AerospaceDaily & DEFENSE REPORT

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Inside:

Bombardier Strike

Bombardier employees are continuing to strike after a failed round of negotiations between the manufacturer and Unfior, a Canadian workers' union. Negotiations held between Bombardier and Unifor ended without a resolution on June 24, following the union's rejection of Bombardier's final offer. According to Unifor, the company's offer was deemed "insufficient" after being reviewed by its bargaining committees. The terms of the final offer were not made public. Negotiations are expected to continue, but specific details will not be released to "protect the integrity of the bargaining process," the union says. Unifor is representing 1,350 Bombardier employees throughout the process, who are members of Unifor's Local 112 and 673 groups.

Daily Briefs

L3HARRIS has indefinite-delivery/indefinite-quantity U.S. Navy contract worth up to $999m for production, retrofits, development, sustainment of Multifunctional Information Distribution System Joint Tactical Radio System terminals.

ACUTRONIC GROUP announced expansion in Texas with plans for a 14-acre aerospace manufacturing facility in Bastrop while establishing Austin as the global HQ for its Aerospace Components division.

SWEDISH SPACE CORPORATION will provide comms links to **ISPACE TECHNOLOGIES U.S. INC.**'s upcoming Mission 3 Apex 1.0 lunar lander mission, scheduled for 2026.

LOCKHEED MARTIN has $67m U.S. Navy contract for aircraft sustaining engineering and logistics support services for C-130J/T aircraft for U.S. and international operators.

NANOSATELLITE/MICROSATELLITE market reached $2.23b globally in 2020 and should reach $8.69b in 2030, for a CAGR of 14.9%, according to **ALLIED MARKET RESEARCH**.

PROGRAMS

USAF Removes Sentinel Program Leader Amid Review

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The U.S. Air Force has relieved the leader of the LGM-35A Sentinel Ground-Based Strategic Deterrent program amid a major review of the program's cost and schedule, though the service said the move was not directly related.

The Air Force Nuclear Weapons Center Commander removed Col. Charles Clegg from the role as Sentinel Systems Director "due to a loss of confidence in his ability to lead the directorate. He was removed because he did not follow organizational procedures."

The service did not specify the procedures that were not followed. In a statement, the Air Force said the removal was not directly related to the ongoing review of the Sentinel program under the Nunn-McCurdy Act. The review was prompted by a cost expansion of the program of about 37%, forcing Defense Secretary Lloyd Austin to determine if the program is necessary for national security and needs to continue.

Air Force officials have said the Sentinel program, which will replace aging Minuteman III Intercontinental Ballistic Missiles, is necessary and would continue at nearly any cost.

"In no way does this removal impact our operational Minuteman III ICBM force," an Air Force spokesperson says. "It remains our nation's safe, secure, and effective nuclear deterrent, just as it has been without interruption for the past six decades."

The Nunn-McCurdy review is expected to be completed in early July, though a group

SENTINEL, P. 2

FUNDING & POLICY

U.S. May Allow Military Contractors To Work Inside Ukraine

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The White House appears set to allow American military contractors to travel and work in Ukraine to keep U.S.-provided weapons in operation.

The move would allow more U.S. nonmilitary personnel into the country as key systems, such as Lockheed Martin F-16s, are expected to arrive in the coming months. It also comes as the Biden administration has increasingly allowed Ukraine to fire U.S.-provided weapons beyond its borders into Russia.

A senior administration official told CNN that no decision has been made. If there is a change, it would allow the Pentagon to award contracts to U.S. companies to work inside Ukraine for the first time since the Russian invasion began in 2022, the network reported.

Pentagon spokesman Maj. Gen Patrick Ryder, when asked about the report on June 25, said he would not comment on internal discussions or proposals under consideration. Both President Joe Biden and Defense Secretary Lloyd Austin have said U.S. troops will not go to fight in Ukraine and "that won't change," he says.

While many U.S.-provided weapons have been sent to Ukraine and have been in operation since the invasion, the bulk of those that need repairs have to be shipped outside of its borders. U.S. companies and service members have provided remote support to Ukrainian forces. Several key U.S. defense company leaders have traveled to Ukraine for discussions with top officials about their systems, but without publicly providing contractors to work in the country.

Ukraine will get its first F-16s this summer, Chairman of Joint Chiefs Gen. Charles Q. Brown Jr. said in a June 13 press conference.

PROGRAMS

Eurodrone Critical Design Review Slips To 2025

ROBERT WALL, robert.wall@aviationweek.com

The critical design review for the Eurodrone project is now scheduled for May 2025, according to the German Defense Ministry, reflecting delays in completing the program's preliminary design review.

The critical design review (CDR) milestone was planned for this year, but the schedule has been adjusted to reflect a slip in the preliminary design review (PDR). Program officials initially targeted the PDR for September 2023, but it did not occur until May 6, 2024.

The schedule change in the Franco-German project will not affect costs to the government because of the fixed-price nature of the contract, the ministry said.

Development of the Eurodrone is being led by Airbus in Germany and supported by Dassault, Italy's Leonardo, as well as Airbus in Spain. The twin-engine, 11-metric-ton medium-altitude, long-endurance uncrewed aircraft system is partly aimed at building homegrown industrial capacity—rather than relying on U.S. and Israeli platforms.

Asked by lawmakers whether the Eurodrone delay augurs further schedule slippage in the Franco-German-Spanish Future Combat Air System effort to develop a next-generation fighter, the German Defense Ministry said it does not expect FCAS to be held up.

The government also says it has scrapped a trial involving a General Atomics MQ-9 Sea Guardian with a Boeing P-8A to focus on quickly fielding a capability.

SENTINEL, from P. 1

of lawmakers are questioning the process. In a June 24 letter to Austin, Reps. John Garamendi (D-Calif.) and Don Beyer (D-Va.) along with Sens. Edward Markey (D-Mass.) and Jeff Merkley (D-Ore.) wrote that the review is not comprehensive, thorough and unbiased.

Recent comments from Pentagon leaders, including acquisition head Bill LaPlante, that the program needs to continue shows that the review is being conducted with a desired end state in mind, the lawmakers say. "Given the cost and importance of this program, it is essential that the DOD is as transparent as possible with Congress and the public," the lawmakers say. "While some details may merit classification, it is imperative that DOD officials transparently share details of this determination to ensure proper oversight, given that a Pentagon official will be determining the fate of a defense program. Without clear explanations and justification, there is no reason that Congress should continue to fund this program at ever-increasing levels, especially given the trade-offs it imposes on other 'critical' programs."

Sentinel is now expected to cost about $130 billion, a 211% increase above initial estimates from 2015, the lawmakers write.

OPERATIONS

China's Chang'e 6 Mission Returns Samples From Far Side Of Moon

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SINGAPORE—The Chang'e 6 mission's return module has landed back on Earth after a 53-day lunar mission, bringing back lunar samples from the far side of the Moon for the first time in the history of space exploration.

The module landed at Siziwang Banner in China's Inner Mongolia region on June 25 at 2.07 p.m. Beijing time.

It has not been confirmed that all 2 kg (4.4 lb.) of lunar samples were successfully returned. The module is being airlifted to Beijing where the contents will be extracted and undergo analysis and research, according to the China National Space Administration (CNSA).

The Chang'e 6 spacecraft was launched from the Wenchang Satellite Launch Center on May 3 and landed on June 2 at the Apollo crater in the Moon's South Pole-Aitken basin.

Kang Guohua, professor of Aerospace Engineering at Nanjing University of Aeronautics and Astronautics, told state newspaper Global Times that since the South Pole-Aitken basin is the oldest and deepest large impact basin on the Moon, the soil can provide "critical clues" about the formation and evolution of the solar system "The successful execution of the Chang'e-6 mission has achieved breakthroughs in key technologies such as retrograde lunar orbit design and control, rapid intelligent sampling on the lunar far side, and ascent from the lunar far side," Kang added.

A key enabler for the Chang'e 6 is the Queqiao-2 communications relay satellite. Following the Chang'e 6 mission, CNSA said Queqiao-2 will use its extreme ultraviolet camera, arrayed neutral atom imager, and an Earth-Moon Very Long Baseline Interferometry (VLBI) experiment system to collect data from the Moon and deep space.

Chang'e 6 was carrying European Space Agency (ESA)'s lunar surface ion composition analyzer, radon detection instrument from France and Italy's laser corner reflector. ESA engineer Neil Melville-Kenney has said ESA will meet CNSA in October to discuss further collaboration in space missions.

The Wolf Amendment in 2011 has prevented NASA and its Chinese counterparts from communicating with each other, but in November 2023 NASA certified to Congress that its researchers could study samples from China's Chang'e 5 mission without harming national security and urged scientists to apply to the Chinese for access. In 2020 Chang'e 5 collected samples from the near side of the Moon.

CNSA is yet to say if it will make samples collected by Chang'e 6 available to scientists from other countries.

PROGRAMS

KAI, Hanwha Secure KF-21 Production Contracts

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SEOUL—South Korea's Defense Acquisition Program Administration (DAPA) has awarded initial production contracts for the KF-21 fighter jet to KAI, Hanwha Aerospace and Hanwha Systems.

The first batch will cover 20 KF-21s in the Block 1 configuration after funding was approved in March.

KAI has secured a KRW1.96 trillion ($1.4 billion) contract for aircraft manufacturing, system integration and integrated logistics support. This amount also includes KRW481 billion to cover development costs for the KF-21.

Hanwha Aerospace has received a KRW556 billion ($397 million) to license produce the F414-GE-400 engine. "This contract serves as a stepping stone for Hanwha Aerospace's plans to develop next-generation engine technologies.

The company is actively pursuing research and development in 6th generation engine technology, positioning itself at the forefront of global aerospace innovation," the supplier said in a statement.

The company added that more than 40 F414 engines will be delivered along with spare modules for the KF-21, as well as provide engine maintenance manuals and on-site technical support.

Meanwhile, Hanwha Systems, another subsidiary of conglomerate Hanwha Group, secured a KRW114 billion ($82 million) contract to supply the active electronically scanned array (AESA) radar that will be installed on the aircraft.

All contracts will end between Aug. 31, 2027, and Dec. 15, 2027. According to DAPA, contracts with KAI and Hanwha for an additional 20 KF-21 Block 1 will be awarded by June 2025. DAPA has not disclosed when contracts for 80 KF-21 in the Block 2 configuration will be awarded.

Correction

A June 25 DAILY story on the Overhead Persistent Infrared program misidentified a contractor. Northrop Grumman is building the polar spacecraft for the system.

BUSINESS

Airbus Signals More Space Changes Possible After Earnings Hit

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Airbus is considering major changes to its space operations after a program review identified almost $1 billion in higher costs on critical satellite contracts.

Airbus is open to reviewing the space portfolio, may consider divesting elements of those operations, or may seek cooperations with others, CEO Guillaume Faury said on a June 24 call. "We are evaluating all strategic options for the space business," he said

The company is contending with a range of issues on some of its satellite programs. These include a challenging environment in the telecommunications sector, supply chain issues and having bid on too many programs that are coming together at an overlapping time with technical challenges that are causing execution problems. Many of those contracts were booked in the 2018-2021 timeframe, Airbus said.

Airbus said a reassessment of program costs will lead it to take a €900 million ($966 million) earnings charge in the second quarter. It is only the latest earnings setback for the European aerospace giant's defense and space portfolio. Management has for years struggled to improve the unit's financial performance. Last year, Airbus took a €600 million charge on its space programs and put in place a new management team that conducted a review identifying the latest problems.

"The recurring nature of these charges and their cumulative impact is worrisome," according to an analysis produced by Bernstein.

Faury said the new charge initially appears as "a shocking number," but it is so big because it wraps up cost increases that stretch over years, in some cases into the next decade, into a single figure. He added that the space portfolio was not at risk of becoming another A400M, the Airbus military transport aircraft that for years has been a drag on earnings.

The company expects to have clarity on the technical maturity of most of the troubled programs this year. The majority of issues involve telecom and navigation satellites projects, though some observation activities now are also affected because of bottlenecks in key testing infrastructure, Airbus suggested.

Although Airbus is taking the hit to earnings now, some of the higher costs will not occur for years. The company said about a third of the cash impact will come in 2024 as it trimmed its free cash flow guidance, before customer financing, to €3.5 billion from €4 billion. The company also lowered its adjusted earnings target to €5.5 billion from a range of €6.5 billion to €7.5 billion, reflecting also lowered commercial aircraft delivery guidance because of supply chain issues.

Airbus CFO Thomas Toepfer said the space business was still working to achieve mid-to-high single-digit earnings margins in the segment, though it will take longer to achieve the performance. Several years ago Airbus became more selective in bidding projects, he said, which should help deliver the goal.

FUNDING & POLICY

U.S. OKs Taiwan To Buy 1,000 Loitering Munitions

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The U.S. State Department has approved Taiwan to acquire more than 1,000 loitering munitions from AeroVironment and Anduril, signaling the growing demand for these types of weapons, which have gained prominence in conflicts in Ukraine and Nagorno-Karabakh.

The State Department said a $300 million contract would cover 291 Anduril Altius 600M-V systems for Taiwan. A second deal, valued at $60.2 million, would potentially lead to Taipei buying 720 AeroVironment Switchblade 300 vehicles and 101 fire control systems. Each contract would include training, maintenance and logistics.

Taiwanese defense officials have suggested they see these platforms as key to strengthening the island state's defenses. In its National Defense Review paper, the Taiwanese Defense Ministry said it has reviewed lessons from the Russia-Ukraine war and decided the country must "adopt an innovative and asymmetric mindset to exploit vulnerabilities during any potential invasion by China."

Both the Switchblade and Altius loitering munitions have been used in Ukraine.

The U.S. said the deals would "improve the recipient's ability to meet current and future threats," but would not shift the military balance in the region.

The OK of the foreign military sale comes days after Taiwanese prime contractor Aerospace Industrial Development Corp. and U.S. uncrewed aircraft systems (UAS) company AEVEX Aerospace signed a memorandum of understanding geared toward the manufacturing of UAS and loitering munitions in Taiwan. The Asian country's National Chung-Shan Institute of Science and Technology also is developing a loitering munitions in-house.

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OPERATIONS

Firefly Joins Northrop, Rocket Lab At Wallops Island Launch Site

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Firefly Aerospace plans to use the state of Virginia-owned launchpad at NASA's Wallops Flight Facility for East Coast launches of its Alpha small-satellite rocket.

The company plans to use Pad-0A for U.S. military and other missions, particularly those requiring tight turnaround between procurement and launch.

The pad, which is owned by the Mid-Atlantic Regional Spaceport, currently supports Northrop Grumman's Antares rockets, which are in the process of being redesigned with new first-stage engines build by Firefly.

The two companies are also partnering in the development of a medium-lift launch vehicle that likewise will fly from Pad-0A.

"Firefly is creating an Alpha pad interface to leverage the existing pad commodities system used for Antares and our Medium Launch Vehicle," spokeswoman Risa Schnautz said in an email.

The first Alpha rocket could lift off from Wallops as early as 2025, about the same time that Northrop is aiming to return the newly designed Antares 330 booster to flight. Firefly currently flies Alpha from Vandenberg SFB in California.

"Firefly is committed to establishing a regular on-demand launch service and serving our customers' growing responsive space needs. That requires operating a diverse set of launch sites," CEO Bill Weber said in a statement.

New facilities

In addition to flying from Wallops, Firefly plans to add a launch control center, horizontal integration facility and administrative office space on Wallops Island, located on Virginia's Eastern Shore. The company plans to use existing vehicle and payload processing facilities.

Alpha is a two-stage expendable launch vehicle capable of carrying about 2,200 lb. to low Earth orbit. The company is preparing for its fifth Alpha launch as early as June 26 on a NASA-backed mission to deploy eight cubesats.

Since its failed debut in September 2021, Alpha has made one successful flight and twice ended up deploying payloads in short-lived, lower-than-intended orbits.

With both the Wallops and Vandenberg sites operational, Firefly aims to increase Alpha's launch cadence to monthly flights by 2026.

The company, which last flew in December 2023, plans to fly up to four times this year and six times in 2025.

Firefly previously announced plans to launch from Cape Canaveral SFS, but is now prioritizing establishing operations at Wallops.

"Adding the Wallops launch site option not only helps supplement Firefly's current launch facilities, but it also brings much-needed diversity and resiliency to the U.S. launch range options for its customers. This flexibility is critical when conducting rapid response missions, where the team needs to process payloads, conduct operations, and launch within a day's notice," the company said in a statement.

"With Firefly conducting all its Alpha missions in a rapid cadence for its customers, it is prioritizing operations on Wallops Island while maintaining its relationship at the Cape Canaveral Space Force Station," it said.

PROGRAMS

ArianeGroup Sees Demand For Higher Ariane 6 Production Rate

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The manufacturer of Europe's new Ariane 6 rocket says there is sufficient demand to warrant increasing annual production rates beyond what is planned, even ahead of the launcher's inaugural mission scheduled for next month.

"If we look at market demand, if we were able to produce much more, we would find customers," said Franck Huiban, ArianeGroup's head of civil programs, at a June 25 European Space Agency (ESA) briefing. "It's a strong incentive to continue the ramp up."

The upcoming launch effectively kicks off the production ramp-up phase for the program, Huiban said. ArianeGroup is a joint venture between Airbus and Safran.

Arianespace, which sells the launcher and will operate them starting with the second mission, expects another Ariane 6 launch before year end, followed by six in 2025, according to Caroline Arnoux, the launch service provider's head of the Ariane 6 program. The flight pace is slated to increase to eight launches in 2026 and reach 10 in 2027, which Huiban called "a first step."

Customers have signed up for 30 Ariane 6 launches so far. About two thirds of those missions are for commercial customers, including Amazon for its Project Kuiper satellite internet service system. Arianespace declined to disclose launch dates for specific customers, citing contractual sensitivity.

Program partners also would not discuss Ariane 6 launch costs, though Arnoux said the market uptake indicates customers are willing to pay its rate. Huiban added that the higher production rate and faster build process compared to the Ariane 5 had helped in lowering the prices for the vehicle compared to its predecessor. Ariane 6 enters an increasingly competitive launch market with a growing number of commercial launch service providers vying for business.

ESA is still analyzing data from an Ariane 6 wet dress rehearsal at the European spaceport in Kourou, French Guiana, on June 20, but is sticking to the planned July 9 launch date. "We are ready for launch," said Lucia Linares, ESA's head of strategy and institutional launches, at the briefing.

The launch window for the mission is 2 p.m. to 5 p.m. EDT—or 3 p.m. to 6 p.m. in Kourou. The Ariane 6 is expected to deploy cubesats at an altitude of around 580 km (360 mi.). The mission was designed in part, to ensure maximum connectivity with ground stations, according to Michel Bonnet, ESA's inaugural flight principal.

The upper stage will undergo some other tests before deploying two reentry capsules that are slated to fall into the Pacific, though not be recovered. The Vinci cryogenic liquid rocket engine powering Ariane 6's upper stage will fire three times. The final burn will be used to deorbit the upper stage.

The missions this year will involve a two-booster configuration for Ariane 6. The four-booster version is likely to fly in mid-2025.

OPERATIONS

Second Vulcan Rocket Arrives For Key ULA Flight

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The United Launch Alliance (ULA) Vulcan-Centaur rocket that is being prepared to fly a dual-purpose mission this fall arrived at Cape Canaveral on June 24 ahead of a planned launch in September.

Timing for the flight depends not only on ULA's work to prepare the rocket, but also on progress getting Sierra Space's Dream Chaser spaceplane ready for its debut cargo run to the International Space Station (ISS) for NASA. ISS and Eastern Range scheduling will also drive the launch date for ULA's second Vulcan mission.

For ULA, the mission's more important goal is to demonstrate launch and flight operations required for certification to proceed with previously contracted national security space launches under the U.S. Space Force's Phase 2 program.

If Dream Chaser is not ready to fly, ULA has backup plans for the mission, known as Cert-2.

"While ULA will be ready to fly in mid-2024, our customer, Sierra Space, has requested a launch period in the beginning of September. It is important for us to fly our Cert-2 mission soon since that is part of our certification program with the Space Force to fly its missions," ULA Communications Director Jessica Rye wrote in an email.

"We expect to fly Cert-2 before October 1. If our customer is not ready to fly, we have backup plans. We will support our Space Force customer's launches on Vulcan as soon as their spacecraft become available. We are not aware of any significant delays concerning Space Force missions due to Vulcan," she said.

Vulcan debuted on Jan. 8 on the Cert-1 mission which

VULCAN, P. 8

BUSINESS

Terran Orbital Gets Second Delisting Warning From NYSE In 12 Months

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Terran Orbital is back in the doghouse, with its second delisting warning from the New York Stock Exchange (NYSE) in the past year after its stock price fell below $1 a share for 30 trading days.

The company received a prior delisting warning from the stock exchange in October 2023.

It regained compliance on March 29, not long before the end of a six-month warning period, after boosting its common stock price above $1 per share over a consecutive 30-trading-day period.

Terran Orbital generates most of its revenue by manufacturing satellite buses for Lockheed Martin, its strategic partner and largest customer.

The prime manufacturer does final assembly on the structures before delivering the spacecraft to the Space Development Agency, which is using the satellites for its Proliferated Warfighter Space Architecture constellation.

The satellite bus builder has spent heavily on a vertical integration strategy, consistently losing money since going public in 2022 via a reverse merger with a special purpose acquisition company (SPAC). Cash has been spent on everything from building new factories to acquiring specialized manufacturing equipment. The company says it manufactures 85% of its components in-house.

Anticipation of a sale of Terran Orbital, possibly to Lockheed Martin, helped boost its share price between late February and early May. But then Terran's share price fell again below the $1 mark after the company's leadership rebuffed a buyout offer from Lockheed Martin.

Later in May, the company disclosed it was in a cash crunch caused by a drop in revenue and a $53 million loss in the quarter that ended on March 31. Terran ended the first quarter with $44 million in cash on hand, giving it less than two quarters of runway based on its first-quarter burn rate.

Terran Orbital's stock has traded below $1 a share since May 14. It has bobbed around 75 cents a share for the past week, close to a historic low that was set around the last time it received a delisting warning.

The company received its most recent delisting warning on June 17. It can regain compliance with NYSE standards during the "cure period" by maintaining a closing stock price of at least $1 a share on the last trading day of a calendar month and an average share price of at least $1 for the preceding 30 trading days.

Terran Orbital says it "intends to remain listed on the NYSE and is considering all available options to regain compliance with the NYSE's continued listing standards, including, but not limited to, a reverse stock split, subject to stockholder approval."

BUSINESS

Cognizant Buys Engineering Services Specialist Belcan

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The private equity owners of Belcan, an engineering services provider to several marquee aerospace and defense companies, have sold the company to Cognizant, another engineering services firm looking to enter the sector.

Cognizant says it signed a definitive agreement to buy Belcan from AE Industrial Partners (AEI) for almost $1.3 billion. Belcan CEO Lance Kwasniewski is expected to continue leading Belcan, which will market itself under the Belcan name but as an operating unit of Cognizant.

"Cognizant will better position our team to capitalize on compelling tailwinds—including increasing outsourced engineering, research and development spending; the transformative impact of digital engineering adoption rates; robust commercial aerospace demand; and favorable long-term defense and space spending," Kwasniewski says in the announcement.

A publicist for the announcement notes the acquisition enables Cognizant to establish a leadership position in the high-growth aerospace and defense industry with Belcan's blue-chip client base, deep domain expertise, and more than 6,500 engineers and technical consultants. Belcan also serves marine and industrial sectors.

The acquisition should close in the third quarter, according to the June 10 announcement. The total purchase price of about $1.29 billion, subject to customary adjustments, comprises $1.19 billion in cash plus publicly traded Cognizant shares with a current value of $97 million based on Cognizant's closing share price June 7.

AEI bought Belcan in 2015. The private-equity firm continued to bolt on related businesses it acquired later, such as Base2 Solutions, which AEI bought from Safran in 2020. As a private company, AEI rarely discloses financial details of its deals, including the purchase prices.

BUSINESS

Electrification Pioneer MagniX Launches First Battery System

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Electric propulsion developer MagniX has launched its first battery product line, focused on maximizing energy density and cycle life with the safety required for certification.

Alongside the startup's magni350/650 electric engines, the Samson battery allows MagniX to offer a complete electric powertrain.

The first member of the family, the Samson300, has an energy density of 300 Wh/kg at the module level to maximize aircraft range and a cycle life of more than 1,000 full-depth discharge cycles to minimize operating costs.

Battery development is being advanced under NASA's Electrified Powertrain Flight Demonstration (EPFD) program, for which MagniX is converting a De Havilland Canada Dash 7 regional turboprop into hybrid-electric propulsion demonstration.

The goal of EPFD is to burn down the risks to certification of an electrified powertrain and the project is central to MagniX's plans to obtain FAA certification of its electric propulsion unit (EPU) and energy storage system (ESS).

MagniX decided to develop its own battery system building on experience flying its motors on several demonstrators, including the eBeaver, eCaravan and e-R44, as well as the first prototype of Eviation's Alice. "We learned a lot from those and the learnings have been taken into this project," says Ben Loxton, MagniX vice president of energy storage systems and NASA EPFD program manager "High energy density is a key," Loxton says. "We see 300 Wh/kg as the tipping point to these applications becoming viable, not just as a demonstrator, but as something that can carry a payload, whether it be passengers or cargo. Anything less doesn't really achieve that."

MagniX is not revealing details of the pouch cell it is using. But while the energy density is higher than that quoted by rival battery developers, "it's still a lithium-based chemistry, nothing exotic." Loxton says. "We didn't want to go with anything super-exotic because of the challenges industrializing that."

Another design driver is aircraft turnaround time and "maintaining the ability to turn the aircraft reasonably quickly, within an hour. It has to be able to fly multiple times a day for it to be commercially viable, for the customers operating the aircraft," he says.

"And it has to be safe," Loxton says. "Part of the work we are doing with EFPD is develop a battery that's reliable, that's fault tolerant, so we don't have a system where if any one part fails we lose a big chunk of our energy capacity."

Having flown on several different aircraft, MagniX has seen multiple different battery architectures. "We've seen what works and what doesn't work and what that means for actual operator," says Riona Armesmith, chief technology officer.

"We've seen architectures where if you have a single bad cell you have to take off a whole string, which could be a quarter or a third of the whole battery pack. That's not viable," she says. "Everything that we are trying to do is to give as much to the pilot as possible."

That includes not compromising on cycle life to achieve high energy density. "We've settled on something that gives us the energy density we need and we still get over 1,000 cycles, so you are not replacing these things frequently, which operationally is a nightmare for customers, and expensive."

Active cooling

The Samson battery has active cooling on the ground during charging, with the option for passive cooling in flight to minimize weight and complexity. The system includes integrated power electronics and distribution and the modular design allows the battery to be scaled to power larger aircraft.

"We have the cells, we have the architecture, and now we're doing the work to build up the integrated package," Loxton says. A "significant" ground test campaign is planned before the EPFD flies. "Next year is when the buildup into the aircraft happens. Late 2026 is when flight test is aimed to start."

The Dash 7 will be modified first with a single electric powertrain replacing one of the aircraft's four turboprops, with a second to be replaced in a later phase. Each magni650 will be paired with a 450-kWh battery pack. This combination is also the powertrain size for a Cessna Caravan, Armesmith notes.

While the EPFD is the first application, the modular design means battery systems can be assembled in ways that suit different applications, and do not necessarily have to be paired with MagniX's EPUs, she says, expanding the startup's ability to address the electrified propulsion market.

VULCAN, from P. 6

carried the Peregrine lunar lander, built and operated by Pittsburgh-based Astrobotic. Following its successful launch and deployment, the spacecraft encountered technical issues that nixed the planned lunar landing.

Following Cert-2, ULA plans two more Vulcan flights this year, Rye said.

CEO Tory Bruno noted on the social media site X that the company has now received all the Blue Origin-manufactured BE-4 engines needed for Vulcan's 2024 manifest.

TECHNOLOGY

On-Demand, On-Site Hydrogen Production Heading To U.S. Airports

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A U.S. startup plans to have on-demand production of hydrogen from methanol on-site at airports in 2025, initially to fuel zero-emission ground vehicles but also for fuel-cell-powered electric aircraft as they become available.

Using methanol-to-hydrogen production technology developed by Element 1, startup e1 Air says it can offer hydrogen in reasonable quantity for less than $5/kg at the point of use. This compares with pump prices for hydrogen as high as $35/kg in California, according to data from Platts.

Element 1 has developed technology for the on-demand production of high-purity hydrogen for fuel cells using methanol as the feedstock. Using methanol and water as the hydrogen carrier avoids the high costs of transporting hydrogen as a pressurized gas or cryogenic liquid.

In Element 1's process, the methanol and water feedstock is fed into a catalytic reactor to reform the hydrogen, which then passes through a membrane purifier to produce greater than 99.99%-pure, fuel-cell-grade hydrogen. Waste gas from the purifier is combusted to heat the catalytic reactor.

"The reformer is a product of Element 1 out of Bend, Oregon. They are now deploying units in both the marine and construction sectors," e1 Air CEO Hank Krakowski says. "As these units are becoming operational, the main work ahead is adaptation to the airport environment."

Deployment plans begin with a few target airports on the U.S. East Coast. "We are in discussions with some of them, beginning in the Norfolk, Virginia, area with a target kickoff airport now identified," Krakowski says. The startup then plans to deploy on the West Coast in line with the evolving commercialization of electric vertical-takeoff-and-landing (eVTOL) and other aircraft.

Using the technology, e1 Air is developing a towable methanol/hydrogen/fuel-cell reformer unit on a trailer. "It is under design right now but will look quite similar in design and size to existing on-airport start carts and external air conditioning units," Krakowski says.

"We can also provide this same reformer station at a fixed location on an airport if that is preferred, but the technology is the same," he explains. The unit will produce electricity to recharge battery-electric vehicles as well as hydrogen to refuel fuel-cell vehicles.

"The starting demand for either are the existing ground service vehicles using batteries or hydrogen such as buses, where either the power grid is restricted or at capacity or where there is a desire to provide either a portable or off-grid capability, or both," Krakowski says.

"As for hydrogen-hybrid eVTOLs or aircraft, this market is at an early stage in development, and it is difficult for us to scale what this looks like in the next three-10 years. Our approach is to provide this capability on the ground side first, and we will be ready to scale up as the aircraft need evolves."

Green hydrogen

The aviation industry has a stated desire to use green hydrogen, produced by the electrolysis of water using renewable electricity. This compares with gray hydrogen made from natural gas using steam methane-reforming and blue hydrogen produced the same way with the addition of carbon capture.

For e1 Air, "the color of hydrogen would directly track with the color of methanol used. As more methanol production becomes green, so would our hydrogen product. We have identified a North American source for green methanol who desires to partner with us to provide that supply," Krakowski says. "Clearly we may need to start with a non-green feedstock with the plan to go fully green as that supply scales up."

The key driver of e1 Air's lower cost is that the hydrogen for refilling tanks or fuel-cell recharging of batteries is produced at the point of delivery. "It provides a portable and flexible option, adding to the existing fixed charging/fill stations typically connected to the electricity grid, which we do not require. We charge/fill at the vehicle/airplane side. The capital expenditure needed to produce, transport and store gaseous or liquid hydrogen is eliminated," Krakowski says.

"Methanol transport, transload and storage is virtually no different than any existing aviation fuel and equally as safe, so the airport environment works well for this approach and accounts for the much lower capital and operating expenditure," he adds.

Air Forces In Focus

Republic Of Mali Air Force 2024

On August 18, 2020, Malian President Ibrahim Boubacar Keita was overthrown in a coup d'état led by breakaway elements of the Malian Armed Forces. Subsequently, Mali was suspended from the Economic Community of West African States (ECOWAS) and appeared to shift politically towards Russia, distancing itself from France and the broader West.

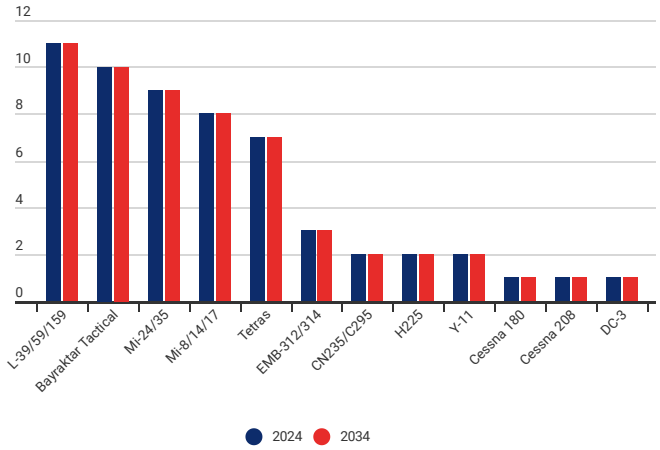
While the state has struggled to regain political stability in recent years, it continues to face threats from terrorist groups operating in the Sahel region. To address this threat, Mali has sought to rebuild its air force assets and has made several notable acquisitions in the past few years.

Six L-39C aircraft were added to enhance the air force's advanced flight training capabilities and provide limited ground strike capabilities. These aircraft will prepare pilots for full-scale ground attack missions alongside the two Su-25s that were also inducted in 2022. Additionally, several Mi-8 and Mi-24 helicopters will support Malian ground forces in direct confrontations with terrorist groups.

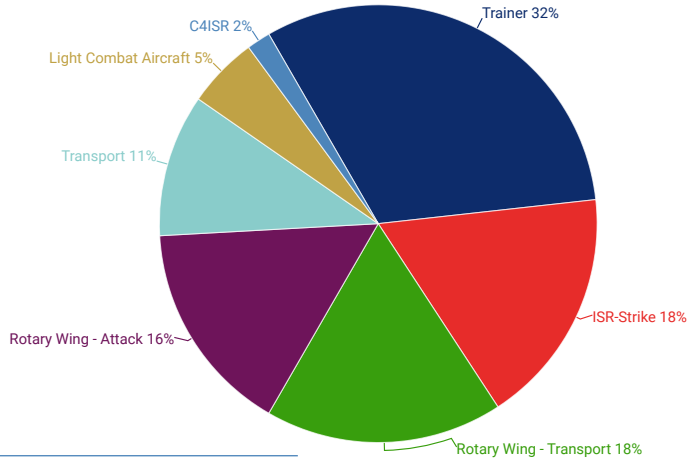
The new arrivals are part of Mali's efforts to strengthen the Republic of Mali Air Force and transform it into a well-equipped force capable of countering increasing terrorist threats. This is especially crucial given the departure of French and other European forces that were involved in stabilization efforts before the 2020 coup d'état. Approximately 70% of the current fleet consists of aircraft from Western companies. However, recent acquisitions have almost exclusively come from Russia, except for the unmanned fleet of ten Bayraktar TB-2 strike-capable UAVs provided by Turkish manufacturer Baykar.

Despite these efforts, the Republic of Mali Air Force remains under pressure, as several of the recent acquisitions have been lost in various incidents. Consequently, its Su-25s are no longer in service, leaving a gap in Mali's attack fighter mission category

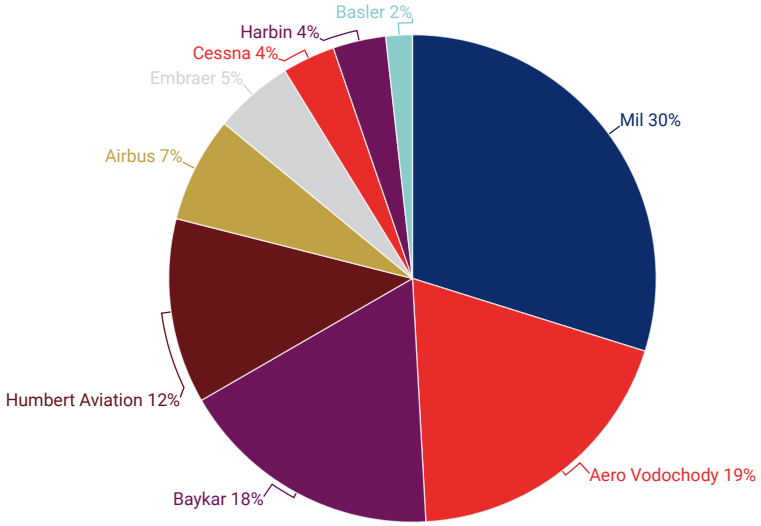
In-Service Fleet By Key Aircraft Families



Future In-Service Fleet By Mission - 2034



Current In-Service Fleet By Aircraft Prime - 2024



Source: Aviation Week Intelligence Network (AWIN) Military Fleet Discovery • **Prepared by**: Anna Sliwon-Stewart, Email anna.sliwon-stewart@aviationweek.com. For more information about Fleet Discovery and other Aviation Week data products, please see: https://aviationweek.com/awin/data-tools