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Network with our industry’s decision makers from government, industry and academia around the world.

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"I just wanted to write to express my thanks to the organizers of the HUMS and Airworthiness Technical Meeting. My colleague and I enjoyed the event very much and found the presentations and associated discussions highly informative.

We made some very useful contacts and intend to try and foster some collaborative activity for the future.

We have some ongoing programs of activity proposing to use regime recognition software for which the presentations provided some significant and positive inputs."

Glenn K. Terry, CEng, MIMechE
Hampshire, United Kingdom

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Advancing Vertical Flight

For more than 80 years, the Vertical Flight Society — founded in 1943 as the American Helicopter Society, Inc. — has been leading efforts to advance vertical flight.

VFS is the world’s only international technical society for engineers, scientists and leaders working to advance vertical takeoff and landing (VTOL) technology. We bring together industry, academia and government to tackle the toughest challenges in vertical flight. Our members share a legacy of knowledge and accomplishment that has been driving innovation since the advent of the helicopter.

Every year, the Society organizes or co-sponsors several regional and international conferences that facilitate the advancement of the understanding and practice of VTOL aircraft technology, and publishes the proceedings. The Society publishes the premier vertical flight technology bi-monthly magazine, Vertiflite, as well as the world’s only peer-reviewed vertical flight technical publication, The Journal of the AHS. VFS advocates on behalf of vertical flight to the public and to government bodies, awards $100,000 in annual engineering scholarships, and sponsors annual student competitions. In addition, the Society presents two dozen annual awards to members of the vertical flight technical community for technical and practical accomplishments.

Vertiflite’s editorial energies are devoted to informing our members of the advances being made in the industry and encouraging increasingly broader use of vertical flight aircraft. Typical issues are 80+ pages and cover the gamut of crewed/uncrewed, military/civil, piston/turbine/electric-powered aircraft, technology and developments. Vertiflite is written and managed by several leading award-winning VTOL journalists and experts. This edition of Vertiflite CLIPS includes a sample feature article on the Future Vertical Lift (FVL) program and examples of typical department articles from the end of 2022 and the beginning of 2023.

We hope that you enjoy the sample articles in this issue of Vertiflite CLIPS and will join us in advancing vertical flight!

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The FLRAA Decision is a Turning Point

By Mike Hirschberg, VFS Executive Director

In November, the US Army is expected to announce the long-awaited decision on the Future Long Range Assault Aircraft (FLRAA) competition. The result of 14 years of studies, demonstrations and government reviews, this selection will have profound impacts on the two competing teams, the Army and America’s allies.

A Short History

FLRAA is part of the Future Vertical Lift (FVL) initiative that was instigated in 2008 by Congress — at the behest of VFS and its members (see www.vtol.org/FVL). The Secretary of Defense established FVL in 2009 to focus technology development on replacing the existing US military helicopters with next-generation rotorcraft. FLRAA is the first program under FVL.

After the US Army awarded conceptual study contracts in 2011, Bell and Sikorsky-Boeing were down-selected in 2014 to each build a roughly 30,000-lb (13.6-metric-ton) gross-weight Joint Multi-Role Technology Demonstrator (JMR TD) aircraft.

Bell’s V-280 Valor tiltrotor first flew in December 2017; it accrued 214 flight hours and demonstrated a maximum speed of 305 kt (565 km) before it was retired in 2021. The coaxial-compound Sikorsky-Boeing SB>1 Defiant made its first flight in March 2019 and hit 247 kt (457 km/h) in October 2021. Both aircraft demonstrated the potential for long-range operations and met the Army’s key performance parameters.

Decision Time

The two next-generation operational designs proposed for the FLRAA competition are designed for the Army’s requirements and are based on the lessons learned from JMR TD.

The companies submitted their proposals in September 2021, with at least one major update since then. At the Association of the United States Army (AUSA) Annual Meeting on Oct. 10–12, Army leaders said the decision would be announced in the coming weeks.

This decision will pick one team to produce thousands of high-end rotorcraft for decades to come.

All is not lost, of course, for the FLRAA team that is not selected. In addition to significant current and planned production for legacy helicopters by each of the competitors, the next program under FVL — the Future Armed Reconnaissance Aircraft (FARA) — is hot on the heels of FLRAA. Bell and Sikorsky are again squaring off for this competition, and the team not selected for FLRAA may well be selected for the 14,000-lb (6.35-t) FARA scout/attack helicopter.

Beyond FARA, the US Marine Corps has been studying a Family of Systems (FoS) for future rotorcraft that could leverage FLRAA or FARA developments, as could the US Navy’s FVL-Maritime Strike to replace the MH-60 Seahawk and MQ-8C Fire Scout helicopters.

In addition, the Army and other services must still develop replacements for many more types of aircraft, including the AH-64 Apache and CH-47 Chinook. Many more competitions will take place in the years to come.

Global Impact

The conflicts over the past two decades have highlighted the need to move beyond today’s enduring fleet of helicopters conceived in the 1960s and 1970s. The mountainous terrain and vast distances of Afghanistan, coupled with China’s increasingly bellicose postering in the Pacific, have highlighted this need for new capabilities. And Russia’s invasion of Ukraine has underscored the need for strengthened defenses in Europe and elsewhere, particularly for longer range and higher speed.

The Defiant and Valor technology demonstrators have proven the potential for next-generation rotorcraft to leap far beyond current Army helicopters, and far beyond anything else available in the world.

FVL aircraft or their derivatives could fulfill the needs of NATO countries and other allies, just as the Black Hawk and its derivatives nearly a half-century ago. Commercial derivatives or civil variants are also a possibility. The FLRAA decision could also have a major impact in solidifying or reshaping the existing US rotorcraft industrial base, with significant implications for the civil business as well.

Thus, the FLRAA decision is a turning point — immediately for the two competing teams and, longer term, for the US rotorcraft industry, the US Army and global market.

What do you think? Let me know at director@vtol.org.
FAA Makes Progress on Powered-Lift Certification
The US Federal Aviation Administration (FAA) has made progress towards implementing a framework for certification and operation of electric vertical takeoff and landing (eVTOL) and civil tiltrotor aircraft. Last May, the agency confirmed that it was requiring all eVTOL aircraft to use the Section 21.17(b) process for airworthiness certification (see “Commentary: FAA Changes Course on eVTOL Certification,” Vertiflite, July/Aug 2022).

On Feb. 7, Acting Associate Administrator for Aviation Safety David H. Boulter testified before the US House of Representatives Committee on Transportation and Infrastructure on a hearing on aviation safety. He highlighted that the agency is working on the Special Federal Aviation Regulation (SFAR) for the integration of powered-lift aircraft into the national airspace system. This rule would enable a path forward for qualifying pilots as well as determining which operating rules apply to powered-lift aircraft. The SFAR is expected this summer and will be a key enabling document to allow advanced air mobility (AAM) operations.

On Nov. 8, the FAA published the proposed airworthiness criteria (G-1) for the Joby S4. This was followed by the publication of the G-1 for Archer’s Midnight eVTOL on Dec. 20. Joby announced on Feb. 9 that it had completed the second stage of the type certification process with the FAA — the means of compliance (G-2) — where the company identifies the ways it will demonstrate it has met the regulatory intent of the safety rules.

FAA Reauthorization Looms
The deadline for Congress to reauthorize the spending and operating authority of the FAA is mere months away. Congress has until the end of the fiscal year, Sept. 30, to sign a reauthorization package for the agency, which is typically reauthorized every five years. The upcoming reauthorization bill will have significant implications for the future of AAM. Last fall, a subcommittee of the Senate Committee on Commerce, Science and Transportation held a hearing on the inclusion of uncrewed aircraft and AAM platforms in the FAA reauthorization bill. “The last FAA Reauthorization Act helped pave the way for expanded drone use,” said Sen. Roger Wicker (R-MS) in a statement at the hearing. “I hope next year’s bill will do the same for AAM.”

Congress Authorizes $25M for AAM Infrastructure
On Dec. 29, President Biden signed into law spending legislation that includes funding for the development of infrastructure to support AAM operations. Under Section 101 of the omnibus 2023 Consolidated Appropriations Act, Congress directed the FAA to establish a grant program to assist with the development for the infrastructure required to facilitate AAM operations. Congress authorized the FAA to allocate $12.5M for each of the fiscal years of 2023 and 2024. Prior to its inclusion in the omnibus bill, the section was an independent piece of legislation known as the Advanced Air Mobility Infrastructure Modernization (AAIM) Act. The AAIM Act, a bipartisan bill sponsored by Rep. Rick Larson (D-WA), passed the House in June 2022 (see “Washington Report,” Vertiflite, July/Aug 2022).

Proposal to Create AAM Office Within FAA
On Jan. 9, Rep. Jefferson Van Drew (R-NJ) introduced legislation that would create an office dedicated to AAM within the FAA. The bill, known as H.R.220, would redesignate the Office of NextGen as the Office of Advanced Aviation and direct the Secretary of Transportation to appoint an Associate Administrator for Advanced Aviation to head the office. The FAA established the Office of NextGen in 2008 to coordinate the implementation of the Next Generation Air Transportation System, the FAA’s multibillion-dollar infrastructure program that is expected to be fully implemented by 2030.

Should the legislation pass (as part of the FAA Reauthorization Act), the new office would be responsible for managing the integration of a variety of aviation technologies and platforms, ranging from drones and counter-drone systems to electric- and hydrogen-powered aircraft, among others. The proposed bill would relocate the office in the FAA’s organizational structure, making it one of the primary offices in the department and akin to those dedicated to air traffic, airports and aviation safety. It would also rename the FAA’s center in New Jersey to the William J. Hughes Technical Center for Advanced Aviation (emphasis added) and add additional responsibilities to its purview.

FAA and Korea Partner on AAM
The FAA announced on Jan. 9 that it will work with the Korea Office of Civil Aviation (KOCA) on future AAM aircraft development and operations. The two countries agreed to collaborate on AAM projects and share information. The announcement follows similar agreements with the aviation safety agencies of Japan and the UK, among others. “Collaborating with our international partners on safely integrating these new technologies will create more efficient, sustainable and equitable transportation options,” said Acting FAA Administrator Billy Nolen in a statement.
USAF HH-60W Reaches IOC

On Oct. 4, Gen. Mark Kelly, commander of US Air Force (USAF) Air Combat Command, declared that the Sikorsky HH-60W Jolly Green II, the service’s new combat rescue helicopter, has reached initial operational capability (IOC). The milestone means that the Air Force now has sufficient helicopters, trained crews and logistics support to complete a 30-day deployment with four aircraft to any location. A variant of the UH-60 Black Hawk, the HH-60W will replace the Air Force’s HH-60G Pave Hawk helicopters.

First Flight of Production AW609

On Oct. 13, Leonardo Helicopters conducted the maiden flight of the first production version of the AW609 tiltrotor. The flight took place at Leonardo’s Philadelphia facility; AC5 (N609LH), the fifth AW609 produced to date, joins one prototype aircraft in the US and two more in Italy. Three production aircraft for customers are in final assembly in Philadelphia. “This amazing achievement adds to several milestones for the AW609 program over the last year, through its technical progress and during its public appearances,” said Gian Piero Cutillo, managing director of Leonardo Helicopters, in a statement.

Italian Carabinieri Picks AW119Kx

Italy’s Carabinieri revealed on Oct. 27 that it will acquire 20 Leonardo Helicopters AW119Kx aircraft in a drive to modernize its fleet. The Carabinieri, Italy’s national military police, will use the light single-engine helicopter for a variety of missions around the country, including reconnaissance and surveillance, disaster relief and firefighting, among others. The helicopters will be assembled at Leonardo’s facility in Vergiate, Italy, and are expected to be delivered in 2023–2026.

Sweden Aims to Cut NH90

The Swedish military announced on Nov. 1 that it intends to phase out its fleet of 18 NHIndustries NH90 helicopters. In a defense spending and equipment proposal, Sweden’s military head, Gen. Micael Bydén, said that both the land and sea versions of the NH90 currently in service with Sweden will be decommissioned between 2024–2030. In place of the NH90, Sweden intends to acquire additional Sikorsky UH-60M Black Hawks, as well as an unnamed maritime helicopter. The move comes after a Swedish military review of the NH90 program found that the aircraft suffered from low availability rates. The replacement decision will need to be approved by the government before proceeding. Sweden is the third country after Norway and Australia to terminate its NH90 program in the past year (see “Norway Dumps the NH90,” Vertiflite, July/Aug 2022). Sweden said it will also begin retiring its fleet of 20 Leonardo Helicopters A109M, which Sweden uses primarily for training and education.

Jordan Selects Bell 505 for Training

Bell Textron will deliver 10 Bell 505 helicopters to the Royal Jordanian Air Force (RJAF), which will use the aircraft for training pilots. Under an agreement signed on Nov. 1 at a defense exhibition in Jordan, Bell will deliver the aircraft with a flight training device and a comprehensive computer-based training package. Jordan will be the sixth military worldwide to operate the Bell 505 for training; in May 2022, South Korea placed an order for 40 Bell 505s. Bell has delivered more than 400 Bell 505s since the helicopter’s launch in 2017.
Bell Delivers Vipers to USMC, Bahrain

Bell announced on Nov. 2 the delivery of the final AH-1Z Viper attack helicopter to the US Marine Corps. In a ceremony at Bell’s Amarillo Assembly Center in Texas, Bell celebrated the delivery of the 189th AH-1Z to the USMC and the 349th aircraft delivered under the H-1 program of record. The Marine Corps ordered its first production H-1 Huey in 1962; Bell created the derivative AH-1 Cobra as a dedicated gunship in 1966.

Meanwhile, at the Bahrain International Airshow in mid-November, the Kingdom of Bahrain displayed its first AH-1Z Viper. The aircraft was one of six delivered by Bell to Bahrain in the summer of 2022. In all, the Royal Bahrain Air Force will operate 12 AH-1Zs, with delivery of the remaining six expected by the end of the year. Bahrain, which acquired the aircraft in a $911M contract signed in 2018, is the first international operator of the AH-1Z.

First Flight of Ingenuity After Update

NASA’s Ingenuity Mars helicopter completed its 34th flight on Nov. 22, flying for 18 seconds and reaching a height of 16 ft (5 m), but not moving laterally. The flight is the first since a major software update to improve the Ingenuity’s ability to land in difficult terrain and navigate using digital elevation maps. The update is a consequence of recent flights in the Jezero Crater, where the Ingenuity and Perseverance rover encountered rocky terrain. The Ingenuity, which was designed to operate over flat terrain, will now be able to recognize elevation and avoid obstacles when landing. “While in flight, Ingenuity will identify the safest visible landing site,” the Ingenuity team wrote in a Nov. 23 blog post. “When preparing to land, Ingenuity will then divert over to this selected site.”

Unmanned Aerospace Among Winners at Competition

Unmanned Aerospace announced on Nov. 22 it has been selected as a winner of a US military experimentation competition. The company’s GH-4 hydrogen-powered gyrocopter was among a handful of winners of the Joint Interagency Task Force South (JTIAF-South) SCOUT competition. The 82-lb (37-kg) GH-4 is powered by hydrogen fuel cells and is designed to deliver cargo. According to Unmanned Aerospace, a San Diego, California-based company, the GH-4 offers a number of advantages, including low noise signature and rapid deployment times.

UK Donates Sea Kings to Ukraine

The United Kingdom is donating three Westland Sea King helicopters to Ukraine. During a visit to Norway on Nov. 23, UK defense secretary Ben Wallace said that the three heavy-lift helicopters are part of a new aid package to assist Ukraine in resisting Russia’s invasion. According to Flight Global, the UK Ministry of Defence repurchased the three former Royal Navy helicopters from HeliOperations, a private British helicopter company. The UK refurbished the helicopters and provided a six-week training course for 10 Ukrainian crews. As of press time, one of the three Sea Kings has already been delivered to Ukraine. The UK also provided 10,000 artillery rounds and winter equipment to Ukraine as part of the aid package.

FAA Approves FastFin for UH-60

On Nov. 30, BLR Aerospace announced that the US Federal Aviation Administration (FAA) has approved the FastFin system for the Sikorsky UH-60 Black Hawk. According to BLR, a Washington state-based company, the FastFin system will help boost the useful load of the Black Hawk, and potentially improve yaw pedal margins, and reduce pilot workload and fatigue. “There’s a lot of interest and pent-up demand for our FastFin system, particularly from the restricted category utility operators,” said Keith Ray, director of commercial helicopters at BLR Aerospace, in an interview with Vertical magazine.
Vertiport Standards Update

ASTM, FAA and NFPA have each recently published vertiport standards to support the eVTOL revolution

By Rex Alexander, VFS Infrastructure Advisor

After a substantial amount of time and effort on the part of numerous individuals (many of whom are volunteers), along with various organizations and numerous regulatory representatives, two vertiport standards have now been published to support planning for electric vertical takeoff and landing (eVTOL) aircraft for advanced air mobility (AAM) operations. That said, these new standards should be considered as a good starting point and not a final product. As eVTOL aircraft and AAM plans mature, these new standards are expected to be modified and improved over time.

One of the challenges in developing any new standard for a rapidly evolving technology such as AAM is in striking a balance between safety, practicality and efficiency. Given that there are no detailed aircraft performance data published for the many eVTOL designs currently under development, a very pragmatic approach was therefore warranted by the standards development groups. This involves a more conservative methodology than many would like — which leans more towards a prescriptive approach. As aircraft performance data is developed, it is expected that these standards will change.

On Aug. 22, 2022, ASTM International announced that their vertiport standard had been published, making theirs the first to successfully cross the finish line. The new F3423 standard was developed over a five-year period by numerous volunteers of the F38 Committee for Unmanned Aircraft Systems. This standard is intended to provide guidance for ground infrastructure for both crewed and uncrewed eVTOL aircraft. As a participant who helped to lead this effort, I would like to acknowledge the exceptional support and participation by the VFS and its members in accomplishing this challenging task.

The second standard, which was published by the US Federal Aviation Administration (FAA) on Sept. 26, 2022, is the FAA Vertiport Engineering Brief No. 105. While a product of the FAA, there was a significant amount of time and effort devoted to the development of this standard by members of VFS, the Helicopter Association International (HAI) and the General Aviation Manufacturers Association (GAMA). This effort culminated in a day-long industry meeting held March 7, 2022, at HAI’s annual conference Heli-Expo in Dallas, Texas. Over 100 industry volunteer subject matter experts took part in reviewing the FAA’s engineering brief line-by-line, producing over 100 comments and recommendations to the FAA Airports organization.

The FAA vertiport engineering brief, however, is somewhat of a stop-gap measure until the agency has had time to develop and publish a functional, performance-based vertiport advisory circular (AC). The company on contract with the FAA leading this project is Woolpert, Inc., an architectural and engineering firm based in Dayton, Ohio, with significant experience in aviation.
infrastructure development (Woolpert is a VFS corporate member and frequent participant in VFS meetings). Having been afforded the privilege to work with this group on this project, I can say from personal experience that it is in very good hands.

The actual FAA vertiport AC is expected to be published in late 2024 or early 2025. Until then, the current engineering brief will provide guidance and will likely be updated, possibly as early next summer. Once the AC is published, the engineering brief will no longer be in effect.

While there are some differences between these two standards, one obvious benefit of having members of VFS, HAI and GAMA involved in the FAA’s effort is that much of the terminology and guidance found in the FAA standard has been harmonized with the ASTM International standard. This harmonization allows for a much simpler and coherent path towards regulatory development at the US federal, state and local level. This in turn, equates to a much better infrastructure business model being achievable, which can more easily be reproduced in various locations across the US, saving significant money, time and effort.

One important difference of note that ASTM International incorporated into its standard — which the FAA did not — was uncrewed aircraft systems (UAS) weighing 55 lb (25 kg) or more. This was achieved by designing a standard that was scalable to the dimensions of these smaller aircraft. This inclusion was designed to allow proponents looking to conduct cargo/delivery operations with smaller uncrewed aircraft the ability to use the ASTM International standard in the development of “droneports.” The FAA engineering brief states that it “is written for aircraft with a maximum takeoff weight (MTOW) of 12,500 lbs. (5,670 kg) or less” but does not mention UAS aircraft.

Another important standard in the process of addressing vertiport infrastructure is the National Fire Protection Association (NFPA) 418 Standard for Heliports. As the chair of the technical committee responsible for the development of this standard, I have been pleased to support getting the first draft published for public comment in early October — it will remain open for comments until Jan. 5, 2023. This draft includes new language that addresses charging systems, battery storage, electrical storage systems (ESS), hydrogen storage and dispensing, and numerous other items. It too has been carefully harmonized with the ASTM and FAA standards. Access to this draft standard can be found on the NFPA website at www.nfpa.org. All comments are welcome.

A rather unique standard that is also in its final stages of development that the author has also been working on — and which will now include criteria for heliports and vertiports — is the Illuminating Engineering Society (IES) Outdoor Lighting for Airport Environments (RP-37-15). This standard provides guidance for areas surrounding a landing facility such as loading and unloading zones, wash racks, refueling sites, and maintenance areas.

All in all, some very exciting progress to report in the development of AAM and eVTOL infrastructure standards...
In January, a few of the leading helicopter manufacturers reported their aircraft orders and deliveries for 2022. In general, the figures were largely consistent with those for 2021, when helicopter manufacturers saw a rebound from the COVID-19 pandemic (see “Helicopter Orders Increased in 2021,” Vertiflite, March/April 2022). The past year also marked notable firsts and achievements for the companies, which continue to strive to return to pre-pandemic expectations for growth. Leonardo and Robinson had not reported their 2022 results by press time.

Airbus Helicopters reported a total of 374 orders and 344 deliveries in 2022. In a press release on Jan. 25, Airbus said that 2022 marked several important firsts for the company, including the first delivery of an H160 to the French Navy for search-and-rescue operations and the first delivery of an ACH160; Airbus Corporate Helicopters (ACH) models are the company’s VIP packages for “stylistically demanding design and the highest possible levels of comfort.”

Though the number of orders for Airbus helicopters declined slightly from 2021, the number of deliveries increased over the prior year. “2022 was a year in which Airbus Helicopters solidified its recovery, in a context of instability with the war in Ukraine and a fragile supply chain,” said CEO Bruno Even in the press release. The company reported orders from 203 customers in 48 countries in 2022, an increase in both from 2021. The company said it continued to hold a 52% share of the civil and parapublic market — for turbine-powered helicopters with more than five seats — and that fleet flight hours had returned to pre-COVID-19 levels.

Boeing Defense & Security (BDS) reported delivering a total of 107 new and renewed helicopters — 75 AH-64 Apaches and 28 CH-47 Chinooks — in 2022. The figure was consistent with 2021, when the company reported 103 helicopter deliveries. Overall, however, the company said that BDS revenues decreased in 2022, a consequence of costs associated with development programs and weapons volume. Still, Boeing reported several notable achievements, including a contract from the Egyptian Air Force for 12 CH-47F Chinook helicopters towards the end of the year. Boeing also made its first deliveries of the MH-139 Grey Wolf (see “Grey Wolf Gains Acceptance,” Vertiflite, Nov/Dec 2022), which is a missionized Leonardo AW139.

Lockheed Martin Rotary and Mission Systems (RMS), which includes Sikorsky, reported a total of 86 helicopter deliveries to US government programs and nine helicopter deliveries to international military helicopter programs in 2022. In all, the company reported 95 helicopter deliveries in 2022, down from 110 in 2021. Revenue for Lockheed’s RMS segment, however, was largely consistent with the prior year. On Jan. 20, 2023, Sikorsky delivered the 5,000th member of its “Hawk” family, a US Army UH-60M Black Hawk.

Textron’s Bell said that helicopter deliveries to civil customers rose in 2022, while those to military customers declined. In the past year, the company said it delivered a total of 179 helicopters to civil customers, an increase of 23 over 2021, and 31 military rotary-wing aircraft, a decline of 17 helicopters. The primary difference between the two years was an increase in orders for the Bell 505 light helicopter and Bell 412 intermediate.
UK Selects Four Bidders for NMH

By Dan Gettinger, Managing Editor

The UK Ministry of Defence (MoD) downselected four companies — Airbus, Boeing, Leonardo and Lockheed Martin — to compete for the $1.15B contract for its New Medium Helicopter (NMH) program. On Oct. 31, the MoD invited the four companies to participate in the next stage of the competition, which will see the helicopter manufacturers respond to a more detailed list of requirements from the MoD.

Under the NMH program, the MoD intends to acquire a single helicopter to replace its fleets of Airbus (Aérospatiale) SA330 Puma, Bell 212 and 412, and Airbus AS365N3 Dauphin helicopters. The MoD could acquire as many as 44 helicopters under the NMH program to replace those in service with the Royal Air Force, British Army and UK Special Forces. The MoD issued a request for information for the NMH program in November 2021, before formally launching the program in May 2022 (see “UK Issues New Medium Helicopter Tender,” Vertiflite, July/Aug 2022).

The MoD is expected to release a detailed request for proposals to the four downselected companies in the first quarter of 2023, which will serve as the basis for negotiations with the manufacturers. The second stage of the acquisition program is expected to run until March 31. Though the MoD had previously been expected to select a winning entry in early 2023, the timeline for the NMH program has been delayed by some months and it is unclear when precisely it intends to do so.

Despite the delays, the MoD has not said whether it will postpone its ambitious goal of an in-service date of 2025. The accelerated timeline was designed to coincide with the retirement of the UK’s fleet of 23 Pumas. In a statement to OvertDefense.com in October, an MoD spokesperson said that the Puma’s out-of-service date will “remain under review.”

Airbus Helicopters and Leonardo are offering their H175M and AW149, respectively, for the NMH Program, while Lockheed Martin is expected to propose the Sikorsky S-70M Black Hawk. Boeing has not said what it will offer for the program; the company is providing the medium-lift MH-139A Grey Wolf, a variant of the Leonardo AW139, for the US Air Force. However, according to Flight Global, Boeing may offer training and support services for the program rather than a specific airframe.

The downselection announcement comes after a summer of intense campaigning by some of the helicopter manufacturers (see “UK New Medium Helicopter Competition Heats Up,” Vertiflite, Sept/Oct 2022). Aside from the technical requirements, the MoD has made it clear that a key consideration in the competition will be the degree to which the aircraft is produced in the UK. Both Airbus and Leonardo intend to assemble their aircraft locally, while Sikorsky, which assembles the S-70M at its facility in Poland, has said it will work closely with British suppliers.

With the field effectively narrowed, the competition for the UK’s next medium-lift helicopter is entering a decisive stage. Even so, questions regarding the precise requirements of the aircraft and the final timeline for the program remain unresolved.
Here’s our roundup of news on battery-electric, hybrid-electric and hydrogen-electric vertical takeoff and landing (eVTOL) aircraft from our Electric VTOL Newsletter and website: www.eVTOL.news. More than 750 eVTOL aircraft have been catalogued to date in the VFS World eVTOL Aircraft Directory, with new aircraft added after every unveiling. Check out eVTOL.news for more information on each of the aircraft described here or to subscribe to our newsletter.

Regulators Strike AAM Partnerships
The US Federal Aviation Administration (FAA) and the Japan Civil Aviation Bureau have pledged to cooperate on advanced air mobility (AAM) regulations, the FAA announced on Oct. 18. The two agencies will share information on certifying AAM vehicles, as well as on other aspects such as the production and operation of AAM vehicles and personnel licensing. “Close collaboration with our international partners is critical to successfully and safely integrating these new technologies,” said FAA Acting Administrator Billy Nolen in a statement.

The European Union and Singapore, meanwhile, have launched a similar collaborative partnership on safety and regulatory standards for AAM vehicles. On Oct. 18, the Civil Aviation Authority of Singapore and the European Union Aviation Safety Agency (EASA) said that the partnership will also involve conferences and outreach to relevant stakeholders.

XPeng AeroHT X3 Takes Flight
In a video posted to YouTube on Oct. 24, XPeng AeroHT (previously “XPeng Heitech” and “HT Aero”) revealed that it conducted the maiden flight of an uncrewed demonstrator for its X3 flying car. In the video, XPeng AeroHT, the eVTOL affiliate of the China-based automaker XPeng, shows the eVTOL aircraft take off, hover and land. The X3 is an interim name for the latest iteration of XPeng’s flying car design. The prototype features a multicopter design arranged in a coaxial octocopter configuration and situated on the roof of a car.

In a separate Oct. 24 video, XPeng AeroHT revealed a design for the future of its flying car, showing how the arms would unfold outwards from the roof of the vehicle. (An early concept unveiled last year had an animation of the arms extending from the rear windows and then unfolding.)

BAE and Amprius Collaborate on Batteries
On Oct. 25, Amprius Technologies announced that it has entered into a three-year collaboration agreement with BAE Systems. Amprius and BAE Systems Air, the military aviation division of BAE, will work together on developing high-energy batteries for electrically powered aircraft. Amprius, a Fremont, California-based company, specializes in high-energy and high-power lithium-ion batteries. Additionally, Amprius and BAE will explore investment opportunities involving Amprius batteries, particularly for electric products developed by BAE for military applications. “Amprius’ innovative silicon nanowire anode battery cells have the potential to deliver exceptional performance,” said Dave Holmes, a director at BAE Systems Air, in a statement.

LIFT and Charm Partner for eVTOL Flights
LIFT Aircraft announced on Oct. 26 that it had partnered with Charm Aviation to introduce personal eVTOL tourism flights to New York City beginning in 2023. LIFT and Charm, a helicopter tour operator with operations in multiple East Coast cities, will establish a joint venture and pre-order 100 HEXA eVTOL aircraft that will be flown from LIFT vertiport locations in the New York City area. Under the current concept, customers will be able to learn to fly the single-seat HEXA eVTOL in less than one hour and will not be required to have a pilot’s license for the ultralight aircraft. “These are like Segway tours, but in the air — with a much better view and much more fun,” said Caitlyn Ephraim, President of Charm Aviation, in a statement.
Meanwhile, the US Air Force announced that on Nov. 16, Airmen had begun remotely flying the HEXA at Eglin Air Force Base’s Duke Field. “This was an early step in creating a training program to incorporate Airmen into the aircraft’s flight operations,” the Air Force reported. The goal of training the Airmen “to validate the HEXA’s training program by having the Airmen execute it in a controlled, test environment,” as well as to “serve as a proof of concept for how to develop responsive training for government operators” of uncrewed eVTOL aircraft.

Order for up to 100 SkyDrive SD-05s
On Nov. 28, Japanese eVTOL developer SkyDrive announced that it has received a pre-order for 10 SkyDrive SD-05 aircraft from Pacific Group, Vietnam-based renewable energy and investment company. The agreement also includes a conditional pre-order option for up to 90 flying vehicles. SkyDrive and Pacific Group will also work collaboratively to obtain regulatory approval for the aircraft in Vietnam and explore sustainable and accessible mobility solutions in the country. SkyDrive unveiled the two-seat SD-05 in September and expects the aircraft to be operational by 2025 (see “Electric VTOL News,” Vertiflite, Nov/Dec 2022).

VPorts Forms International AAM Corridor
VPorts, a Canadian AAM infrastructure company, announced on Nov. 29 that it will establish an AAM corridor between Syracuse, New York, in the US, and Québec, Canada. The corridor, reportedly the first of its kind to cross international borders, will foster the development of an “AAM ecosystem that will provide a platform for full commercial cargo transport operations using eVTOLs,” said Dr. Fethi Chebil, President and Founder of VPorts, in a statement. The corridor is backed by a consortium of organizations and companies in the US and Canada, each of which will be able to use it to explore different aspects of AAM operations.

Sikorsky Developing Hybrid-Electric VTOL
Sikorsky is developing a hybrid-electric VTOL demonstrator aircraft, Vertical magazine reported on Dec. 2. The aircraft will be designed for a range of AAM applications, and eventually could serve as a vehicle for developing an electric propulsion system for commercial and military aircraft. The demonstrator vehicle will use a turbine generator and the company’s Matrix autonomy system, which Sikorsky, a Lockheed Martin company, developed with the US Defense Advanced Research Projects Agency (DARPA). Using the Matrix system, an aircraft “can avoid obstacles, and it can pick landing zones,” said Igor Cherepinsky, director of Sikorsky Innovations, in an interview with Vertical. “If you think about the commercial space, AAM is also in our sights.” The company will begin building the demonstrator in 2023, the article stated.

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ANNA DIETRICH
Director, Industry & Strategy
Community Air Mobility Initiative (CAMI)

ANNUAL DUES BASED ON BELOW:

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*Associations, operators, government agencies, consultants and certain small organizations. Additional subscription purchase required to access the Vertical Flight Library & Online Store.
Katrin Mayrhofer  
INCAS Program Manager for Racer

Overseeing Romania's National Institute for Aerospace Research “Elie Carafoli” (INCAS) contribution to Airbus’s Racer high-speed helicopter, Katrin Mayrhofer plans, monitors and coordinates technical-related tasks with government and industry players in Bucharest. She recalled, “When I left Germany and Airbus, there were voices who questioned why I would go to Romania. I think in Western Europe we didn’t pay too much attention to what is happening in Romania, to be honest. I wasn’t aware of the old and rich history Romania has in aerospace. I think Romania provides everything you need for the aerospace industry in the research environment.”

Airbus’s Racer (originally standing for the Rapid And Cost-Effective Rotorcraft), is part of the European Union’s Clean Sky 2 research initiative and aims to fly a 216 kt (400 km/h) compound helicopter with less noise and lower fuel consumption than conventional rotorcraft. Mayrhofer explained, “The Racer research project is a consortium. INCAS is responsible for the main fuselage. We have been responsible for the design, stress analysis and everything that comes with it. Then we have ROMAERO, the state-owned aerospace company who did the manufacturing and assembly. Now we are back to STRAERO, which is the private research and development company, for the static testing, the ground testing of the airframe.”

Romania’s INCAS is a Racer core-partner under Airbus Helicopters. “Within the European research joint undertaking umbrella, there is no such thing as a supplier,” noted Mayrhofer. “We are more a collaborator. The program is set up such that the coordinator — Airbus — proposed an entire range of things. INCAS is one of seven core partners for the entire project.” Mayrhofer continued, “The main fuselage, the flying part, was delivered to Airbus last year in March. We’ve now finished the four test specimens. We are conducting static testing on the upper and lower decks of the main fuselage. Then we had a fuel drop test specimen that went to Airbus. We just manufactured and assembled the hardware. The same for the fuel rig test specimen.”

Within the INCAS Racer team, Mayrhofer shares leadership. “Actually the constellation in INCAS is a little bit different from what you’re probably used to in the industry,” she said. “We are a group of people sharing different disciplines in program and project management. For example, when it comes to fully technical-related responsibilities, it’s the chief engineer Adrian Gaz. Adrian and I coordinate every technical and schedule-related thing. Then we have the administrative and legal part of it with Dr. Daniela Mocenco. We three are the key players in Racer within INCAS. Overall, the lead coordinator is Dr. Cătălin Nae,” the General Manager and CEO of INCAS.

INCAS — which stands for “Institutul Național de Cercetare-Dezvoltare Aeroespacială” in Romanian — traces its roots to 1950, when the Applied Mechanics Institute of the Romanian Academy was established. The institute changed names and missions many times since then; however, in 1991, it was reorganized — along with the entire Romanian aeronautical industry, following the 1989 Romanian Revolution — into its current form, INCAS. The institute’s name honors the great Romanian aeronautics pioneer, Elie Carafoli (1901–1983), who served as the early institute’s founding director.

At various stages, work on Racer involved 100 to 130 people. Mayrhofer noted, “We have a lot of projects ongoing at the Research Institute. This is how we make our living.” Other aviation and space projects are underway in Bucharest, Craiova and other locations. “Within the INCAS research establishment, we have scientists; we have researchers; we have engineers. We have ‘blue collars’ because we manufacture our own wind tunnel models, for example. Depending on the year, we have 200 to 250 employees, and we have university students who we try to grow in aerospace research and industry environments.”

Aircraft Attraction

Katrin Mayrhofer grew up in the small German town of Weissenhorn in Bavaria. “My father was the assembly manager for a mechanical engineering company in the automotive sector,” she recalled. “In his rare free time, he built radio-controlled aircraft. In order to spend quality time with my father, I just got involved in the hobby. On the way, I got interested in the airplanes — building them, flying them, damaging them, repairing them. Those are some of my best childhood memories.”

Weissenhorn’s modern secondary school provided pivotal direction. “The school system then was quite different from today,” noted Mayrhofer. “At the secondary school, you had to make a choice of dedicated paths. I chose the technical-
mathematical path. Besides the regular classes, the focus was on teaching mathematics, physics and chemistry, and as an elective class — I chose technical drawing.” The future research manager never received a university degree. “I had my son very early, so I did not have time to go to university. I had to get a job and make my living.”

A succession of business and technical support positions in industry ultimately led Mayrhofer to Donauwörth, Germany. “When I saw the job opening at Airbus Helicopters — at that time it was Eurocopter — I thought, ‘I can’t get any closer to aerospace technology than applying there.’ I just gave it a shot. I had the interview on a Friday in the strategic procurement department. Monday was a public holiday, and I started on Tuesday. It went that fast, and I just thought, ‘This is your chance to be where you wanted to be — grab it.’ I got plenty of opportunities in Airbus, people supporting me, training me, and I trusted them. It was a long road, but here we are.”

Mayrhofer joined Airbus in 2011. “After strategic procurement, I moved to the airplane door system center, which was making all the passenger and cargo doors for all civil Airbus airplanes. I was part of airplane door systems when the A350 first flew, so I gained a lot of knowledge and learned how to deal with high pressure.” Airbus Helicopters offered broader opportunities. “After door systems, I went to the research department, and I started as the [Donauwörth-based] assistant for our vice president of research and innovation, Tomasz Krysinski” (currently the VFS Chair of the Board), who was based in Marignane, France.

“Within the R&D programs, my boss at that time, Markus Feiler, approached me and said, ‘You’re totally under-challenged here. I know you’re much more interested in the technology and want to get involved.’ He and Tomasz actually pushed me forward through all national research topics. One of the international programs was Clean Sky I, the Green RotorCraft [GRC]. I was also involved in the beginning with the CityAirbus electric air taxi and also Racer. There, I got a lot of experience with all subsystems involving different people and so many companies and countries with different mentalities — cross-national and cross-discipline.”

Turning East
Katrin Mayrhofer joined INCAS and the Racer Romanian consortium, RoRCraft, in July 2017. The EU research programs solicit collaborative proposals. “In the end, the best one gets the catch. For Racer, it was INCAS.” The compound helicopter integrates a transport cabin with lateral pusher propellers, double wing and faired main rotor. “Efficiency and, of course, speed are the main targets of the aircraft,” noted Mayrhofer. “The optimization for the cruise speed was one of the main targets, so the design required a lot of focus on drag reduction. We designed the aircraft [fuselage] and performed some testing along the way, especially on some critical composite parts in parallel to ensure every calculation we did was valid.”

Mayrhofer continued, “We got the load cases for the mission from Airbus. According to the load cases that needed to be tested, we designed the test program for the main fuselage. The materials are state of the art. I think the main challenge was the hybrid structure. The central longeron and side shells are fully composite. We had rivets, fasteners, also some reinforcements that are metal.”

Romania gave INCAS an experienced workforce. Mayrhofer noted, “We have quite a few aerospace companies in Romania, not just in Bucharest, also in Bacau and more locations. We try as much as possible to involve them in the research activities. The knowledge, the technologies, everything is available in Romania, and you have excellent engineers here. ROMAERO, the manufacturing partner we had on Racer, works with other companies internationally.”

Racer remains a one-off demonstrator. Mayrhofer acknowledged, “We, of course, all hope that in the end, Airbus will succeed to make a serial product out of it. I think there is a market for it, for sure when it comes to search and rescue missions, besides VIP transportation. We all know how much a life can depend on the minutes waiting for the arrival of the emergency team. I think for this mission especially, Racer is pre-destined. You have a large cabin. You have the speed. You have less vibration due to the wing.”

INCAS is pursuing other advanced programs. “We applied for the Clean Aviation program,” noted Mayrhofer. “I would love to be part of developing the hydrogen technology. The zero-emission goals from Europe are there for years, so the focus will be more on electric and hybrid flight.”

Unrelated to the research program, Mayrhofer in 2020 co-founded ELSA Industry S.R.L. in Bucharest to give Romania a domestic composites capability. “My company has literally nothing to do with INCAS or Racer. It’s a free-standing composites company. There’s nothing like this existing in Romania. It’s not to compete with anyone. It’s more to have a wider range of suppliers in the country. Our wish in the future is to collaborate. We’re a startup in our very beginning, so we are not there yet.”

Katrin Mayrhofer joined VFS in 2017 and is now working to start a VFS Chapter in Romania. “I can remember one of my former colleagues was a member of the Vertical Flight Society. When he finished reading a Forum technical paper, I was the one asking to read it. My colleague said, ‘Maybe that’s hard to read because you’re not an engineer. I can remember I said, ‘One day I want to become a member.’ When I joined the VFS, I posted a picture and said, ‘That’s fulfilled.’
The VFS Philadelphia Chapter had a booth at the Wings N’ Wheels event in Blue Bell, Pennsylvania, on Sept. 10. This annual event, benefitting Angel Flight East, historically focuses on cars and general aviation fixed-wing aircraft. This year it expanded, with the VFS team leading the “technology hangar,” along with two FIRST Robotics teams, the local chapter of the American Institute of Aeronautics & Astronautics (AIAA), and the American Helicopter Museum & Education Center’s interactive helicopter, “Stubby.”

A large crew from the Philadelphia Chapter offered VFS-branded propeller toys and other promotional items while using trivia games and rotorcraft models to teach about vertical flight technology and products. The enthusiastic team prepared and presented written and physical content to educate attendees at the event. Materials addressed all ages and skill levels to teach the basics of flight as well as advanced vertical lift concepts and trivia.

While several new people agreed to join the VFS, the real value came from engaging potential future engineers and scientists — and their parents and grandparents. An example of this is Dan Newman explaining the physics of an Aero Prop to a middle school child (shown). By showing the required rotation to fly, he reinforced the concept of rotary lift by demonstrating that the lift requires a positive angle of attack. The team used simple questions aimed to explain the capabilities of a helicopter verbally and then proved the lessons with physical demonstrations.

The most popular demonstration was Keith Conaron demonstrating the hover and directional capability of a small lighted quadcopter. Children (like the two boys shown) chased the drone and begged parents for one of their own. The VFS team captured imaginations, leaving a long-lasting impression on children of all ages attending the event. The team also used sample parts, materials and rotorcraft models donated by our local corporate members Leonardo and Boeing. All of these showed the variety of aircraft technology that represent the vertical takeoff and landing sector.

Even toddlers (like the one shown examining the toy tandem rotor helicopter) greatly enjoyed the VFS exhibit. By day’s end, the VFS Philadelphia Chapter had shared the many benefits of vertical lift with well over 400 people, some of whom may be among the next generation of vertical lift critical thinkers. A special thanks to Daniel Jaep, Daniel Newman, Keith Conaron, Stefano Coratella, Marco Garcia, Winter Conover and Gregory Walsh, who made this an impactful event.

Keith Conaron is the Mideast US Regional Vice President on the VFS Board of Directors, and a past President of the VFS Philadelphia Chapter. He is a project engineer at The Boeing Company.
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