in Europe increased from 97 in 2022 to 106 in 2023, with deliveries to France, Belgium, Germany, Spain, Turkey, and the United Kingdom.[60] And those six countries are still waiting for more: there are 59 aircraft yet to be delivered, which will further bolster Europe's strategic lift and aerial refueling capability (see below).

Other aircraft will swell Europe's ranks in the coming years. In addition to the forthcoming A400Ms, the MMF is expected to receive two more A330 MRTT planes by 2024.[61] Between 2023 and 2025, Spain intends to add three to its own national fleet.[62] France is also waiting on four.[63] Regarding tactical lift, Portugal is reportedly acquiring five Embraer KC-390 medium transport aircraft, a variant of the C-390 Millennium that is also configured for aerial or on-ground refueling.[64] The Netherlands has plans to replace its four C-130s with the same, and Hungary has also ordered two.[65] Slovenia also intends to buy two C-27J aircraft.[66]

These acquisitions, while they will not have a major impact, seem to reflect a growing awareness among some smaller European militaries that a degree of native air enabling capability is desirable: Portugal, Hungary, and the Netherlands, for example, all currently lack any nationally held aerial refueling or multirole tanker/transport aircraft.[67] On the other hand, some countries are moving in the opposite direction: Germany has retired its

Figure 3: European Acquisitions of A400M Atlas Transport Aircraft

Country	Ordered	Delivered	Forthcoming
Belgium	**7**	**6**	**1**
France	**50**	**20**	**30**
Germany	**53**	**40**	**13**
Luxembourg	**1**	**1**	**0**
Spain	**27**	**13**	**14**
Turkey	**10**	**10**	**0**
United Kingdom	**22**	**21**	**1**
Total:	**170**	**111**	**59***

*Recent reporting indicates that the United Kingdom is considering acquiring an additional six A400M aircraft, which would bring the total number of forthcoming planes to 65. See Tim Martin, "RAF defends decision behind 2-year tactical airlift capability gap, plans additional A400M buy," Breaking Defense, February 2, 2023, https://breakingdefense.com/2023/02/raf-defends-decision-behind-2-year-tactical-airlift-capability-gap-plans-additional-a400m-buy/.

Source: "Orders, Deliveries, In Operation Military Aircraft by Country - Worldwide," Airbus, January 31, 2023, https://airbus.web.factory.eu.airbus.com/sites/g/files/jlcbta136/files/2023-02/2023-01_MRS_GEN_Ord-Deliv%20by%20country_0.pdf.

A310 MRTT fleet but reportedly is not replacing them with national capabilities, opting instead to rely on the NATO MRTT fleet for the needed enabling capability.[68]

The European Union is also seeking a role in the development of air enabling capabilities, albeit in a less concrete way. Via its Permanent Structured Cooperation (PESCO) framework, it is assisting five member states to develop a future platform for strategic airlift by means of the Strategic Air Transport for Outsized Cargo (SATOC) program.[69] It is not clear that the program will result in the actual delivery of new aircraft in a relevant timeframe.[70] The bloc is pursuing a similar project for tactical lift via the Future Medium-Sized Tactical Cargo project (FMTC), but it is limited to defining requirements for what EU tactical airlift fleets might look like after 2035.[71] Another project aspires to develop an EW jamming capability, and another to "potentially" adopt a joint EW concept of operations, which itself "might include . . . the establishment of a joint EW unit."[72] Another small project will fund research into a new hose and drogue system for existing tanker aircraft.[73]

With respect to airborne C2, a few developments are notable. For one, NATO is currently undertaking a modernization program for its E-3A AWACS, which it plans to retire and replace around 2035.[74] At the moment, the program is in early stages: in 2022, the NSPA reportedly awarded three contracts to defense industry competitors to develop technical concepts for how to replace NATO's aerial surveillance and C2 capability, based on proposals the companies had submitted in an earlier round.[75] The United Kingdom will add to this capability when it replaces its retired fleet of E-3D Sentry aircraft with three modern E-7 AEW&C planes—the same aircraft that the United States intends to acquire.[76]

Regarding aerial ISR, some European countries, such as the Netherlands and Poland, have plans to acquire MQ-9 Reaper UAVs. Finland has also conducted test flights with the drone.[77] France also an ongoing program under its 2019–2025 Loi de Programmation Militaire to develop a light ISR aircraft. One of these modified Beechcraft 350 aircraft has already been delivered to the French Air Force; Paris intends to field a second by 2025, out of an eventual six.[78]

Another notable initiative is the "Eurodrone" project.[79] A three-company consortium is developing the modern, twin-turboprop uncrewed aerial vehicle (UAV) for Spain, France, Italy, and Germany.[80] OCCAR has acted as the contracting authority. The Eurodrone's main mission will be ISTAR (intelligence, surveillance, target acquisition, and reconnaissance)—notably including armed ISTAR (i.e., ground support).[81] The consortium will make 60 total UAVs.[82] It projects the first flight for 2026 and delivery of the first aircraft for 2029.[83] If successful, the project will add a needed ISR and combat capability to Europe's repertoire, the former of which is a perennial low-density, high-demand area. Project leaders also hope it will represent a success story for European defense collaboration and the European defense industry.[84]

German chancellor Olaf Scholz (center) in front of Eurodrone

Source: TOBIAS SCHWARZ/AFP/Getty Images

Finally, with respect to EW and SEAD, the European defense company MBDA—a "joint venture" of Airbus, BAE Systems, and Leonardo—is currently developing the SPEAR-EW missile.[85] According to MBDA, this variant of the SPEAR missile will provide jamming and decoy capability "across the threat spectrum" and will be able to be deployed on F-35 fighters as well as, reportedly, the future sixth-generation UK-Japan-Italy fighter.[86] Other than the UK Royal Air Force, it is not clear which, if any, European countries will buy the missile. Italy's recent announcement that it wishes to convert six Gulfstream aircraft into EC-37B Compass Call offensive EW aircraft is an extremely positive development.[87] The United States should approve this sale in order to bolster European capabilities.

CAPABILITY GAPS

Despite these forthcoming capabilities, nearly every area mentioned here represents a capability gap. As Figure

1 shows, Europe lags well behind the United States in several areas. The differences in terms of airborne C2 (roughly 35 relevant European platforms compared to over 120 U.S. aircraft) and air-to-air refueling (about 150 to almost 450) are particularly stark. The disparity in aerial ISR assets is also notable: Europe has a few dozen relevant aircraft to 150 for the United States, and roughly 200 UAVs to over 900 for the United States.

When it comes to strategic airlift, AAR, and ISR, Europeans have been transparent about the shortfalls. In its Strategic Compass released in March 2022, for example, the European Union mentioned strategic airlift and ISR capabilities as critical gaps to "substantially reduce" by 2025.[88] In November, the EU Coordinated Annual Review on Defence (CARD) also identified strategic air transport as one of the "shortfalls corresponding to strategic enablers" that EU member states should address.[89] France's inability to conduct operations in the Sahel without U.S. air enablers likely motivated these inclusions.[90] As recently as 2021, the United States also provided ISR, C2, and strategic and tactical lift for NATO's Very High Readiness Joint Task Force (VJTF).[91]

Regarding EW and SEAD, as the previous section notes, Europeans are currently reliant on the United States. According to a recent RUSI report, "no European NATO air forces currently have sufficient expertise or the required munitions stocks to conduct suppression and destruction of enemy air defences (SEAD/DEAD) at scale."[92] The lack of HARM missiles, especially the most modern version, is also problematic—particularly given the reports from Ukraine that they have been extremely effective.[93] This too echoes the finding of a prior CSIS report, which found that the lack of long-range, high-speed radar-homing missiles for SEAD among Europeans could be a significant issue in a Russia fight, particularly as concerns the defense of the Baltic allies.[94] It is therefore a serious gap in European capabilities.

RECOMMENDATIONS FOR FILLING GAPS

When it comes to European military capabilities, words are cheap. Consider again the 2002 Prague Summit Declaration, which, it will be remembered, flagged ISR, C2, airlift, and air-to-air refueling as "continuing capability shortfalls."[95] The same document said the following: "We will take the necessary steps to improve capabilities in the identified areas of continuing capability shortfalls . . . We are committed to pursuing vigorously capability improvements."[96] These promises were not realized by the time of Operation Unified Protector. Since then, some progress has been made on airlift and AAR but not enough—and, in the meantime, EW/SEAD has emerged as yet another capability gap in the area of air-based enablers.

Although some of the raw numbers in earlier sections may imply Europe is in a decent state, should a major conflict with Russia break out, it will be woefully ill prepared. To start, Europe currently has little to no SEAD capabilities to speak of, a crucial enabler when faced with the Russian A2/AD network. Second, almost half of European tactical C2 aircraft are older and near the end of their lifetime. Furthermore, the relatively low number of these tactical C2 aircraft may not be robust enough to run the type of large continuous air campaign that would be required if Europe's air forces were to go head-to-head with the VKS. Finally, NATO needs to adopt a concept similar to the U.S. Air Force's (USAF) Agile Combat Employment (ACE) doctrine for use in the European theater, which would likely require in turn investments in tactical lift aircraft.[97] In order to fill these gaps, European countries will need to decide whether these relatively unglamorous capabilities are worth the investment, think creatively, and look for opportunities for collaboration.

On the final point, recent CSIS research that conceptualized European defense cooperation as a collective action problem outlines several principles that, if adopted, correlate with successful initiatives: (1) use the power of small groups, (2) normalize cooperation, and (3) incentivize cooperation to discourage fragmentation.[98] As previously noted, air enablers have in the past decade been unusual in that these principles are already being followed in certain areas.

IF IT AIN'T BROKE

The United States has a dedicated Air Mobility command for "strategic and tactical airlift, air-to-air refuelling and aeromedical evacuation."[99] It is tempting to say that Europe should copy the U.S. example and consolidate the bureaucratic entities discussed above into a single

outfit—their functions centralized within, for example, the NATO chain of command, the MCCE, or the EATC. The presumption would be that this would streamline the process of making assets available when something goes wrong and they are needed.

However, it is not clear that this is currently a problem. There is not publicly available evidence that the MCCE, the EATC, or the various NATO and EU bodies have failed to execute on any mission or operation as a result of excessive administrative or bureaucratic entanglement or red tape. This seems to be a case where the principle of normalizing cooperation has in fact led to an effective system. The problem, therefore, seems to come back to the quantity of platforms.

PRIORITIZE THE RUSSIA FIGHT

When NATO adopted its new Strategic Concept at the Madrid Summit in June 2022, it de facto elevated collective defense above NATO's other core tasks, calling it the alliance's "key purpose."[100] The decisions taken at the Madrid Summit reinforced this prioritization, as have NATO's actions since then.[101] It follows that Europeans should emphasize, in doctrine and in budgets, air enabling capabilities that most enable a successful defense (and deterrent) against Russian aggression.

To that end, a participant at a recent CSIS workshop identified airborne ISR and air mobility (airlift) as the two areas that European countries ought to prioritize. In the case of the former, the participant emphasized uncrewed systems, as those would be the assets the United States would most likely take out of the European theater in the event of an Indo-Pacific contingency.[102] In the case of the latter, Europeans have made substantial investments in strategic airlift, as discussed above.

However, in the case of a conventional fight with Russia, tactical lift may be the most needed. Some European countries seem to be going the opposite direction: the United Kingdom, for example, is retiring its 14 C-130J Hercules tactical lift aircraft in favor of the A400M. France has also invested heavily in the A400M. While the A400M is capable of tactical airlift, it is not specifically designed for this purpose, and there may be a tension if a simultaneous need arises for strategic airlift. In the last year, only Poland added new, operational planes to its fleet of tactical aircraft.[103] The small number of forthcoming aircraft detailed in Section Four are not likely to be sufficient to enable NATO to ensure the large-scale mobility of materiel in and around Europe, should conflict erupt with Russia.

This mobility could be essential and should replicate, as stated above, the USAF's ACE doctrine. ACE is the proactive and reactive movement of forces around theater to complicate an adversary's targeting solution and timeline and preserve friendly forces through the inherent defense of movement.[104] While not specifically the U.S. ACE doctrine, the Ukrainian Air Force has been successful in complicating Russia's targeting by dispersing their aircraft to alternate, non-traditional bases and remaining agile to avoid Russian missile attacks.[105] Key to expanding this type of pursuit to the whole of Europe is the airlift capacity to move supplies and support personnel around the continent—in other words, pilots must be able to land on any European airbase and be sure that the base will have what is needed to service their aircraft. This is where modern tactical airlift capacity becomes critical. It follows that European NATO allies, perhaps deploying the principle of small groups via joint procurement, should prioritize investments here. The European Union could play a key role in this.

When it comes to EW and SEAD, European countries ought to invest to counter Russia's vast Anti-Access/Area Denial (A2/AD) capabilities. Specifically, European nations should consider a SEAD missile compatible with their F-35 fleets such as the AARGM-ER or the future SPEAR-EW. Additionally, nations should consider investing in EW capabilities that are compatible with the future U.S. Electromagnetic Battle Management (EMBM) and Cognitive EW systems. This will ensure NATO allies are able to jointly coordinate the fight in the electromagnetic spectrum across the EMBM network and respond to unexpected threats in near-real time via Cognitive EW techniques. This will require aircraft purchases and upgrades that include software open system architecture and software-defined radios in order to link in with the future systems via software updates, as opposed to more expensive hardware buys.

SEEK OPPORTUNITIES FOR SPECIALIZATION

In some cases, it makes sense for European militaries to opt for proportionately large investments in certain capabilities and abstain from investing in others. For example, some experts have noted that SEAD is an area where European air forces would need to specialize in order to do it effectively.[106] Since the F-35 is an EW-capable aircraft that will soon be able to use the newest AARGM-ER (extended-range) HARM and the SPEAR EW, it may be wise for one European air force that flies it—or a small group, in accordance with the second collective action principle—to assume primary responsibility for European EW capabilities.[107] The logic here is that EW/SEAD is a highly complex task that requires a significant amount of training and exercising, not to mention investment in the anti-radiation missiles and other technologies needed to do it effectively.[108] Italy or Germany, as they already have some experience with the mission, would be viable candidates to take on this role, even if they make must budgetary sacrifices elsewhere.

EUROPEAN UNION: USE THE PRINCIPLE OF INCENTIVIZING COOPERATION

The European Union is increasingly finding itself as an actor in security and defense. But its projects are often limited in ambition and financing.[109] Nonetheless, it has tools it can bring to bear, including the EDA's expertise on harmonizing requirements, financial capacity to incentivize joint procurement, and—if member states were to raise their level of ambition—even possibly the ability to pool or borrow large amounts of money to directly procure military hardware as a bloc. In any case, politics and practicality dictate that any new methods—or significant expansions of existing methods—would need a project to act as proof of concept.

For the sake of argument, one potential project emerges from the analysis above. Tactical airlift is a critical enabling capability in a collective defense contingency vis-à-vis Russia, whether or not NATO adopts a version of the USAF's ACE doctrine. Furthermore, as mentioned above, there is already a pertinent EU PESCO project, FMTC. Intra-Europe military mobility is an EU defense priority, as well as a priority area for EU-NATO cooperation. Finally, the three tactical aircraft that Europe flies—the C-130, C-295, and C-27J—are reportedly "approaching the end of their lifecycle in the upcoming decade."[110] It is logical therefore that this is an area where the European Union should focus its efforts.

The forthcoming European Defense Investment Program (EDIP) will build on an existing program and should combine funding with incentives like tax waivers to encourage joint procurement.[111] It could adopt the FMTC project—which has only just been launched and is limited in scope—as a flagship program, which will enable in turn a potential replication of the ACE concept at the NATO level.[112]

UNITED STATES

The United States can assist its European allies by considering four key suggestions. First, it can encourage cooperative developments in European defense—as well as consider joint and interoperable transatlantic procurement with European allies—specifically in the area of software open system architecture. Second, there is a need to be open with European allies about U.S. capabilities that cannot be reliably assumed to remain in the European theater, especially in the event of a contingency in the Indo-Pacific. Third, the U.S. Department of Defense should spread the U.S. "distributed and collaborative" concept of Cognitive EW to European allies and partners and include European partners in the development of that system, as well as the EMBM system. This also goes for the Agile Combat Employment doctrine. Finally, there are strong arguments in favor of the United States considering ways to increase classified information-sharing with allies and close partners, particularly those using similar U.S.-made equipment.

At the same time, the United States and NATO should learn from Russia's failures in Ukraine and their own shortcomings in Libya. Critical air enabling capabilities may not garner media attention, but they are needed to win the fights for which the United States and its European allies and partners are preparing. The Euro-Atlantic community did not fill this gap between 1999 and 2011, nor between 2011 and 2023. How wide will the gap be in another 12 years? ■

Colin Wall *is an associate fellow with the Europe, Russia, and Eurasia Program at the Center for Strategic and International Studies (CSIS) in Washington, D.C.*
John Christianson *is a military fellow with the CSIS International Security Program.*

The opinions expressed are those of the authors and do not represent the official position of the United States Air Force or the Department of Defense.

This brief was made possible by general funding to CSIS. No direct sponsorship contributed to this brief.

Cover Photo: DANIEL MIHAILESCU/AFP via Getty Images

ENDNOTES

1 Anika Binnendijk et al., *At the Vanguard: European Contributions to NATO's Future Combat Airpower* (Santa Monica, CA: RAND Corporation, 2020), https://www.rand.org/pubs/research_reports/RRA311-1.html, 21.

2 "Prague Summit Declaration," NATO, November 21, 2002, https://www.nato.int/cps/en/natohq/official_texts_19552.htm.

3 Ibid.

4 The United States also provided air enabling support to France, ostensibly Europe's most well-rounded military, in its counterterrorism missions in the Sahel.

5 Sophia Ankel, "Russia is holding back on using its most advanced fighter jets over Ukraine because it's scared they'll get shot down, UK intel says," Business Insider, January 9, 2023, https://www.businessinsider.com/russia-limiting-its-advanced-combat-jets-to-russia-airspace-2023-1.

6 C. Shane Clark, "The Inspector General: An Air Force Enabler," *Air and Space Power Journal*, *Chronicals Online Journal Archives 1998-1995*, https://www.airuniversity.af.edu/Portals/10/ASPJ/journals/Chronicles/clark.pdf; "Artificial intelligence becomes the critical enabler of future operations (Studio)," Shephard Media, August 27, 2021, https://www.shephardmedia.com/news/digital-battlespace/artificial-intelligence-becomes-critical-enabler-f/.

7 According to NATO, "Air-to-air refuelling does not only mean longer mission time, but it also allows receivers to take-off with less fuel and greater payload such as weapons, cargo, or personnel. It is thus, a key enabler for distance and endurance, and a force multiplier that allows combat air platforms to cover multiple missions." See NATO, "Multi Role Tanker Transport Capability (MRTT-C)," Fact sheet, September 2022, https://www.nato.int/nato_static_fl2014/assets/pdf/2022/9/pdf/2209-factsheet-mrtt.pdf.

8 "What is Intelligence, Surveillance, and Reconnaissance," CSMI Technology Services, https://csmi.com/what-is-isr/.

9 U.S. Department of Defense, *Joint Electromagnetic Spectrum Operations* (Washington, DC: U.S. Department of Defense, May 2020), III-15, https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/jp3_85.pdf?ver=2020-07-21-114233-010.

10 Tyson Wetzel, "Ukraine air war examined: A glimpse at the future of air warfare," Atlantic Council, August 30, 2022, https://www.atlanticcouncil.org/content-series/airpower-after-ukraine/ukraine-air-war-examined-a-glimpse-at-the-future-of-air-warfare/.

11 Ibid.

12 Peter Weber, "What would a U.S.-Russia war look like?" *The Week*, January 8, 2015, https://theweek.com/articles/449917/what-usrussia-war-look-like.

13 Charles Clover, "Russia versus US: Military views defence as best form of attack," *Financial Times*, June 16, 2013, https://www.ft.com/content/04a05602-cf5e-11e2-be7b-00144feab7de.

14 Franz-Stefan Grady, "US Air Force: Russia Has Closed Air Power Gap With NATO," *The Diplomat*, September 16, 2015, https://thediplomat.com/2015/09/us-air-force-russia-has-closed-air-power-gap-with-nato/.

15 John A. Tirpak, "Lessons From Libya," *Air & Space Forces Magazine*, December 1, 2011, https://www.airandspaceforces.com/article/1211libya/.

16 Major Jason R. Greenleaf, "The Air War in Libya," *Air and Space Journal* 27, no. 2 (March-April 2013): 28-54, https://www.airuniversity.af.edu/Portals/10/ASPJ/journals/Volume-27_Issue-2/F-Greenleaf.pdf.

17 Todd R. Phinney, "Reflections on Operation Unified Protector," *Joint Force Quarterly* 73 (April 2014): 86-92, https://ndupress.ndu.edu/Media/News/News-Article-View/Article/577509/reflections-on-operation-unified-protector/.

18 *Precision and Purpose: Airpower in the Libyan Civil War*, ed. Karl P. Mueller (Santa Monica, CA: RAND Corporation, 2015), https://www.rand.org/content/dam/rand/pubs/research_reports/RR600/RR676/RAND_RR676.pdf.

19 Justin Bronk, "Getting Serious About SEAD: European Air Forces Must Learn from the Failure of the Russian Air Force over Ukraine," *RUSI Defence Systems* 24 (April 6, 2022), https://rusi.org/explore-our-research/publications/rusi-defence-systems/getting-serious-about-sead-european-air-forces-must-learn-failure-russian-air-force-over-ukraine.

20 "NATO Airborne Early Warning and Control Force," NATO, last updated March 3, 2022, https://www.nato.int/cps/en/natohq/topics_48904.htm.

21 "Funding NATO," NATO, last updated January 12, 2023, https://www.nato.int/cps/en/natohq/topics_67655.htm.

22 John A. Tirpak and Abraham Mahshie, "Boeing-Led Team to Explore E-3 AWACS Replacement Options for NATO," *Air and Space Forces Magazine*, March 31, 2022, https://www.airandspaceforces.com/boeing-led-team-to-explore-e-3-awacs-replacement-options-for-nato/. The NATO aircraft were supplemented by a British unit with E-3D Sentry aircraft, stationed in the United Kingdom, but these aircraft were retired in September of 2021 and their replacement E-7 Wedgetail aircraft are not scheduled to arrive until later in 2023. See "HQ NAEW&C FORCE," NATO, https://awacs.nato.int/organisation/hq-naewcf; George Allison, "British E-3D Sentry 'AWACS' aircraft to sold to Chile," *UK Defence Journal*, January 18, 2022, https://ukdefencejournal.org.uk/british-e-3d-sentry-awacs-aircraft-to-be-sold-to-chile/.

23 International Institute for Strategic Studies, *The Military Balance 2023* (London: Routledge, February 2023), https://www.routledge.com/The-Military-Balance-2023/IISS/p/book/9781032508955.

24 Ibid.

25 "Combined Air Operations Centres," NATO, https://ac.nato.int/about/caoc.

26 IISS, *The Military Balance 2023*; "Strategic Airlift Capacity," SAC Program, https://www.sacprogram.org/default.

27 Belgium, Czech Republic, France, Germany, Hungary, Norway, Poland, Slovakia, and Slovenia.

28 If these multirole aircraft are excluded, there would be only 16 strategic lift aircraft.

29 IISS, *The Military Balance 2023*; Belgium and Luxembourg have four and one, respectively, and are forming a joint A400M unit. Ibid.,74.

30 "Strategic Airlift," NATO, last updated February 20, 2023, https://www.nato.int/cps/en/natohq/topics_50107.htm. The six allies are Belgium, the Czech Republic, Germany, Luxembourg, the Netherlands, and Norway.

31 IISS, *The Military Balance 2023*.

32 Although some aerial refueling aircraft can conduct tactical lift, they are not here counted as the latter.

33 If these aircraft are removed from the aerial refueling count, Europe is left with only 27 relevant aircraft.

34 IISS, *The Military Balance 2023*.

35 Ibid.

36 Ibid.

37 Justin Bronk, *Regenerating Warfighting Credibility for European NATO Air Forces* (London: Royal United Services Institute for Defence and Security Studies, February 2023), https://static.rusi.org/whr_regenerating-warfighting-credibility-nato_0.pdf.

38 IISS, *The Military Balance 2023*.

39 "Panavia Tornado: The Final Operators," *Key.Aero*, October 6, 2020, https://www.key.aero/article/panavia-tornado-final-operators.

40 Ibid.

41 IISS, *The Military Balance 2023*; Bronk, Regenerating Warfighting Credibility, vi.

42 IISS, *The Military Balance 2023*.

43 Ibid. They are also used for NATO's air policing mission: "NATO E-3A AWACS Participates in Baltic Air Policing Exercise," NATO, June 30, 2021, https://ac.nato.int/archive/2021/nato-e3a-awacs-participates-in-baltic-air-policing-exercise.

44 "AWACS: NATO's 'eyes in the sky'," NATO, last updated March 3, 2022, https://www.nato.int/cps/en/natohq/topics_48904.htm.

45 OCCAR, "OCCAR Welcomes Signing of Contract for A330 MRTT Aircraft," News release, July 28, 2016, https://www.occar.int/occar-welcomes-signing-contract-a330-mrtt-aircraft.

46 NATO Support and Procurement Agency, "Multinational MRTT Fleet Continues to Grow," News release, August 31, 2021, https://www.nspa.nato.int/news/2021/multinational-mrtt-fleet-continues-to-grow; Gareth Jennings, "NATO MMU receives latest MRTT," Janes, July 28, 2022, https://www.janes.com/defence-news/news-detail/nato-mmu-receives-latest-mrtt. The six participating allies are Belgium, the Czech Republic, Germany, Luxembourg, the Netherlands, and Norway. "Strategic Airlift," NATO.

47 "Strategic Airlift," NATO.

48 "Strategic Airlift Capability," SAC Program.

49 "Strategic Airlift," NATO.

50 Two on 72 hours' notice; one on six days' notice; two "subject to availability." "Strategic Airlift," NATO.

51 Ibid.

52 Belgium, the Czech Republic, France, Germany, Hungary, Norway, Poland, Slovakia, and Slovenia.

53 "Organization," Movement Coordination Centre Europe, https://mcce-mil.org/organisation/.

54 "MCCE at a Glance," Movement Coordination Centre Europe, February 2020, https://www.mcce-mil.org/wp-content/uploads/2020/02/MCCE-At-A-Glance.pdf.

55 "The member nations," European Air Transport Command, https://eatc-mil.com/en/who-we-are/the-member-nations.

56 "EATC's portfolio," European Air Transport Command, https://eatc-mil.com/en/who-we-are/the-fleet.

57 Max Bergmann et al., *Transforming European Defense* (Washington, DC: CSIS, August 2022), https://www.csis.org/analysis/transforming-european-defense, 6.

58 Expert on air and space operations, CSIS workshop, February 24, 2023.

59 Today, even the MCCE admits that "there is still a real issue with the global shortage of military strategic lift assets." See "MCCE at a Glance," Movement Coordination Centre Europe.

60 International Institute for Strategic Studies, *The Military Balance 2022* (London: Routledge, February 2022), https://www.routledge.com/The-Military-Balance-2022/IISS/p/book/9781032279008; IISS, *The Military Balance 2023*.

61 NATO Support and Procurement Agency, "NSPA Delivers Sixth and Seventh Aircraft to the Multinational MRTT Unit," News release, July 29, 2022, https://www.nspa.nato.int/news/2022/nspa-delivers-sixth-and-seventh-aircraft-to-the-multinational-mrtt-unit.

62 Airbus, "Spanish Ministry of Defence signs order for three Airbus A330 MRTT," News release, https://www.airbus.com/en/newsroom/press-releases/2021-11-spanish-ministry-of-defence-signs-order-for-three-airbus-a330-mrtt.

63 "Orders, Deliveries, In Operation Military aircraft by Country," Airbus.

64 IISS, *The Military Balance 2023*, 123; "C-390 Millenium," Embraer, https://embraer.bynder.com/m/7dafc13b2342260a/original/C390_Millennium_Brochure_Ingles_ONLINE_12aug22.pdf.

65 IISS, *The Military Balance 2023*, 116; IISS, The Military Balance 2022, 84.

66 IISS, *The Military Balance 2022*.

67 Although Hungary and the Netherlands do participate in some of the NATO-led schemes discussed above, Hungary is a member of SAC and SALIS, while the Netherlands is a member of SAC and the MRTT Fleet. See "Strategic Airlift," NATO.

68 Khalem Chapman, "Final A310 MRTT Retires from Luftwaffe Service," *Key.Aero*, June 17, 2022, https://www.key.aero/article/final-a310-mrtt-retires-luftwaffe-service.

69 "European Defence Agency to support FMTC and SATOC platforms," *Airforce Technology*, January 30, 2023, https://www.airforce-technology.com/news/european-defence-fmtc-satoc-platforms/.

70 Gareth Jennings, "EU launches new strategic airlifter effort," Janes, November 16, 2021, https://www.janes.com/defence-news/news-detail/eu-launches-new-strategic-airlifter-effort.

71 "EDA supporting two PESCO projects on future European airlift capabilities," European Defence Agency, January 27, 2023, https://eda.europa.eu/news-and-events/news/2023/01/27/eda-to-support-two-pesco-projects-dedicated-to-future-european-airlift-capabilities.

72 "Airborne Electronic Attack (AEA)," European Union, https://www.pesco.europa.eu/project/airborne-electronic-attack-aea/; "Electronic Warfare Capability and Interoperability Programme for Future Joint Intelligence, Surveillance and Reconnaissance (JISR)," European Union, https://www.pesco.europa.eu/project/electronic-warfare-capability-and-interoperability-programme-for-future-joint-intelligence-surveillance-and-reconnaissance-jisr-cooperation/.

73 Inder Singh Bisht, "EU Defense Body Launches Automatic Air-to-Air Refuelling Project," *The Defense Post*, January 5, 2023, https://www.thedefensepost.com/2023/01/05/eu-automatic-air-to-air-refuelling/.

74 David Donald, "NATO Awards Contracts for AWACS Replacement Studies," AIN Online, April 4, 2022, https://www.ainonline.com/aviation-news/defense/2022-04-04/nato-awards-contracts-awacs-replacement-studies.

75 Ibid.

76 IISS, *The Military Balance 2022*, 81.

77 Finnish Defence Forces, "Finnish Defense Forces Is Testing Unmanned Aerial Systems," Press release, July 1, 2021, https://puolustusvoimat.fi/en/-/finnish-defense-forces-is-testing-unmanned-aerial-systems. Regarding the Netherlands, see: IISS, The Military Balance 2022, 130; regarding Poland, see: IISS The Military Balance 2023, 81.

78 Emmanuel Huberdeau, "First French light reconnaissance aircraft to be operational in 2021," Janes, October 20, 2020, https://www.janes.com/defence-news/news-detail/first-french-light-reconnaissance-aircraft-to-be-operational-in-2021; "Projet de loi de programmation militaire 2019/2025: Dossier de presse" [Military Programming Bill 2019-2025: Press Kit], French Ministry of Armed Forces, 2018, https://www.defense.gouv.fr/sites/default/files/ministere-armees/Dossier%20de%20presse%20LPM%202019-2025.pdf.

79 Also known as the European Medium Altitude Long Endurance Remotely Piloted Aircraft System (MALE RPAS).

80 "Eurodrone," Airbus, https://www.airbus.com/en/defence/eurodrone.

81 "MALE RPAS - MEDIUM ALTITUDE LONG ENDURANCE REMOTELY PILOTED AIRCRAFT SYSTEM," OCCAR, https://www.occar.int/programmes/male-rpas.

82 Airbus, "Airbus and OCCAR sign Eurodrone contract," Press release, February 24, 2022, https://www.airbus.com/en/newsroom/press-releases/2022-02-airbus-and-occar-sign-eurodrone-contract; Vivienne Machi, "Airbus prepares for 'Eurodrone' contract signing in early 2021," *Defense News*, December 9, 2020, https://www.defensenews.com/global/europe/2020/12/09/airbus-prepares-for-eurodrone-contract-signing-in-early-2021/.

83 "Eurodrone," Airbus.

84 Vivienne Machi, "With Spain on board, final contracts imminent for Eurodrone program," *Defense News*, January 27, 2022, https://www.defensenews.com/global/europe/2022/01/27/with-spain-on-board-final-contracts-imminent-for-eurodrone-program/.

85 "About Us," MBDA, https://www.mbda-systems.com/about-us/.

86 "SPEAR-EW: Network Enabled Electronic Warfare Capability," MBDA, https://www.mbda-systems.com/?action=force-download-attachment&attachment_id=20573; Andrew White, "New UK-Japan-Italy Fighter takes shape, with electronic details emerging," *Breaking Defense*, March 20, 2023,

87 "Italy reveals plans for converting Gulfstream jets," *Defense News*, April 10, 2023, https://www.defensenews.com/air/2023/04/10/italy-reveals-plans-for-converting-gulfstream-jets/.

88 European External Action Service, A Strategic Compass for Security and Defense (Brussels: European Union, March 2022), https://www.eeas.europa.eu/node/106337_fr, 50. A follow-on European Commission report examined defense investment gaps in greater depth; it stated that the Eurodrone project has gained in importance and that "upgrading and expanding Air-to-Air Refuelling capabilities and existing aircraft fleets" is a short- to medium-term priority. See European Commission, *Joint Communication to the European Parliament, the European Council, The Council, The European Economic and Social Committee and the Committee of the Regions on the Defence Investment Gaps Analysis and Way Forward* (Brussels: European Commission, May 2022), https://commission.europa.eu/system/files/2022-05/join_2022_24_2_en_act_part1_v3_1.pdf.

89 European Defence Agency, *2022 COORDINATED ANNUAL REVIEW ON DEFENCE REPORT* (Brussels: European Defence Agency, November 2022), https://eda.europa.eu/docs/default-source/eda-publications/2022-card-report.pdf. The same document noted that that "joint and enabling capabilities" receive less funding than other areas.

90 Abraham Mahshie, "France Stresses Need for Continued American ISR in African Sahel," *Air and Space Forces Magazine*, July 9, 2021, https://www.airandspaceforces.com/france-stresses-need-for-continued-american-isr-in-african-sahel/.

91 Seth Jones, Rachel Ellehuus, and Colin Wall, *Europe's High-End Military Challenges: The Future of European Capabilities and Missions* (Washington, DC: CSIS, November 2021), https://www.csis.org/analysis/europes-high-endmilitary-challenges-future-european-capabilities-and-missions, 8–9.

92 Bronk, *Regenerating Warfighting Credibility*.

93 "What are HARM, the air-to-surface missiles destroying Russian air-defence radar?" *The Economist*, September 11, 2022, https://www.economist.com/the-economist-explains/2022/09/11/what-are-harm-the-air-to-surface-missiles-destroying-russian-air-defence-radar.

94 Jones, Ellehuus, and Wall, *Europe's High-End Military Challenges*, 37–38.

95 "Prague Summit Declaration," NATO, November 21, 2002, https://www.nato.int/cps/en/natohq/official_texts_19552.htm.

96 Ibid.

97 U.S. Air Force, *Air Force Doctrine Note 1-21 Agile Combat Employment* (Montgomery, AL: Curtis E. Lemay Center for Doctrine Development and Education, August 23, 2022), https://www.doctrine.af.mil/Portals/61/documents/AFDN_1-21/AFDN%20 1-21%20ACE.pdf.

98 Sean Monaghan, "Solving Europe's Defense Dilemma: Overcoming the Challenges to European Defense Cooperation," CSIS, *CSIS Briefs*, March 1, 2023, https://www.csis.org/analysis/solving-europes-defense-dilemma-overcoming-challenges-european-defense-cooperation.

99 IISS, *The Military Balance 2022*, 57.

100 "NATO 2022 Strategic Concept," NATO, https://www.nato.int/strategic-concept/.

101 Sean Monaghan, Colin Wall, and Pierre Morcos, "What Happened at NATO's Madrid Summit?" CSIS, *Commentary*, July 1, 2022, https://www.csis.org/analysis/what-happened-natos-madrid-summit.

102 Subject matter expert at CSIS workshop, February 24, 2023.

103 IISS, *The Military Balance 2022*; IISS, The Military Balance 2023.

104 U.S. Air Force, *Air Force Doctrine Note 1-21 Agile Combat Employment*.

105 Matthew Arrol, "The Key to Maximizing the Air Force's Agile Combat Employment Concept? The Army," *Modern War Institute*, June 28, 2022, https://mwi.usma.edu/the-key-to-maximizing-the-air-forces-agile-combat-employment-concept-the-army/.

106 Bronk, *Regenerating Warfighting Credibility,* 34.

107 According to MBDA.

108 Bronk, *Regenerating Warfighting Credibility,* 34.

109 Max Bergmann and Sophia Besch, "Why European Defense Still Depends on America: Don't Believe the Hype—the War in Ukraine Has Led to Little Change," *Foreign Affairs,* March 7, 2023, https://www.foreignaffairs.com/ukraine/why-european-defense-still-depends-america.

110 "European Defence Agency to support FMTC and SATOC platforms," *Airforce Technology,* January 30, 2023, https://www.airforce-technology.com/news/european-defence-fmtc-satoc-platforms/.

111 Bergmann and Besch, "Why European Defense Still Depends on America." For more on the EDIRPA program (European Defense Industry Reinforcement Through Common Procurement Act), see: Suzanne Lynch, "EU's Breton touts plan to boost – and fund – European defense," Politico, March 6, 2023, https://www.politico.eu/article/eu-thierry-breton-tout-plan-boost-fund-european-defense/.

112 "European Defence Agency to support FMTC and SATOC platforms," Airforce Technology.