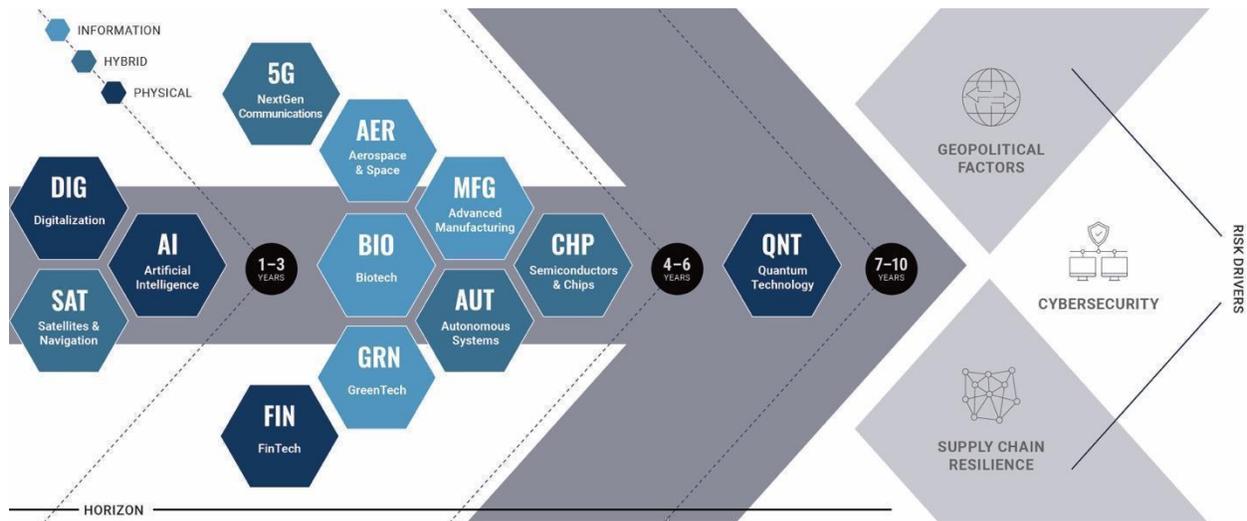




MATRIX MONITOR

Friday March 10, 2023

The only source dedicated exclusively to the emerging technologies shaping the future of business and national security.



This week's Next5 Matrix Monitor features a Chinese satellite has been approaching and inspecting U.S. satellites in geostationary orbit, an analysis of Singapore's AI progress, the Romanian Prime Minister's AI assistant, a proposed internet network for the moon, a "glove" of skin cells that can be slipped onto a severely burned hand, autonomous underwater vehicles for surveillance and exploration, and China's lead in 37 of 44 critical and emerging technologies.

NEXT5 EDITOR'S HIGHLIGHTS

→ **Yesterday, the banking partner for nearly half of U.S. venture-backed technology and healthcare companies listed on the stock exchange - Silicon Valley Bank - fell by more than 60% at closing bell.** Investors dumped shares of the bank and a wide swath of other U.S. banks after the tech-focused lender said it lost nearly \$2B selling assets following a larger than expected decline in deposits. The four biggest banks lost \$47B in market value Thursday. The KBW Nasdaq Bank Index is on pace for its biggest decline since the pandemic outbreak. This event is another consequence of the Federal Reserve's aggressive campaign to control inflation. Rising interest rates have caused the value of existing bonds with lower payouts to fall in value. Banks own a lot of those bonds, including Treasuries, and are now sitting on giant unrealized losses. #USA [WSJ](#)

Analyst Comment: SVB is a critical hub in the U.S. innovation ecosystem, and we anticipate this could cause ripple effects with other Silicon Valley firms. We are hearing reports that VCs have instructed their portfolio companies who bank with SVB to transfer funds out, and that SVB is having trouble meeting the surge of customer requests.

→ **The Intelligence Community's Worldwide Annual Threat Assessment was published on March 8, followed by annual public testimony on the Hill from the Directors of ODNI, CIA, NSA, FBI, and DIA.** The Assessment walks through individual threats, starting with nation states, which just so happen to be the "Big 4" states when it comes to cyber activity. China was top of the list and both the Senate and Congressional hearings spent a considerable amount of time discussing the potential threats posed by TikTok and the CCP's access to data it collects. There was also concern about Chinese control over supply chains and cyber threats. The war in Ukraine also took a center stage and lawmakers debated whether the Wagner Group should be considered a terrorist organization. Both hearings also focused on past violations of FISA laws and debated the necessity of maintaining Section 702 - which all agencies persistently testified is critical for mission success. The law is set to expire this year, so lawmakers will debate whether it should be reinstated or recalibrated. On the domestic front, Congressmen and Senators expressed disappointment in the lack of intelligence surrounding American fentanyl deaths and felt the Assessment did not capture the severity of the threat adequately. The greatest intelligence gaps heard throughout the testimony include the origins of Covid-19 and the cause of "Anomalous Health Incidents" (AHI) where several intelligence personnel around the world are suffering severe medical side effects that have yet to be tied to a U.S. adversary. Looking ahead, lawmakers were interested in how the IC is incorporating commercial intelligence, adopting new technology or preventing it from being used maliciously (in the case of ChatGPT), and updating classification policy to enable better information sharing with the public sector and the American people. The public hearings were followed up with closed sessions where the Directors could speak to lawmakers on both House and Senate intelligence committees at the classified level. #USA #Cybersecurity #SCRM #BIO #AI #Geopolitics #SCRM #CHN #RUS #UKR [2023 Annual Threat Assessment](#)

→ **China's leader Xi Jinping issued an unusually blunt rebuke of U.S. policy on Monday, blaming what he termed a Washington-led campaign to suppress China for recent challenges facing his country.** "Western countries - led by the U.S. - have implemented all-round containment, encirclement and suppression against us, bringing unprecedented severe challenges to our country's development," he said. His comments marked an unusual departure for a leader who has generally refrained from directly criticizing the U.S. in public remarks. Now by directly accusing the U.S. of seeking containment, a term loaded with Cold War meaning, Mr. Xi appears to be associating himself more closely with nationalistic rhetoric - widely used by lower-ranking officials and state media - that attacks Washington at a time when bilateral tensions continue to simmer over trade, technology, geopolitical influence, and discordant views on Russia's invasion of Ukraine. The accusations by Mr. Xi against the U.S., delivered to an audience that includes politically connected businesspeople, appeared in part to be an effort to shift blame away from his own policymaking, including tough Covid restrictions that have weakened the economy, and pressure on tech companies that cost the industry some of its dynamism. #Geopolitics #CHN #USA [WSJ](#)

Analyst Comment: During the House and Senate intelligence hearings this week, DNI Avril Haines directly addressed Xi's speech, saying it represents "the most public and direct criticism we have seen from him to date and probably reflects growing pessimism in Beijing about China's relationship with the United States, as well as Xi's growing worries about the trajectory of China's economic development and indigenous technology innovation - challenges he now blames on the United States. He also wants to message to his populace and regional actors that the U.S. bears responsibility for any upcoming increase in tensions."

→ **Canadian Prime Minister Justin Trudeau appointed a special investigator to review alleged Chinese election meddling.** The issue will also be studied by a group of lawmakers cleared to see top level intelligence. A series of media reports in recent weeks said Trudeau received intelligence briefings that China meddled in both the 2019 and 2021 votes that returned him to power. The reports included claims that Chinese officials spread misinformation to hurt certain candidates, including Conservative Party candidates, and funneled money and volunteers toward people it wanted to see elected. Recent polling has found that two-thirds of Canadians believe China tried to interfere, and more than half see it as a serious threat to Canada's democracy and want Trudeau to do more in response. #Geopolitics #CAN #CHN [Bloomberg](#)

Analyst comment: Former National Intelligence Officer for Cyber, Chris Porter shared this article and noted on a LinkedIn post that there is much more for the public to learn about Chinese interference in U.S. politics and elections. He said, "When can we expect the U.S. Intelligence Community to be equally transparent about the reporting behind the dissent I and other senior analysts took on the 2020 election influence by China in America's elections?" Of note, the U.S. Intelligence Committee's Annual Threat Assessment said that Beijing "has shown a willingness to meddle in select election races that involved perceived anti-China politicians," though it did not provide much

information about which elections or how successful China might have been at influencing politics and election outcomes in the West.

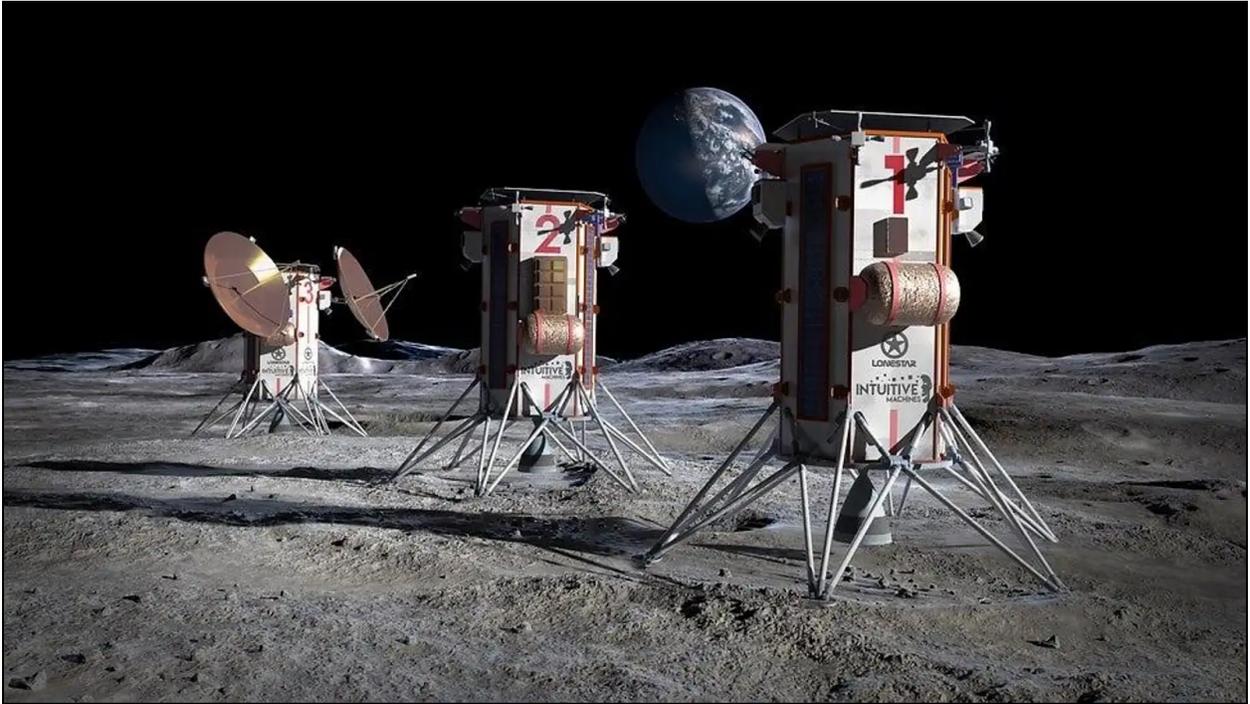
DIGITALIZATION

→ **Governments are increasingly developing and implementing advanced algorithms to make critical decisions for the welfare of their citizens, according to an investigation.**

Specifically, in 2017 the city of Rotterdam in the Netherlands deployed a machine learning algorithm built by Accenture to help investigate people suspected of committing benefits fraud. The algorithm generates a risk score for everyone on welfare, which is determined by factors such as age, gender, etc. In 2021, the city suspended use of the system following a critical external ethical review commissioned by the Dutch government, though Rotterdam continues to develop an alternative. Researchers were granted access to examine the algorithm, which included personal data fed into the algorithm, the inner workings of the data processing, and the scores it generates. The researchers discovered that the system discriminates based on ethnicity and gender after [reconstructing and testing it](#). It also revealed evidence of fundamental flaws that made the system both inaccurate and biased. The information fed into the algorithm ranges from the length of someone's most recent romantic relationship to someone's ability to persuade and influence others to how many times someone has emailed the city and whether someone plays sports. Despite the scale of data used to calculate risk scores, it performs no better than random selection. The training data for the algorithm included information on 12,707 people who had previously been investigated by the city, with half being found to have broken the law. The algorithm attempts to determine what distinguishes someone who is committing welfare fraud from someone who is not. However, an algorithm is only as good as the data it is trained on, and the data from Rotterdam was flawed. Some groups rarely show up in Rotterdam's training data. To reflect the actual proportion of people under the age of 27 who receive welfare in the city, there should have been around 880 young people in the data but there were only 52. In the researchers' tests of the algorithm, it was age, specifically youth, that was the most significant attribute in raising risk scores. The algorithm concluded that young people are more likely to commit welfare fraud, but it did so based on a sample size so small that it was inadequate. #DIG #AI #Cybersecurity #NLD [WIRED](#)

→ **Florida-based startup [Lonestar](#) has raised \$5M to build data centers on the moon.**

Previously, Lonestar completed a successful test of its data center aboard the International Space Station. The company is now preparing to launch a small data center box to the lunar surface as part of Intuitive Machines' second lunar mission, IM-2 (the company's first mission, IM-1, is scheduled to launch in June). The lunar data centers will initially be geared towards remote data storage and disaster recovery, allowing companies to back up their data and store it on the Moon. In addition, the data centers could assist with both commercial and private ventures to the lunar environment. The miniature data center weighs about 2 lbs and has a storage capacity of 16 TB. The first data center will draw power and communications from the lander, but the ones that will follow (pending its success) will be standalone data centers that the company hopes to deploy on the lunar surface by 2026.



#DIG #5G #AER #USA [Gizmodo](#)

SATELLITES & NAVIGATION

→ **Chinese satellite TJS-3, launched in 2018, has been approaching U.S. satellites in geostationary orbit and inspecting them.** The Twitter account Orbital Focus notes that the satellite has been drifting along the geostationary belt, but pausing to take a closer look at satellites USA 233 and USA 298, both thought to be military communications satellites operated by the U.S. Space Force. The recent trend of countries scouting each others' satellites in geostationary orbit has created a game of learning and testing counter-space and situational awareness capabilities. Satellite Dashboard, a web tool that collates and analyzes space situational awareness (SSA) data, reveals that TJS-3 approached as close as 3.8 miles to USA 233 on October 31, 2022. U.S., Russian, and Chinese satellites have all increasingly been scouting each others' satellites in GEO in recent years, using close approaches to obtain images and other data. Countries are aiming to learn about each others' spacecraft and test their counter space and SSA capabilities. #SAT #USA #CHN #RUS [Space.com](#)

→ **Raytheon has won a \$250M contract from the Space Development Agency (SDA) to build seven missile-tracking satellites.** The satellites will become the fifth plane of the Tracking Layer Tranche 1 constellation, a US Defense Department network of infrared-sensing satellites that aims to detect and track ballistic and hypersonic missiles launched by foreign adversaries. In addition to Raytheon's seven satellites, the constellation will include 14 made by Northrop Grumman and 14 made by L3Harris. Defense appropriators said they added funds in response to an urgent request from the U.S. Indo-Pacific Command to accelerate the deployment of missile-tracking sensors over the region. Congress last year added \$500M to

SDA's budget for the Tracking Layer, and the agency moved up the first launch of Tranche 1 from the original 2026 target to 2025. The \$250M contract also includes ground operations and support services. #SAT #USA [Space News](#)

ARTIFICIAL INTELLIGENCE

→ **Georgetown University's Center for Securing and Emerging Technologies (CSET) explores Singapore's AI progress. Singapore has been a leader in technology governance in Southeast Asia and is aiming to become a global AI hub.** The country has provided top-down support for AI research and development, including significant streamlining of patent timelines, cultivation of AI talent, and fostering an ecosystem conducive to growing AI startups. CSET's findings highlight the following:

- **Singapore's national AI strategy seeks to harness AI in key sectors.** Active areas of research are predominantly focused on domestic improvements in healthcare, manufacturing, and cybersecurity. There is little indication that it is aiming to leverage AI for military purposes.
- **Singapore's future AI progress will be challenged unless it addresses its tech talent shortage.** With only 2,800 information and communications technology graduates in 2020 and an expected demand of 60k through 2024, Singapore is falling short. To address this issue, Singapore has implemented apprenticeship programs, fortified its youth tech talent pipeline, facilitated partnerships with tech companies internationally, and attempted to attract global talent.
- **Singapore's regional leadership in other technical areas could serve as a template for AI leadership in the region.** In addition to spearheading numerous Association of Southeast Asian Nations cybersecurity initiatives, Singapore has also built a physical center—the ASEAN-Singapore Cybersecurity Centre of Excellence—to house regional exchanges and dialogues around cybersecurity. This endeavor positions it to be a leader in other technology forums, particularly those centered around AI.
- **Singapore has taken steps toward a human-centric, ethical employment of AI applications.** The city-state has a unique definition of “human-centricity” in AI that is directly tied to its approach to AI ethics. The government has also created the Model AI Governance Framework to implement the guiding principles from its ethics documents. These frameworks are similar to U.S. efforts, including the Blueprint for an AI Bill of Rights and the AI Ethics Framework for the Intelligence Community, both of which carry principles of human consideration and involvement in AI decision-making. There may be opportunities for further alignment between the two countries and with other allies and partners to further promote trust in AI developments and ensure their ethical use.

CSET states it is important for the U.S. to continue to invest in its partnership with Singapore, especially in the emerging technology of AI, while respecting the country's desire to remain neutral and not be treated as an instrumental player in the US-China competition. #AI #MFG #BIO #Cybersecurity #USA #SGP #CHN [CSET](#)

→ **The Central Intelligence Agency is making progress in using AI and machine learning to parse through data and alert officials to global developments.** However, the agency isn't

on the cusp of outsourcing its analysis to bots like ChatGPT. Congress is pushing spy agencies to embrace AI and other digital technologies. At the CIA, much of the work around data is led by the Directorate of Digital Innovation. The CIA's new jobs website shows numerous openings at the directorate, including postings for positions like data analysis officer, data engineer, data lifecycle specialist, and data scientist. The agency's analysts typically want tools that sort through data and alert them to developments in certain parts of the globe, like when an individual they're tracking enters a specific, geo-fenced area. The explosion of open source and commercially available data is posing challenges, and the agency wants its analysts to live up to the "all-source" moniker through the use of tools to find open-source insights. #AI #USA [Federal News Network](#)

→ **The Romanian Prime Minister has introduced an AI assistant named Ion that will use sentiment analysis to inform the government about the wishes of Romanians in real-time.** Ion has a physical form and a moving graphic at the top that suggests it is listening at all times. While governments around the world have been using machine learning for sentiment analysis, some experts have concerns about the ethics of data scraping on social media and the potential for bad actors to manipulate the system. They also warn that recent attempts to rush AI into the market have shown how AI can be wrong about humans and human intent, and that further development is needed before relying on it to properly assess what people are thinking. #AI #ROU [Vice.com](#)

→ **AI robots may soon be used as teaching assistants in classrooms in the UAE, according to the nation's Minister of Education.** The minister emphasized that AI technologies would be used to enhance the quality of learning and education, not replace teachers, and that they would collaborate with partners such as Microsoft and OpenAI. The UAE is embracing the use of new technology in education, with a policy in development to guide teachers on how best to use such technology to help students interact with it and ensure the best learning. #AI #USA #ARE [Interesting Engineering](#)

NEXT GENERATION COMMUNICATIONS

→ **NASA is in the early stages of creating LunaNet, a critical initiative to build an Internet network for the moon.** Specifically, the agency is planning to construct a wide range of infrastructure on and around the moon, including a lunar web service that can keep everything connected. To improve service, NASA is planning to launch lunar satellites that will connect with each other, and then back to communications infrastructure on Earth. NASA will also deploy a series of ground stations, which will essentially work like cell towers, on the lunar surface. In theory, lunar communications will work less like a phone line and more like an Internet network. Private companies will play a role in the development of this new Internet infrastructure. For example, [Aquarian Space](#) plans to launch its first lunar communications satellites in 2025, with the ultimate goal of providing a 100 MBps, 24/7 lunar surface. NASA is also collaborating with [Nokia](#) on the development of a cellular network for the moon. NASA has already awarded the company a more than \$14M contract, and its first base station, along with radio equipment,

should be delivered to the moon via a [SpaceX](#) rocket scheduled to launch sometime next year. #5G #AER #DIG #SAT #USA #FIN [Fast Company](#)

FINANCIAL TECHNOLOGY

→ **U.S. lawmakers are planning on reintroducing a bill that will reform the way crypto is treated for tax purposes.** The bill called Keep Innovation in America Act would narrow the definition of a crypto broker for tax purposes to “any person who (for consideration) stands ready in the ordinary course of a trade or business to affect sales of digital assets at the direction of their customers,” according to a draft document of the bill. Lawmakers want to put this reform forward because they believe the current reporting requirements for companies dampen innovation in the crypto sector. “The reporting requirements under current law require digital asset market participants to adhere to standards that are incompatible with this technology’s operation,” the bill said. “This will hinder the development of digital assets and its underlying technology in the U.S., shifting its development outside the U.S.” #FIN #Geopolitics #USA [Coin Desk](#)

AEROSPACE & SPACE

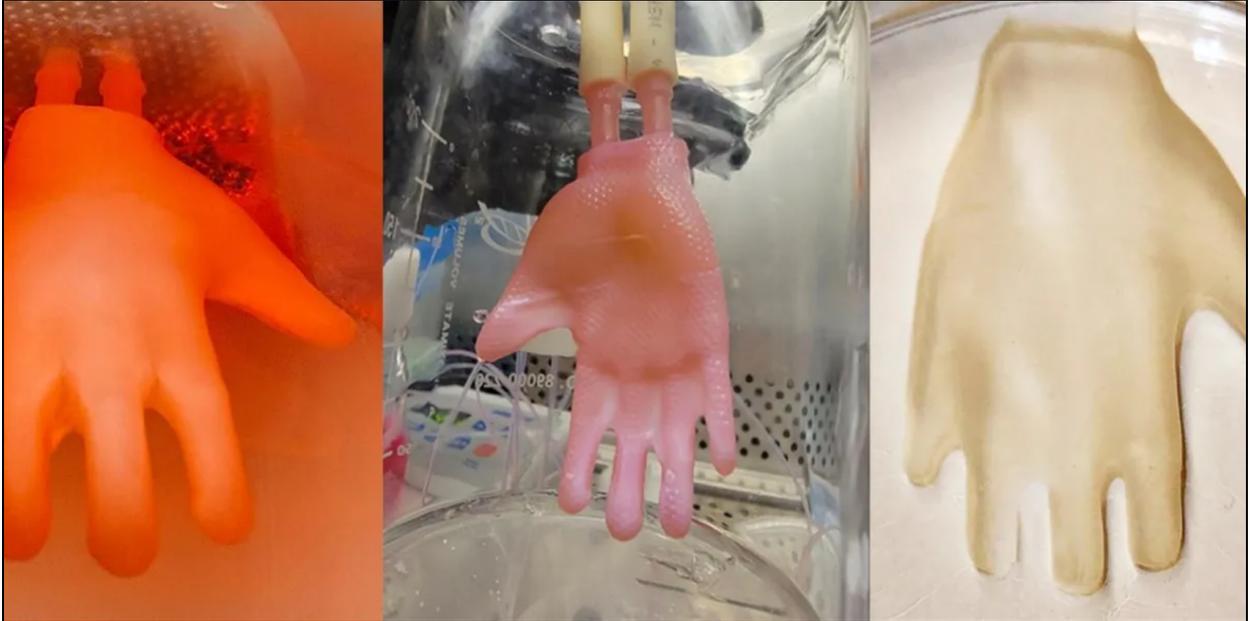
→ **Japan's first launch of its new flagship space rocket, the H3, ended in failure on Tuesday, March 7, after controllers issued a destruct command 15 minutes after liftoff,** according to the Japan Aerospace Exploration Agency (JAXA). A report from public broadcaster NHK said the second stage of the H3 rocket did not ignite. The rocket was carrying the Advance Land Observation Satellite-3 (ALOS-3), which was planned to be a key tool in disaster management efforts. Tuesday’s failure occurred on JAXA’s second attempt to launch the H3. On February 17, two secondary booster engines strapped to the side of the space vehicle did not ignite on the launch pad and the H3 failed to take off. The space agency has touted the H3 as the successor to Japan’s H-2A and H-2B rockets, with flexible configurations based on what it would need to lift into orbit. It has previously touted the expected ability of the H3 to launch both government and commercial missions. According to JAXA, the H3 would be more economical than many other launch vehicles because it uses commercial-off-the-shelf products from other industries (such as the automobile industry) rather than products exclusive to space use. JAXA and Mitsubishi have reportedly spent over \$1.5B on the project since its inception nine years ago. #AER #JPN [CNN](#)

→ **The U.S. Defense Department has released updated guidelines for safe and responsible space operations, reflecting recommendations from U.S. Space Command.** The guidelines lay out five “tenets of responsible behavior in space,” including operating in a professional manner, limiting debris generation, avoiding harmful interference, maintaining safe separation and trajectory, and enhancing communication and notification for safety and stability. U.S. Space Command said the list of behaviors was developed in consultation with the military services, DoD leaders, the National Reconnaissance Office, the Department of State, and the National Security Council staff. The guidelines apply to military operations and were released to provide transparency and reduce the risk of misunderstanding and miscalculation. The U.S.

government follows a number of policies and protocols with regard to orbital debris and safety of space operations, including the United States Orbital Debris Mitigation Standard Practices, the United Nations Long-Term Sustainability Guidelines, and most recently a U.S. commitment not to conduct destructive direct-ascent anti-satellite missile tests. #AER #SAT #USA [Space News](#)

BIOTECHNOLOGY

→ **Columbia University researchers have developed a method for growing engineered skin in complex, 3D shapes, allowing them to create a seamless "glove" of skin cells that can be easily slipped onto a severely burned hand.** The complex process started with scanning a body part and then 3D printing a biocompatible scaffold in that shape. The scaffolds included ports to allow the infusion of different culture liquids at different stages of skin development. The scaffolds' structure was designed to support the growth of various types of skin cells in a timed, stepwise manner that mimics natural skin formation. After about one month of incubating the scaffolds in sequential steps to encourage different layers of cells to grow, the researchers analyzed the engineered skin. They found that the grafts had a uniform covering of the epidermis. When compared with standard, flat cultured grafts, the 3D-cultured skin was more resistant to stresses produced by movement. Further analysis showed that the 3D cultures had higher levels of extracellular matrix proteins, supportive proteins found in mature skin. A healthy blood supply is also essential to the success of grafted skin. When the researchers added cells that can grow into new blood vessels to their 3D grafts, they observed new vessel-like structures start to form. Over time, the new vessels grew toward the upper surface of the new skin. To test the ability of their grafts to heal in a real-life scenario, the team cultured 3D grafts in the shape of the skin on mouse hindlimbs. Transplanting these ready-made grafts to injured mouse legs took less than 10 minutes. The mice regained full functioning of their legs within four weeks.



Creating a "glove" of engineered skin begins with a 3D-printed scaffold and ends three weeks later with a construct ready for grafting. Images: Alberto Pappalardo and Hasan Erbil Abaci / Columbia University Vagelos College of Physicians and Surgeons.

#BIO #MFG #USA [NIH](#) [Wevolver](#)

GREEN TECHNOLOGY

→ **Researchers have developed simple techniques to detect and quantify lithium plating on graphite anodes inside lithium-ion batteries (LiBs), according to a [study published in Nature Energy](#).** LiBs are among the most widespread rechargeable battery technologies due to their high energy densities and performances. Despite their versatility and advantageous characteristics, these batteries often require specific times to charge – speeding up these charging times has so far proved challenging. The main reason for this is that during fast charging, lithium plating could form on the batteries' graphite anode which could pose safety risks. Lithium plating reactions on graphite anodes – which can also occur at low temperatures, during overcharging, or following battery malfunctions – can lead to the formation of non-cyclable lithium metal and salts, which could ignite causing fires or battery explosions. **The techniques developed could help develop safer, fast-charging LiB designs, and provide insight into the factors and processes that promote plating.** #GRN #USA [Tech Xplore](#)

→ **Tesla has announced that it will create a permanent magnet electric vehicle motor without using rare earth elements.** Rare earth elements have been a contentious issue in the EV supply chain due to difficulties in securing them, and a majority of worldwide production is either sourced or processed in China. Although rare earth elements are not typically used in lithium-ion batteries, they are used in electric car motors, with neodymium being the most commonly used. Tesla has previously reduced rare earth usage in its Model 3 drive units by 25% between 2017 and 2022 but is now aiming to create a permanent magnet motor without rare earth elements for its future vehicles. #GRN #USA [Electrek](#)

ADVANCED MANUFACTURING

→ **The Drone Bird Company is collaborating with 3D printer manufacturer EOS, Advanced Laser Materials (ALM), and AM service provider Parts on Demand to produce its bird-shaped drones using AM technology.** The use of ALM's lightweight carbon material and EOS's SLS technology has enabled faster delivery time, lower production costs, and greater design flexibility. The Drone Bird is primarily used in the aviation and agriculture industries as a bird control measure. According to the Federal Aviation Association (FAA), bird strikes and interference reportedly cause up to \$500M each year in damages, with 15,400 strikes occurring in 2021 alone. The realism of the drone's falcon design makes it particularly effective at deterring wildlife and bird populations from populating airfields. The company's integration of 3D printing has allowed for rapid prototyping of components and the ability to test different materials, meeting new challenges and pursuing novel ideations of the product. The commercial drone industry is rapidly growing, making it a valuable market for AM companies to exploit. In 2021, Dragontech, an agricultural technology startup, began using AM technology to develop a drone-based data gathering platform to help farmers monitor and identify problems in their fields. Separately, in 2022, the Royal Air Force (RAF) started development of an aerial attack unit incorporating 3D printed drones. According to UK's current Air Chief Marshal, these 3D printed drones offer "enormous potential" in overwhelming and confusing an enemy's air defenses. #MFG #AUT #NLD [3D Printing Industry](#)

AUTONOMOUS SYSTEMS

→ **The U.S., Europe, and China are all testing autonomous underwater vehicles (AUVs) for surveillance and exploration.** More than 80% of the ocean remains unexplored by humans but could soon be mapped by AUVs. They are able to explore high-pressure areas of the ocean floor that are unreachable by humans through preprogrammed missions, allowing them to function without humans aboard, or controlling them. They're often used by scientists for underwater research as well as oil and gas companies for deep water surveys, but as defensive security threats continue to grow, the largest sector in the AUV market has become the military. They're helpful for obtaining critical information such as mapping the seafloor, looking for mines - a current use in the Russia-Ukraine war - and supplying underwater surveillance. The U.S., Australia, and the U.K. are all making investments in this technology, as well as China, which recently completed construction on the Zhu Hai Yun, an unmanned ship made to launch drones, leveraging AI to navigate the seas without a crew. The ship is described by officials in Beijing as a research tool, but many experts expect it to also be used for military purposes. Robotics and automation is a relatively young field. Researchers began developing AUVs around 50-60 years ago but the quality and variety of sensors necessary to build the systems was historically limited. Now sensors are smaller, cheaper, and higher quality. AUVs still have some challenges to overcome like the environment. Underwater communication from the AUVs is limited as signals used to transfer messages in air get absorbed quickly in water, and cameras are not as clear underwater. However, some AUVs in development can travel on missions up to ten days autonomously and sail as far as 6,500 nautical miles without connecting to another ship, as

demonstrated by Boeing's Orca XLUV. #AUT #AI #MFG #USA #CHN #EUR #GBR #RUS #UKR #AUS #Geopolitics [CNBC](#)

→ **Scientists are using robotics, self replication, and mechanical automatons to autonomously restructure asteroids into a large rotating space station.** The restructuring process makes structures from asteroid oxide materials, uses productive self-replication to make replicators, helpers, and products; and creates a multiple floor station to support a large population. In an example simulation, it takes 12 years to autonomously restructure a large asteroid into the space station. This is accomplished with a single rocket launch. The payload contains a base station, 4 robots (spiders), and a modest set of supplies. The simulation creates 3000 spiders and over 23,500 other pieces of equipment. The equipment and tools have simple mechanical programs to perform repetitive tasks. The resulting example station would be a rotating framework almost 5 kilometers in diameter. Once completed, it could support a population of over 700,000 people. Many researchers identify the high launch costs, the harsh space environment, and the lack of gravity as the key obstacles hindering the development of space stations. The single probe addresses the high launch cost. The autonomous construction eliminates the harsh space environment for construction crews. And, the completed rotating station provides radiation protection and centripetal gravity for the first work crews and colonists. The below image depicts a space colony constructed from asteroid material.



#AUT #AER #MFG [Space Ref](#)

SEMICONDUCTORS & CHIPS

→ **Silicon Valley-based [Applied Materials](#) has made a breakthrough in lithography technology that will reduce the cost, complexity, and environmental impact of advanced chip manufacturing.** The new patterning system and pattern-shaping technology will allow chip manufacturers to print a single EUV pattern, then use the system to elongate the shapes in any direction, reducing the space between features and increasing pattern density. This technology is expected to save ~\$250M in costs for every 100k wafer starts per month of production capacity. In contrast, common EUV double patterning involves splitting a high-density pattern in half and producing two masks that adhere to EUV resolution limits. This method complicates design and pattern production, making it an expensive proposition for businesses. Furthermore, when compared to the double patterning process, using a single patterning system reduces the number of EUV lithography steps. #CHP #USA [Reuters AIM](#)

QUANTUM TECHNOLOGY

→ **[HRL Laboratories](#) has published the first demonstration of universal control of encoded spin qubits, in which a novel silicon-based qubit device architecture is used to trap single electrons in quantum dots.** The experiment demonstrated universal control of their encoded qubits, which means the qubits can be used successfully for any kind of quantum computational algorithm implementation. The encoded silicon/silicon germanium quantum dot qubits use three electron spins and a control scheme whereby voltages applied to metal gates partially swap the directions of those electron-spins without ever aligning them in any particular direction. The demonstration involved applying thousands of these precisely calibrated voltage pulses in strict relation to one another over the course of a few millionths of a second. The quantum coherence provided by the isotopically enriched silicon used, the all-electrical and low-crosstalk-control of partial swap operations, and the configurable insensitivity of the encoding to specific error sources all work together to provide a strong pathway toward scalable fault tolerance and computational advantage, both of which are important steps toward a commercial quantum computer. #QNT #DIG #USA [Phys.org](#)

GEOPOLITICS

→ **China has a lead in 37 of 44 critical and emerging technologies as Western democracies lose a global competition for research output, according to a security think tank tracking defense, space, energy, and biotechnology.** The Australian Strategic Policy Institute (ASPI) conducted a study that showed that, in some fields, all of the world's top ten research institutions are based in China. The study, funded by the U.S. State Department, found the U.S. was often second-ranked, although it led in global research in high performance computing, quantum computing, small satellites, and vaccines. The report called for democratic nations to collaborate more often to create secure supply chains and "rapidly pursue a strategic critical technology step-up." ASPI tracked the most-cited scientific papers, which it said are the most likely to result in patents. China's surprise breakthrough in hypersonic missiles in 2021

would have been identified earlier if China's strong research had been detected, according to the report. Over the past five years, China generated about 50% of the world's high impact research papers into advanced aircraft engines, including hypersonics, and it hosts seven of the world's top ten research institutions in this field. China was found likely to emerge with a monopoly in ten fields including synthetic biology, where it produces one third of all research, as well as electric batteries, 5G, and nano manufacturing. The Chinese Academy of Sciences, a government research body, ranked first or second in most of the 44 technologies tracked, which spanned defense, space, robotics, energy, the environment, biotechnology, AI, advanced materials, and quantum computing. The report also found that one-fifth of the top Chinese researchers were trained in a Five Eyes country, so the study recommended visa screening programs to limit the illegal tech transfers and instead favor international collaboration with allies. #Geopolitics #BIO #MFG #AI #QNT #GRN #AER #DIG #5G #SAT #CHN #USA #AUS #GBR #NZL #CAN [Reuters](#)

→ **Sen. Josh Hawley (R-Mo) unveiled new legislation aimed at stopping Chinese corporations and entities linked to the CCP from buying up U.S. farmland.** Hawley's "This Land is Our Land Act" would force Beijing-backed businesses to divest interest in U.S. agricultural land and prevent more from buying acreage. Multiple lawmakers, many from the Midwest, have shared national security concerns over China's purchases of vast tracts of farmland. Not only have attempted purchases by Chinese groups raised alarms for being close to areas of sensitive military activity, but they've also spurred fears about Beijing's control over U.S. food supply. Hawley's bill would prohibit corporations backed by China from acquiring or leasing agricultural land in the U.S. as well as similar deals by people or groups linked to the ruling CCP. Nearly 1% of all U.S. agricultural land - 383,935 acres - had been bought by China by the end of 2021. Between 2009 and 2016 alone, China's international holdings in agriculture, fisheries, and forestry soared in value from \$300M to \$3.3B, according to the USDA. No later than one year after the bill's passage, Chinese entities with existing leases or stakes of interest would be forced to sign a letter of intent to signal that they will part from those assets. If they don't divest within two years, they risk facing fines and criminal penalties, as well as the threat of asset forfeiture. Hawley previously signaled he'd introduce such a bill after the Chinese surveillance balloon was spotted over the U.S. midwest. #Geopolitics #SCRM #USA #CHN [Fox News](#)

CYBERSECURITY

→ [Ruhr University Bochum](#) and [CISPA Helmholtz Center for Information Security](#) researchers have demonstrated that they can reverse engineer the radio signals of **DJI drones in order to decode a radio protocol known as DroneID**. The DroneID system was created to allow governments, regulators, and law enforcement to monitor and prevent the misuse of drones. However, in the past year, hackers and security researchers have warned that DroneID is unencrypted and accessible to anyone who can receive its radio signals. The German researchers, along with another researcher at the [University of Tulsa](#), have now demonstrated how completely that signal can be decoded and read, allowing any hacker who can eavesdrop on DroneID to pinpoint a drone's hidden operator, even if that drone pilot is

thousands of miles away. The researchers publicly demonstrated their [findings](#) by releasing a [prototype tool](#) to receive and decode DroneID data. This research provides new evidence of the serious privacy and operational security concerns that DroneID poses for operators, especially given that DJI drones are now frequently used in war zones. China-based DJI previously [claimed](#) that DroneID was encrypted, and thus inaccessible to anyone who didn't have its carefully controlled Aeroscope devices. However, DJI later [admitted](#) that the transmissions were not in fact encrypted, after a security researcher showed that some DroneID data could be intercepted with a commercially available Ettus software-defined radio. The German researchers — who also helped debunk DJI's initial encryption claim — have gone further. By analyzing the firmware of a DJI drone and its radio communications, they've reverse engineered DroneID and built a tool that can receive DroneID transmissions with an Ettus software-defined radio or even the low-cost HackRF radio, which sells for just a few hundred dollars compared to over \$1k for most Ettus devices. With that inexpensive setup and their software, it's possible to fully decode the signal to find the drone operator's location, just as DJI's Aeroscope does. #Cybersecurity #DIG #AUT #DEU #USA #CHN [WIRED](#)

→ [EPFL](#) researchers have created a novel chromo-encryption technology that encodes messages with color by combining silver nanostructures with polarized light. The researchers discovered that when polarized light was shone through the nanostructures from specific directions, a variety of vivid and easily identifiable colors were reflected back. These various colors could be assigned numbers, which could then be used to represent letters using ASCII. The researchers used a quaternary code with the digits 0, 1, 2, and 3 to encode a secret message (as opposed to the more commonly used binary code 0 and 1). The result was a series of four-digit strings made up of different color combinations that could be used to spell out a message, giving rise to the method of chromo-encryption. For example, in their system, the color sequence orange, yellow, red, and white represented the digits 1, 0, 2, 0; a string of numbers that coded for the letter "H" in the secret test message "Hello!". Because each color code is not unique, the same digit – 0, 1, 2, or 3 – may represent a different color. This means that the encryption system is even more secure, as the likelihood of guessing the correct code sequence is reduced, according to the researchers. Notably, only the correct combination of polarization directions would reveal the secret message in the chromo-encryption method; light polarized in any other direction would reveal a series of colors corresponding to a nonsense message. The researchers anticipate that this technology will find use in encryption techniques, such as more secure banknotes. #Cybersecurity #DIG #MFG #CHE [ScienceDaily](#)

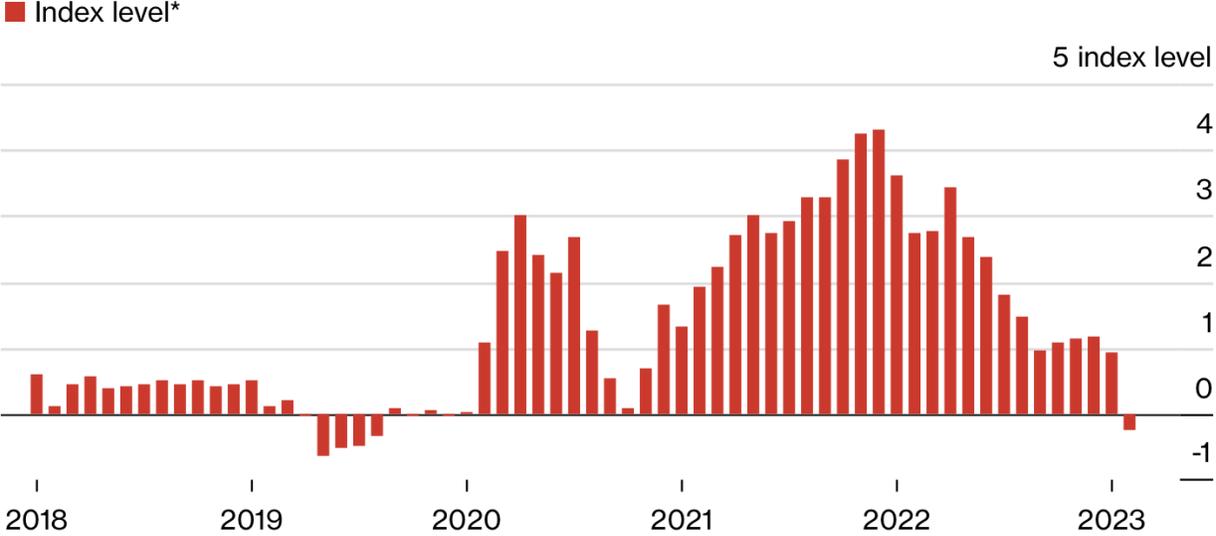
SUPPLY CHAINS

→ [Russia is successfully circumventing chip sanctions with the help of Turkey and the UAE](#). Russian imports in general have largely returned to their pre-war 2020 levels and analysis of trade data suggests that advanced chips and integrated circuits made in the EU and other allied nations are being shipped to Russia through third countries such as Turkey, the UAE, and Kazakhstan. EU and G-7 countries have introduced multiple rounds of sanctions since the invasion of Ukraine a year ago in an effort to degrade Russia's ability to fight and undermine its economy. The data suggest that the real impact in some areas is so far falling short of what

officials might have hoped for. Shipments from China to Russia have also surged as Beijing plays an increasingly important role in supplying Moscow. Those countries outside the EU haven't sanctioned Russia themselves, but most have repeatedly denied they are helping the Kremlin. The EU has sanctioned 1,500 individuals, restricted exports on hundreds of goods and technologies, and targeted many of Moscow's key revenue sources. In some cases, the exports to Russia of technologies that could be used for military purposes in Ukraine have gone from effectively zero to millions of dollars. Russia was buying an average of \$163M worth of advanced chips and integrated circuits from the EU, the US, Japan, and the UK each year between 2017 and 2021. In 2022, that slumped to about \$60M. And the data shows that Turkey, Serbia, the UAE, and a half-dozen other economies in Eastern Europe and Central Asia helped make up the shortfall. Meanwhile, shipments of high tech components to those countries from allied nations surged by a similar amount. On Thursday, the Biden administration released a compliance note aimed at cracking down on intermediaries used to evade sanctions and export controls on Russia. The notice names China, Armenia, Turkey, and Uzbekistan as locations that may be used to illegally redirect restricted items to Russia. #SCRM #CHP #Geopolitics #RUS #UKR #USA #CHN #EUR #GBR #JPN #TKY #ARE [Bloomberg](#)

→ **Global supply chains have returned to normal, the Federal Reserve Bank of New York said, almost three years after Covid-19 was declared a pandemic.** Supply pressures around the world even fell below normal. The February reading in the NY Fed's Global Supply Chain Pressure Index wawa -0.26, reaching negative territory for the first time since August 2019, with zero being the historical average. Maximum disruptions pushed the gauge to a peak of 4.31 in December 2021. Less shipping congestion, an easing of parts shortages, and weaker consumer demand have pulled the indicator lower in seven of the past ten months, and the latest figure reflected more improvement.

The NY Fed's global supply pressure index fell below normal in February



Source: NY Fed
 *Standard deviations from average value

#SCRM [Bloomberg](#)

→ **An ongoing shortage of medicine commonly used to treat people with breathing problems - Albuterol - is expected to get worse after a major supplier to U.S. hospitals shut down last week.** The manufacturer, Akorn, had filed for bankruptcy in May 2020. It was the only company to make certain albuterol products used for continuous nebulizer treatment. It is a staple in children's hospitals, but had been out of stock since last fall. Without that particular form of the product, hospitals have had to scramble to find alternatives. Hospitals are watching the supply chain closely, but there is concern they might have to delay discharging patients because they don't have enough medicine, or they may see more ER visits for people with breathing problems who don't have access to medicine. #SCRM #BIO #USA [CNN](#)

→ **Concerns about North Korea's chronic food shortages are growing, with multiple sources suggesting this week that deaths due to starvation are likely.** Some experts say the country has hit its worst point since a 1990s famine known as the "Arduous March" caused mass starvation and killed hundreds of thousands of people. Trade data, satellite images and assessments by the UN and South Korea suggest the food supply has now "dipped below the amount needed to satisfy minimum human needs." Even before the Covid pandemic, nearly half of the North Korean population was undernourished, according to the UN. Three years of closed borders and isolation only made matters worse. And even if food was provided to the country, deaths would still be likely due to uneven distribution where the elite and military take precedence. Various experts also blame North Korea's isolationist tendencies, and say the root problem is years of economic mismanagement and that Kim Jong Un's efforts to ramp up state control further will only make the situation worse. #SCRM #Geopolitics [CNN](#)