NATO activities relating to Next Generation Rotorcraft commenced in 2012 and significantly expanded following the formation of the Next Generation Rotorcraft Capabilities (NGRC) Team of Experts (TOE) in 2016 sponsored by the NATO Joint Capability Group Vertical Lift (JCGVL).

A NATO Specialists Meeting (AVT-245) was held in Prague in October 2015 to discuss the next generation of rotorcraft and future requirements. The NATO Science & Technology Organisation (STO) supported the NGRC study by the TOE in 2016–18 (see the author’s article, “US Army Working with NATO on DVE and Next Gen Rotorcraft,” Vertiflite, May/June 2017).

Additional meetings since have most recently resulted in the defense ministers of France, Germany, Greece, Italy and the United Kingdom signing a Letter of Intent (LOI) in October 2020 (see “JMR Proves Its Military Merit,” Vertiflite, Jan/Feb 2021) to back a multinational project to develop NGRC, with the objective of delivering a new medium multi-role helicopter to military operators in 2035 through to 2045. Several other key countries were present, but elected not to sign at that time; as the document matures, the number of signatories may likely expand.

The Royal Aeronautical Society’s Next-Generation Rotorcraft conference, staged virtually on Jan. 20–21, brought together subject matter experts from the military and the civilian world to discuss future vertical flight developments. It was chaired by Pat Collins, senior fellow, Helicopters Operating Centre, Defence Equipment & Support, UK Ministry of Defence.

**NATO Needs**

The need for a new medium multi-role military helicopter became apparent with the realization that nearly 1,000 medium helicopters within NATO fleets (excluding US military rotorcraft) would reach the end of their service life between 2030 and 2050. These were spread across numerous nations and helicopter types, including:

- 100 Mil Mi-8/17 in 2030–35
- 191 Aérospatiale SA 330 Puma in 2030–40
- 167 Sikorsky S-70/UH-60 in 2030–40
- 143 Leonardo AW101 in 2035–40
- 331 NHIndustries NH90 in 2040–45

The most concerning factor, well known to all involved in aviation projects, is the length of time it takes to develop a new rotorcraft design from conception, through design, certification, production and entry into service with initial then full operating capability. Twenty years is not uncommon — NH90 feasibility studies began in 1981 with first aircraft flight taking place in 1995 and deliveries beginning in 2006.

Lt. Cdr. Andrew White Royal Navy, Capability Air Manoeuvre, SO2 Concepts, British Army, and secretary to the NATO NGRC, summarized the out-of-service numbers, adding that “if you add the small to mediums such as the Bell 412 then that number goes up massively.” He stated that it was envisaged that rotorcraft would be required in the medium-to-long term, and that any platform in the future would likely be optionally crewed.

Despite the long time taken to develop a new platform, in regard to a multinational project, there are both benefits and drawbacks. White said that the US Army was driving the Future Vertical Lift (FVL) specification forward — despite originally intending to be a joint program when it started out as the Joint Multi-Role (JMR) initiative — even though other services such as the US Marine Corps have a strong interest. “A multinational project such as NGRC can cater for lots of requirements and therefore everyone across the project can get what they are

The French–German–Italian–Dutch NH90 is built by NHIndustries, comprised of Airbus, Leonardo and GKN’s Fokker Technologies. A total of 427 have been delivered in 26 different versions. (Airbus Helicopters)
Why did NATO NGRC decide that a medium rotorcraft was the best option going forward? White stated that studies into the cost effectiveness of various fleet mixes generally came down in favor of medium aircraft. “Sometimes a heavy or medium bias can be more efficient; however, it is always going to be more efficient sending a medium aircraft to do a medium role.”

Looking at global deployment, he stated that a medium could be broken down relatively quickly and transported by a tactical or strategic aircraft to be deployed globally and brought quickly into operation once it arrived. Operationally, medium platforms were also better suited to go into tighter landing zones such as in urban areas, or on the landing deck of naval vessels that could not accommodate heavy helicopters: “Every future trend analysis we do always includes a medium.”

In terms of looking at what kind of technology the NGRC project is thinking about, White stated, “The Modular Opens Systems Approach (MOSA) is fundamental to the future. It is the driving force behind a great many programs and projects. AI [artificial intelligence] and machine learning will also provide a huge amount of information to the crew, onboard or remotely, to increase situational awareness.”

Future aircraft will have either a full crew for high-end missions, or a single crew member or potentially unmanned, dependent upon the mission being undertaken. In terms of self-protection, the ToE recognized the benefits of directed energy weapons and was keen to explore further. Advances in materials and manufacturing technologies will increasingly lead to lighter but stronger aircraft, and all of the above combined will increase survivability with the addition of better defensive aide suites as these become available.

**Advanced Capabilities**

Bringing this up to date, in 2019, Project NGRC had its first meeting at the DSEI exposition in London. The UK “saw the merits in NGRC both for NATO and the UK” as a replacement for the Puma and Merlin, and volunteered (on behalf of the JCGVL) Colonel Paul Morris to lead the study through the pre-concept phase. Morris, Royal Marines, Capability Air Manoeuvre and Assistant Head of Plans, British Army, provided a keynote at the conference (and also spoke at Forum 76 in October).

The next steps will entail the release of an industry “read-ahead pack” as soon as possible in the first quarter of this year with an initial statement of requirements, followed by an industry day. “We see real value in getting industry face-to-face with the NGRC core team to discuss and get feedback,” said White.

The ambition is for first aircraft deliveries to begin in 2035 to tie in with the start of out-of-service of some types of rotorcraft. The production will run, through various tranches, out to around 2055, which would also cater to any rotorcraft being delivered or about to be ordered now.

Dan Newman, senior technical fellow and chief engineer for vertical lift aircraft research and development at Boeing’s Phantom Works, shared the findings of a series of NATO Industry Advisory Group (NIAG) studies on new rotorcraft that they must be “interoperable, sustainable and affordable” through their lifecycle.

Summarizing the conclusions from the initial NIAG study group (SG-219), Newman said that 33 companies were represented from 14 countries. The involvement of the NIAG allowed them “the opportunity to get in the same room” and collaborate with the NGRC representatives. In the US, the collaboration is limited because industry gets “talked to individually and there are proprietary interests at stake. When NIAG gets together it is all industry and all sharing — we asked them to put down their flag and their badge, and work on behalf of NATO. We asked them not how to do it, but what was possible.”

The output from the NIAG study, together with complementary work from STO, was used to inform the NGRC Team of Experts final report.

NGRC decided early in the process that it wasn’t going to consider specific capabilities like whether it would go fast or have long range, Newman said. “We were going to consider the issues common to all platforms because we are looking at replacing an entire fleet so we couldn’t focus on one mission. Instead we focused on cost and schedule, interoperability, sustainment and regulatory approval.”

He added that common airworthiness approvals were as important as hardware and interfaces.

As far as technology goes, the NIAG study looked at readiness as well as cost — being ready doesn’t mean we should do it, said Newman. The key themes were modularity, multiple levels of capability (nicknamed Yugo, Malibu and Cadillac, after the cars — because not everyone needs a Cadillac), conditions-based maintenance (operating dynamically with a complete understanding of the aircraft and the environment). “We aimed for as much condition-based knowledge as possible, then [to] come away from that during development when it didn’t make sense,” said Newman.

The follow-on Study Group SG-239 examined concepts of sustainment including “increased maintainability, sustainment architecture, sustainment efficiencies, new field supply and maintenance processes and procedures and a focus of technologies that would increase effectiveness and affordability. Reducing force structure was also a very significant objective. “We have been looking at unmanned the maintenance battalion in addition to just unmanned the aircraft,” explained Newman.
Nearly 200 Pumas in NATO service will have to be removed from service in the 2030–40 timeframe. The French Puma was developed with British support and produced by Aérospatiale and Westland. (UK MOD)

The NIAG study proposed three conceptual levels of sustainment: Next-Generation Rotorcraft Sustainability (NGRS), NGRS+ and Integrated Mission Based Operations (ICBO), resulting in increased level of mission effectiveness with each step. The capability spectrum also analyzed a blend between civil and military for logistical support, which was 80/20 percent respectively as depot level, transitioning to 0/100 percent in favor of the military at deployed unit level.

Newman said that study SG-246 Innovative Military Aviation Acquisition is ongoing into how to procure these new medium aircraft. Topics covered include: procurement and initial fielding, multiple manufacturers and system integrators, advanced manufacturing, affordability, supply chain, configuration management in the modular design and others. “This will make recommendations to the nations of how they could procure rapidly and affordably,” concluded Newman.

Continental Considerations
NGRC has been identified as a medium lift rotorcraft capability without further specific terms of reference in regards to platform size — the suggestion is between 17,600–33,100 lb (8–15 metric tons). At this stage, the NGRC is not viewed as a direct competitor to the US Army’s Future Vertical Lift (FVL) program — more especially the Future Long Range Assault Aircraft (FLRAA) — with some level of dialogue and potential cooperation between European and North American rotorcraft manufacturers.

It is not difficult to assume that hard work remains in determining the specifics of what each nation requires in terms of mission profile, and how this can be delivered through one conceptual design. The two versions of the NH90 — the Tactical Transport Helicopter (TTH) and the NATO Frigate Helicopter (NFH) — may offer guidance when the time is right and with both major European industry leaders, Airbus and Leonardo, having experience throughout the lifetime of that airframe’s development and production. However, observers would naturally assess that the NGRC would want to avoid the specter of too many variants as witnessed by the exact challenges experienced by the NH90 program.

Steve Allen, vice president of strategy at Leonardo Helicopters UK, said that while industry is still waiting to be formally engaged in NGRC (starting with the industry day later this year), he welcomed the collaborative approach taken by NATO through the NIAG. He noted that the 8–15-t range that was being proposed for the medium helicopter was very wide, and that “speed, reach and endurance cannot be ignored” as industry begins imagining what will be required.

Allen talked about the need to challenge convention and the benefits of sharing designs and interoperability verses the benefits of competition to industry. He asked whether “the initiative would realistically deliver for our businesses and our nations,” adding that the UK had also agreed to work with the US on future rotorcraft technology and questioned how that might work going forward. Whatever the path ahead, industry had to see a return on its investment.

Jerome Combe, head of product policy and strategy at Airbus Helicopters France, said that it was important for both European helicopter manufacturers, Airbus and Leonardo, to keep their strong positions in helicopter design and manufacture, but noted that “the export market is shrinking. Russia is our main contender after the US, but now China, Turkey, India and South Korea are all developing helicopters for export.” Combe stated that without cooperation it could be difficult for any single European manufacturer to reach a critical mass of orders that would make the venture profitable. He inferred that the timeline to field the new medium rotorcraft would be challenging individually, considering the usual time taken to test and certify any new design, particularly if they were starting with a “clean-sheet” design.

“There is a real opportunity for Europe here to align and deliver an NGRC to European needs,” said Combe. He noted that Airbus envisaged the need for several work packages: the first would define the concept of operations (including the evaluation of European high speed rotorcraft); the second would focus on major technology requirements for the future; and the third work package would be how to make the NGRC both more survivable as well as affordable.

About the Author
Andrew S. Drwiega is the director of DefenceWorX Ltd., a UK-based defense consulting group. He is editor-in-chief of Armada International and Asian Military Review magazines.

Timeline of NATO/NIAG Activities
- 2012: NATO STO Applied Vehicle Technology (AVT) Technical Group
- 2015: NATO STO (AVT) Specialists Meeting AVT-245: Future Rotorcraft Requirements
- 2016: NATO NGRC (NGR Capabilities) Team of Experts
- 2017: NIAG SG-219: NGR Capabilities
- 2017: NATO STO (AVT ST-005) Specialist Team: NGRC Technologies
- 2018: NATO NGRC (NGR Capabilities) Team of Experts reports to JCGVL
- 2019: Project NGRC initiated
- 2019: NIAG SG-239: Integrated Sustainability for the NGR
- 2020: NIAG SG-246: Innovative Military Aviation Acquisition
- 2020: Letter of Intent signed by Defence Ministers from France, Germany, Greece, Italy & UK