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Dear Reader,

From AI-powered battle planning to railguns (yes, it seems that they are back, or did they simply never really leave?), quantum links, and mosquito-sized drones, the pages ahead chart concrete shifts already reshaping defence and security. Add to this radio-frequency weapons designed to counter drone swarms, next-generation scanning systems enhancing base protection, portable oxygen units enabling frontline care, and interceptor platforms designed to neutralise threats in orbit.

The technologies are real, the implications are strategic, and the stakes are escalating. This is not speculation, but a curated snapshot of how innovation is moving faster, smaller and smarter.

You will also notice in the background an evolution in the mentalities, in some important discrepancies in the national budgets allocated to specific topics, opening the way to different ways of addressing the same challenges.

Here are the major news :

We wish you an interesting read.

Foresightly Yours,

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1. Applications of AI and data

1.1	**New report on China's use of generative AI for military intelligence** The report from Insikt Group, which is the threat investigation unit of Recorded Future, offers insight into China's military AI development ambitions and concerns. Insikt Group analysis is based on PLA media, academic research authored by People's Liberation Army (PLA) personnel, PLA and Chinese defence industry patent applications, and other primary sources. (source) *Assessment:* Many modern militaries are seeking to incorporate generative AI into operations, ranging from back-office tasks to logistics and sustainment to strategic intelligence to battlefield chatbots to help operators gain critical information and context. But not all militaries are moving with the same pace, areas of interest, or the same amount of transparency. Gaining insight into the priorities of China's generative AI development can be a particularly difficult task, especially when relying on Chinese state media or other available non-primary sources. This report uses a series of publications from PLA and industry sources as well as patent data to present a coherent perspective on PLA priorities, activities, and concerns related to the development and use of generative AI models for military intelligence. Overall, the report finds that "the PLA has demonstrated clear interest in using generative AI to support intelligence work, has designed methods and systems that apply generative AI to intelligence tasks, and has likely procured generative AI for intelligence purposes." However, the report also stresses that the PLA and the industry that supports it still having concerns over the reliability of general-purpose AI. As a result, "the extent to which the PLA will integrate generative AI into intelligence activities—and the ultimate effectiveness of this integration—remains unclear. Specific key findings include: • The PLA sees a wide range of applications in which generative AI can improve the efficiency of human activities, including improving the collection and analysis of intelligence and enhancing decision-making. • A review of PLA patent applications reveals that the PLA has designed methods and systems that use generative AI to facilitate intelligence tasks such as generating open-source intelligence (OSINT) products, processing satellite imagery, and processing event data. • The PLA has likely prioritised proprietary generative AI models that have been fine-tuned for intelligence tasks. However, they have also used a mix of proprietary and general-purpose models—both foreign and those developed in China—to create generative AI-based intelligence tools. Models from Meta, OpenAI, and Big Science were named as foreign models that have been adapted. Models from DeepSeek, Tsinghua University, Zhipu AI, and Alibaba Cloud were also named as domestically developed resources. • The PLA is concerned that a foreign intelligence agency could use generative AI to produce convincing inauthentic content to mislead Chinese intelligence personnel and degrade the intelligence value of open-source information.

1.2	**Human, Machine, War: How the Mind-Tech Nexus Will Win Future Wars** In April, the United States Air Force's Air University released a 392-page collection of 18 largely academic essays on AI and how the convergence of human and machine intelligence—referred to in the volume as the "Mind-Tech Nexus"—is impacting the future of conflict. (source) *Assessment:* The volume's essays are separated into six thematic parts: • Part One: The Mind-Tech Crucible: Innovation and Ethics (two essays) • Part Two: Command, Control, and Intelligence in the New Fog of War (5) • Part Three: Performance Enhancement (3) • Part Four: Chinese and Russian Mind-Tech (2) • Part Five: The Question of Will and Suppression of Performance (3) • Part Six: Conclusions from Humans—and Conclusions from Machines (3). Interestingly, this chapter includes a summary of the report and key findings from each chapter authored by a large-language model. The human authored conclusion emphasises six key takeaways from the volume • **Ethics:** Advances in the Mind-Tech Nexus raise profound ethical challenges. Meeting them requires the establishment of new international standards and institutions that can be adapted as technologies change. • **Balance between technology and human factors and attributes:** Technological advancement is necessary but not sufficient for the improvement of the Mind-Tech Nexus. Relevant policy and training should focus on getting the most out of humans—and amplifying important human attributes such as courage and judgement—as much as getting the most out of technology. • **The importance of interfaces:** Developing and deploying interfaces that increase the efficiency of human-machine interactions must be a focal point. Incorporating interface design from the start of system design could be a source of competitive advantage. • **Convergence, iteration, and agility:** Efficiency of effectiveness is only developed through the learnings associated with iterative interactions. Because these learnings and the development of best practices for human-machine cooperation can be unpredictable, militaries should build agile processes to promote Mind-Tech advances as they emerge. • **Vulnerabilities:** Every new Mind-Tech advance may bring brilliant new strengths—but it will also bring new vulnerabilities that adversaries can exploit and that need to be anticipated. • **Adversaries and the Will to Fight:** There is a deficit of understanding of adversary advanced and emerging Mind-Tech capabilities. Moreover, because warfighting remains a fundamentally human endeavour, there must be sufficient thought given to how to defend the will to fight among militaries and societies as they are assaulted by AI-enabled and highly targeted influence and disinformation campaigns enabled by Mind-Tech technologies

1.3	**European Parliament (EP) report on "Defence and artificial intelligence" released** The Briefing paper lays out the current state-of-play in defence AI and restates the EP's support for both investment in military AI and efforts to regulate this investment, especially as it pertains to lethal autonomous weapons systems (LAWS). (source) *Assessment:* In April, the European Parliament released a briefing paper on defence and artificial intelligence. The paper provides a useful, high-level, summary of the importance of AI for defence, the state of the global arms race in AI—especially between the United States and China—and the range of actions that European institutions and individual EU states have taken both to pursue or enable development of defence AI and to regulate it. The paper's main themes are summarised at the outset: "The European Parliament recognises the strategic importance of AI in defence but calls for regulation and a prohibition on LAWS. The Parliament's Special Committee on AI in a Digital Age (AIDA) stresses the need for ethical guidelines in defence AI and has warned of the EU's potential lag in AI and called for international regulation of LAWS, robust cybersecurity measures, and global cooperation in military AI regulation." Among the interesting insights in the papers is the stark disparity in investment in AI between Europe and the United States in both the defence and commercial sectors. According to the paper, "EU member states allocate 14.4 billion annually to military research and development, a fraction of the 130 billion spent by the United States . . . To make matters worse, this limited funding is spread thinly across fragmented efforts, with each Member State pursuing its own priorities and working in isolation." The briefing paper also references several European initiatives that seek to facilitate AI investment and development, including the European Defence Fund, EDA's European Defence Innovation Hub, Horizon Europe, the Observatory on Critical Technologies, the EU defence innovation scheme (EUDIS). It also mentions the Defence Equity Facility, which was established to support venture capital and private equity funds investing in European companies developing innovative technologies with dual-use potential. The defence AI development efforts of France—which sees AI as "a priority for national defence—and Germany—which has pledged to increase AI research and development in defence—are also highlighted as reflecting the increasing AI activities in member states. The last four pages of the 11-page document are focused on the need for ethics and the regulation of defence AI. The paper concludes with a restatement of the EP's position on military AI, saying that, "Overall, the Parliament is rather open to military use and recognises AI's strategic importance and potential to protect soldiers and civilians. Members emphasise three key principles for military AI: 1) maintaining human involvement in command and control; 2) 3nsuring legal accountability for individual states, and 3) advocating for international AI governance through the UN, including export regulations."

1.4	**Thou shall not pass: AI to be deployed for base security** The U.S. military is deploying the BV6045 Weapons Detection Scanners to its bases to more efficiently detect threats and speed up security scanning at military bases across the country. (source and source) *Assessment:* Texas-based LINEV Systems is deploying the system to help base security better detect concealed guns, explosives, and other contraband in a heightened threat environment at home and abroad for the U.S. military. The company's product webpage highlights six key features (image below), including a modular design, the deployment of artificial intelligence for automatic detection and classification of threats and predictive analytics to ensure the device is working properly and anticipate malfunctions. Among the advertised benefits of the system are its ability to "flag threats in real time, helping security teams respond faster and more accurately" and reducing "the need for manual checks, helping to cut down on human error and speed up decision-making at high-traffic access points." While reporting during the period focused on the utility of the system for base defence, the company's webpage also emphasises its relevance for critical infrastructure protection facilities, law enforcement and security agencies, customs, border guards, hotels, event centres, educational institutions, sports arenas, and other places where reliable and uninterrupted operation of inspection systems is required.

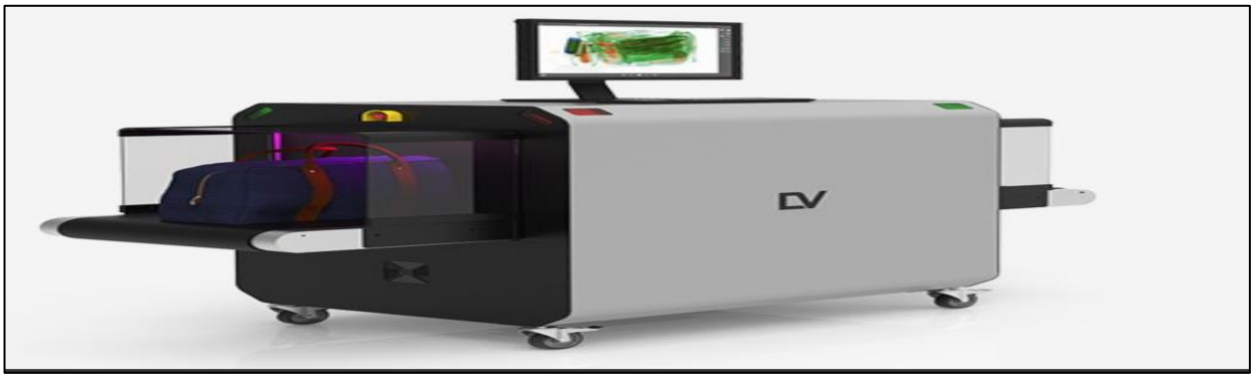

Figure 1: Promotional material highlighting the advantages of the BV6045 Weapons Detection Scanner from the LINEV Systems website. Bottom: A picture of the modular system that is advertised as being able to increase the pace and accuracy of fixed security checkpoint activities. Source: LINEV Systems Website

2. Robotics and Autonomous Systems

2.1	**Making waves: French Navy experiments with weaponised jet ski** The April experiment was part of a broader program to adapt operational concepts, capabilities, and doctrine to a more complex maritime threat environment. (source) *Assessment:* In late April, the French Navy reportedly carried out a successful experiment in which it launched a remotely controlled jet ski loaded with explosives against an out-of-service and specially reinforced Chaland de Transport de Materiel (CTM) landing craft. The weaponised jet ski caused a controlled detonation against the hull of the vessel as captured in the series of images in Figure 2 below. The test is part of the broader POLARIS initiative launched in 2021 and designed to adapt operational concepts and doctrine to a changing maritime threat environment. The rise of more advanced anti-access/area denial (A2/AD) capabilities, the increasing range of anti-ship missiles, the proliferation of asymmetric threats such as small uncrewed systems, and the emergence of new doctrines that rely on the saturation of enemy defences through the use of maritime uncrewed systems have all increased risks to high-value assets and human operators in the maritime environment. POLARIS is the French Navy's effort to rethink the nature of the capabilities and tactics necessary to operate in this environment. The use of small, cheap, expendable systems such as jet skis that can get closer to large surface ships offers one possible solution for the French Navy. At the same time, the proliferation of such simple and easily accessible weapons will necessitate better sensors and protection best practices. Scaling the use of maritime drones and optimising their value will require overcoming several technical challenges. Most notably, maintaining communication with remotely controlled maritime drones over long distances can be difficult due to the unstable electromagnetic conditions in the maritime environment and the potential for jamming of these communications. Furthermore, autonomous maritime uncrewed systems require efficient sensors and navigation systems to avoid collisions and maintain precise trajectories up to the point of impact.

Figure 2: Images from the April French Navy experiment depicting the jet ski approaching the target vessel and the controlled detonation caused by the jet ski's impact. source: French Navy

2.2	**A sign of the times: MBDA reveals small, cheap, expendable drone at Paris Air Show** The drone delivers an affordable means of saturating enemy air defences and creating opportunities for more exquisite and expensive systems to strike high-value targets. (source) *Assessment:* The "One-Way Effector" drone will be able to deliver a 40-kg payload at a distance of 500 kilometres and can travel at a speed of 400 kilometres per hour. The design of the drone started from scratch in December, and the first test flight is expected to take place in September or October. Production is planned for 2027. *Defense News* points out that the small, cheap drone is a departure for MBDA, "whose top-end products can cost millions of euros." That MBDA is investing in this capability—one that meets a stated requirement of the French Armed Forces—reflects three realities related to the emerging battlefield as well as industry trends. First, the One-Way Effector is being developed to "meet [the] need for the return of mass in the armed forces" that has been such a prominent feature of the Ukraine war. In this operational environment, the ability to launch large salvos of low-cost, expendable munitions has become vital to overwhelming air and missile defences and potentially requires these defences to expend high-end air defence weapons on low-cost attack drones. Second, the system demonstrates the ongoing merging of different categories of capabilities and the value of simple, attritable munitions. MBDA representatives describe the system as "a very simple munition" that lacks the sophistication that is often ascribed to modern weapons systems. For example, the drone is not designed to be stealthy, and many of the components are off-the-shelf. Additionally, while the operational concept for the use of the drone involves launching large salvos, the drones will not be capable of autonomous swarming or of communication between one another. As Hugo Coqueret, business development manager battlefield at MBDA, observed, militaries are "going to use it in the same way as artillery." Third, MBDA has formed a partnership with an unnamed French automotive manufacturer to scale production. Coqueret did indicate the partnership is not with Renault, but it is with an automaker seeking to expand its operations into the production of uncrewed aerial systems (UAS), offering additional evidence of the convergence of the expansion of defence industrial bases in many countries around the world to adjacent industries and non-traditional suppliers.

2.3	**Worse than malaria? Chinese researchers develop a mosquito-sized uncrewed aerial system** The state-owned National University of Defence Technology (NUDT) in Hunan Province has developed a biomimetic micro-drone that resembles a mosquito. The drone is well-suited to fly undetected and carry out targeted intelligence, surveillance, and reconnaissance (ISR) activities. (source) *Assessment*: The system reportedly is able to be held in the palm of a hand and can slip through windows, making it "nearly invisible to the naked eye and difficult to detect using conventional radar." It is equipped with small cameras and microphones to capture images, sound, and electronic signals, making it ideal for "information reconnaissance and special missions on the battlefield," according to Lian Hexiang, an NUDT student involved in the project. The revelation of this drone demonstrates two enduring themes in drone development. First, advances in aviation and power storage and distribution, alongside progress in the miniaturisation of sensors, are enabling an exceptional range of drone designs and sizes, including ultra-small drones. Second, the use of biomimetic design principles—that is, incorporating design approaches seen in nature and among animals such as birds or mosquitoes—is increasing the efficiency of uncrewed systems and, in many cases, making them harder to detect. And while technology and design principles have advanced, there remain limitations on, and trade-offs associated with, ultra-small systems. For example, even with impressive gains in sensor and battery miniaturisation, these systems will have limited payloads, short flight times, and on-board processing power to make sense of the complex data sets they collect.

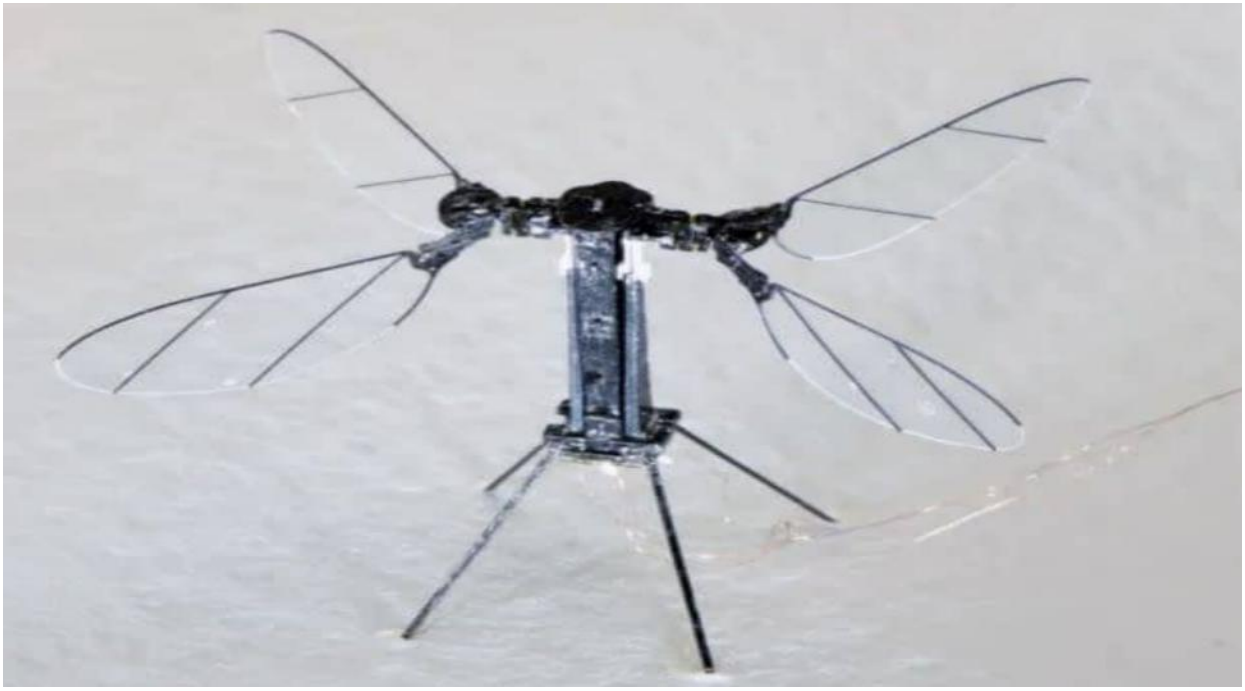

Figure 3: NUDT's mosquito micro-drone. Source: China's CCTV/NUDT via The Defence Post

3. Connectivity

3.1	**Australia begins research project examining quantum communications** The project is designed to deliver secure timing and communications across the battlespace. (source)
	Assessment: The initiative is led by Australia's Defence Science and Technology Group (DSTG) and aims to deliver a quantum-secured timing network featuring a ground-to-satellite optical quantum link. The optical quantum link will have two key components: 1) optical ground stations and 2) quantum light sources. The ground stations will be linked to satellites and will facilitate the transmission and reception of quantum particles carrying encrypted information. Quantum communications are appealing to an increasing number of militaries because they are thought to be impossible to spoof and extremely difficult to jam or detect. Therefore, they can provide a significant advantage in a broader operating environment in which the electromagnetic spectrum is highly contested, and communications are vulnerable to a range of electronic warfare techniques. Quantum systems also provide more precise positioning data and allow synchronisation of assets in military operations. Ben Sparkes, a DSTG scientist working on the project, explained that "the optical quantum link will also provide literally pinpoint precision of relative force position due to the 1,000-fold improvement in timing performance of QSTT (Quantum Secured Time-Transfer) over GPS (Global Positioning System). Several other militaries have invested in quantum secure communications, including China, which is viewed as a leader in quantum key distribution and has established a national quantum communication network. The network is the world's longest quantum communications network at 12,000 kilometres and involves two quantum satellites.

3.2	**Flying blind: Armada International assesses alleged Global Navigation Satellite System (GNSS) jamming in the Middle East conflict zone** The article, entitled "Track Corruption—GNSS Disruption in the Middle East", investigates the disruption of global navigation satellite system (GNSS) signals experienced by U.S. military aircraft in the Persian Gulf in April 2025. It also provides a helpful explanation of the vulnerabilities associated with GNSS signals and technologies developed to jam and protect these signals. (source) *Assessment:* Reports from April indicated that the Global Positioning System (GPS) signal being used by a U.S. Air Force C-17 Globemaster III was jammed while flying near the coast of Qatar. According to flight data taken from the Flightradar24 website, the aircraft was flying on an erratic flight path that indicated challenges in accurately positioning and navigating the aircraft. GPS is one of several GNSS systems that are used for aircraft (and vessel and vehicle) position, navigation, and timing. GNSS signals are critical for aircraft navigation and are integrated into systems like ADS-B transponders, which transmit position, altitude, and speed data. The incident raised broader concerns about the vulnerability of GNSS-dependent systems to electronic warfare (EW) attacks, particularly in or near combat zones and contested regions and highlights the strategic implications of GNSS jamming, which can not only disrupt military operations but also commercial air and maritime traffic as well. The Armada International article provides an interesting analysis of the event, including assessing who might be responsible and what technologies or systems might have been involved. Iran is suspected of launching the GNSS jamming attack, though there are questions about which system it could have used to defeat the U.S. military's military grade P-code encryption. In the days following the April attack, the Iranian Observer, a pro-Iranian government news outlet, published a picture of Iran's Cobra-V1 system, closely based on Russia's Krasukha-S4 electronic warfare system. A caption accompanying the picture read: "U.S. spy planes are facing Iran's electronic warfare systems. Iran has begun jamming communications and GPS signals across the Persian Gulf and Strait of Hormuz." However, the publication of this image may have been a deliberate attempt to mislead military analysts. As the article points out, the U.S. aircraft was flying 174 kilometres from Iranian airspace, outside of the known range of the Cobra-V1 system. This raises the possibility that Russia has covertly supplied Iran with a more powerful system, such as the Samarkand system or that Iran has developed a domestic version of a more powerful GNSS jammer. The article also provides a helpful technical explanation of the relationship between ADS-B transponders and GNSS, as well as how GNSS signals might be jammed, and new encrypted communications under development to better protect GNSS signals.

4. Human Protection and Performance

4.1	**"A game-changing advance in battlefield medicine": UK Defence Science and Technology Lab (DSTL) reveals new portable oxygen delivery system** The Cylinder-less Modular Oxygen Supply System (CMOSS) uses oxygen from the air and provides it to the wounded, allowing medics to deliver potentially life-saving oxygen at the point of wounding rather than having to wait to do so at an aid station. (source) *Assessment:* In late April, DSTL revealed the new CMOSS oxygen delivery system that should improve the ability of battlefield medical personnel to safely deliver oxygen to wounded or injured patients at the front lines. This is currently not possible using traditional cylinder-based systems. The portable CMOSS weighs around 5 kilograms. Oxygen therapy is critical for patients suffering from blood loss, head injuries, and lung trauma, and providing oxygen directly to the point of injury can dramatically improve the likelihood of survival and recovery of battlefield wounds and injuries. The new system does this by pulling air directly from the environment surrounding a patient, rather than relying on supplies of pressurised oxygen cylinders and specialist equipment. The air is pushed into a number of chambers on the machine that remove the nitrogen to allow oxygen-rich gas to be delivered. Additionally, for seriously wounded patients that require more oxygen, the device includes a rebreather element that conserves exhaled breath, scrubs the carbon dioxide out of it, and enables it to be breathed back in. Together, these measures ensure that any oxygen consumed by the patient is replaced, maintaining a consistently high concentration of oxygen delivered to severely wounded patients. According to Major Andrew Maggs, DSTL's military advisor, "by reducing logistical burden and improving safety, the system will provide critical care in situations where every second counts." The system currently costs £15,000 per unit, though there are efforts to design a less expensive system for mass production.

Figure 4: A screenshot of a ForcesTV video that shows the CMOSS system, which is contained in the black bag in the center of the picture with associated tubing seen behind the bag. source: ForcesTV

5. Platforms and Weapons Systems

5.1	**Japan installs electromagnetic railgun on test ship** Railgun weapons use electromagnetic currents to fire projectiles rather than chemical propellants, offering increased speed and range. However, they also bring heightened technical risk related to power generation, barrel wear, and ship design. They are one of several types of weapons systems designed to provide defences against fast-moving, distant threats at a reduced cost. (source) *Assessment:* The Japanese Ministry of Defence's Advanced Technology and Logistics Agency (ATLA) has been working on railgun technologies since 2010 and the organisation announced in 2023 that it had successfully conducted test firings of a prototype at sea. The prototype weapon was installed on the JS *Asuka* a testbed ship with a warship-type design and a displacement of 6,200 tons. ATLA has reportedly been able to demonstrate the ability to fire railgun rounds at a velocity of around 4,998 miles per hour (Mach 6.5) while using five megajoules of charge energy in previous tests. Several militaries have invested in railgun technologies in the last two decades including China and the United States. The United States abandoned its program several years ago due to persistent technical challenges. Three main obstacles to railgun development are frequently cited. First, because they leverage electromagnetic currents, railguns require a large amount of energy to operate. Second, the energy required to fire a railgun creates a high amount of heat, which in turn wears down railgun barrels faster than a powder gun. As a result, the guns lose accuracy more quickly and need to be replaced more frequently. Third, the power sources required to operate a railgun can be large and bulky, making them difficult to fit onto existing ship designs where space is typically at a premium. Nonetheless, ATLA has pressed forward with railgun development in an effort to modernize its force and create novel capabilities to cope with a fraught security environment. Increases in the number, range and speed of China's anti-ship weapons, in particular, and have placed a premium on developing lower cost means of engaging high-speed weapons at range. .

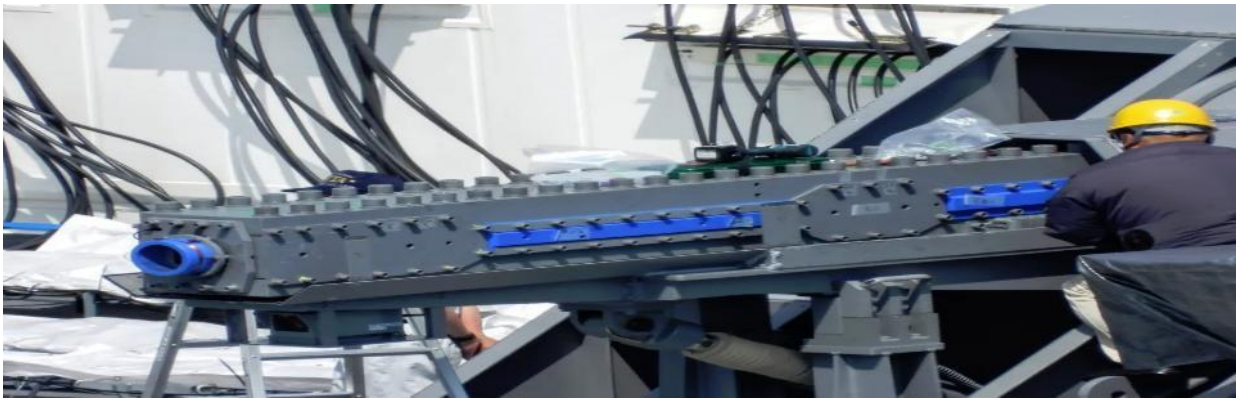

Figure 5: Japan's electromagnetic railgun being installed on the JS Asuka. Source: @HNlEHupY4Nr6hRM via The War Zone

5.2	**Invisible energy: The United Kingdom and China advance directed energy weapons technology** Defence researchers in both the United Kingdom and China announced advancements in directed energy weapons to combat the threat of drone swarms and efforts to saturate air and missile defences. (source and source) *Assessment:* On 17 April, the UK's Defence Science and Technology Laboratory (DSTL) announced that British soldiers had successfully defeated swarms of small drones using a radio wave weapon. The system reportedly can defeat threats at ranges of up to 1 kilometre and is effective against threats such as fibre-optic drones that cannot be jammed in the electromagnetic spectrum. The UK MoD reported that the system has an estimated cost of 10 pence per shot fired. The test involved UK forces "taking down" two swarms of drones involving over 100 drones in total. Sergeant Mayers, a Senior Remotely Piloted Air Systems Operator involved in the exercise, observed that the demonstrator radio wave weapon was "quick to learn and easy to use. With improvements on range and power, which could come with further development" the weapon would be a "great asset to Layered Air Defence." In a related development, defence researchers from China's Northwest Institute of Nuclear Technology (NINT) published a paper in the April edition of High Power Laser and Particle Beams that revealed a successful test of a compact high-power microwave (HPM) system capable of firing over 10,000 times without failure. The gun weights significantly less than traditional HPM weapons and is powered by a three gigawatt-pulsed current. While its exact dimensions were not published, an image in the paper suggests a size comparable to Gatling gun. The main innovation in the Chinese weapon eliminates bulky external pumps, replacing them with advanced manufacturing techniques that brazed aluminium oxide ceramic insulators to stell using high-temperature alloys and replacing rubber O-rings that are prone to leaks,

Figure 6: The British Radiofrequency weapon demonstrator. Source: UK Ministry of Defence

6. Space

6.1	**French startup develops novel weapon to clear space debris, identify and neutralise other threats to space infrastructure** The Interceptor system is still in relatively early stages of development. It is built in response to the French government's increasing concern over the risks and threats of a contested and congested space environment, especially in Low Earth Orbit (LEO). (source) *Assessment:* French startup Dark, founded in 2022 by former missile engineers from MBDA and Thales, is developing an air-launched spacecraft designed to intercept, capture, and dispose of potential threat objects in orbit, such as co-orbital satellites, space debris, and other threats. The concept is a response to the growing number of satellites in space and the growing range of military and counter-space activity. The Interceptor weapon will be launched from a modified commercial aircraft. Once it locates and identifies a target object, it will use a robotic module to grab and decelerate the target. After the threat is neutralised, the Interceptor weapon de-orbits and disposes of the captured objects in a "satellite graveyard" in the South Pacific. Claude Laheyne, Dark's co-founder, told *SpaceNews* that a new approach is required for dealing with the growing hazards of a competitive, congested, and contested space environment. According to Laheyne, "the world needs counterspace systems that are adapted to the increasing hostility of orbital environments," and that new approaches are required that mimic how military aircraft respond to aerial threats. The company also stresses the system's flexibility and response time. Because Interceptor is launched from an aircraft, the company claims it can take off at almost any time instead of waiting for a rocket launch window. This means that Interceptor can respond to a threat within 24 hours of detection. The first test will be held in 2027 with the limited objective of achieving a rendezvous with and shadowing an identified threat object. Dark has attracted $11 million in venture funding, including investment from Eurazeo, Frst, and Long Journey Ventures. The company has expanded to 40 employees, focusing on propulsion technologies, radar, and other sensors needed to detect and inspect space objects

7. Manufacturing and Industry

7.1	**Companies team up to develop new inspection and maintenance tools relying on drones, digital twins, and computer vision** Gecko Robotics and L3Harris ' concept aims to reduce times for defect detection and repair and improve force readiness. (source) *Assessment:* Gecko Robotics and L3Harris announced a novel approach to help solve the U.S. military's problems with aircraft inspection and maintenance, which has led to longer down times for aircraft and a reduction in force readiness. The companies' approach uses small drones to take thousands of images of a specific aircraft. These images are used to create digital twins, accurate digital world replicas of the real-world aircraft. In theory, digital twins can help speed up maintenance time by allowing for AI-enabled computer vision examinations of aircraft for defects that take place in the digital world rather than through time-consuming manual inspections led by humans. Drones will reportedly take 10,000 high-definition photos of aircraft to build full-scale digital models of planes, creating what officials describe as a 360-degree "extended reality" environment." Maintainers could even do inspections remotely and be able to detect issues that would be otherwise invisible to the naked eye. A year of prototype testing with Gecko in collaboration with multiple military customers has identified numerous applications for this technology, including virtual visual inspections, configuration review, and robust defect identification. The company is also applying similar technology to naval applications, where Gecko Robotics is working with the Navy to use the company's wall-climbing robots to conduct careful, point-by-point inspections of ship hulls, reducing maintenance times for certain vessels down from 11 days to just one.

7.2	**More on the digitalisation debate: Roundtable reveals potential and challenges associated with digital twins and digital engineering for aerospace and defence** On 9 May, the United Kingdom's Royal Aeronautical Society released a paper entitled "Can digitalisation give defence the edge?" The paper summarised an expert roundtable on digitalisation and provided a balanced, and ultimately optimistic, assessment of the opportunities and challenges associated with digital engineering technologies by defence. (source) *Assessment:* Defence communities are calling on industry to produce advanced capabilities at scale more quickly. Digital engineering is frequently cited as a key enabler of this acceleration of the design and production process. By allowing companies to experiment with designs and test these designs thousands of times in a digital environment before building a prototype, digital engineering can cut down on the cost and time associated with capability development. However, recent high-profile uses of digital engineering in the design process, such as with the Boeing T-7A Red Hawk, have failed to live up to the hype. This tension between the potential of digital engineering and the tensions and challenges associated with its widespread adoption and deployment is the focus of the Royal Aeronautical Society paper. Key insights include: 1. Digital engineering generally does speed up development, though perhaps not as much as some advocates have advertised. This gap is frequently because the use of digital engineering can also increase the complexity of the systems being designed, which, in turn, requires more time to test in the digital domain. 2. Access to data is an issue in the digital engineering environment. One participant observed that "between 30-60% of engineering time is spent trying to access the data" that engineers need. Another participant recounted that digital simulation tests "take a lot of data, which often isn't readily available." 3. Digital engineering allows individuals in remote workstations to access a digital twin, but it also reduces the amount of in-person collaboration that is traditionally an enabler of innovation and effective engineering. 4. Digital engineering tools are underutilised in part because the full extent of their functionality is not fully understood by operators. Moreover, operators are disinclined to learn more about them due to growing pressures associated with meeting tight timelines. This places a premium on building a digitally literate workforce and on effective training in digital engineering. 5. It can be challenging to keep a digital twin updated throughout the lifecycle of a system, especially when equipment can be modified in the field. There is the potential for the digital twin to not accurately represent the real-world version of a given system, which complicates sustainment. 6. Digital engineering has real potential for cutting down on the time and cost of development as adoption deepens. To facilitate this adoption, the defence industry and communities should celebrate digital milestones, such as the first digital flight for an aircraft.

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