Next Generation Rotorcraft Capabilities

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Rationale

- The importance of rotorcraft in past and current military operations is widely recognized and predicted to endure.
- The threat is constantly evolving and places the NATO rotorcraft fleet at risk of capability overmatch.
- Significant numbers of rotorcraft will reach the end of their programmed life between 2030 – 2050.
- The current state of technology is such that significantly enhanced capability is now achievable.
- Traditionally, rotorcraft take an extended time to develop making it imperative to initiate replacement programmes in the near future.
- The capability/requirements process must start now to meet the near term decision points for replacement.
Future Rotorcraft Requirements

• Large numbers of the current fleet will be nearing the end of their service life in the period 2030 - 2050.
• Analysis suggests a long term enduring requirement for the capability currently provided by rotorcraft.
• Analysis of open source long term helicopter fleet plans for NATO nations (excluding US) suggests:
  - Mil 8/17 100 helicopters, OSD 2030-35
  - Puma 191 helicopters, OSD 2030-40
  - S-70/UH-60 167 helicopters, OSD 2030-40
  - AW.101 143 helicopters, OSD 2035-40
  - NH90 331 helicopters, OSD 2040-45

• Total: 932 by 2045
Future Rotorcraft Requirements

- The majority of currently in service helicopters can trace their origins back to the 1960s-1980s, there have been very few new designs since then (first flight dates):
  - Puma (1965)
  - UH-60 (1974)
  - AW.101 (1987)
  - V-22 (1989)
  - NH90 (1995)
Future Rotorcraft Requirements

- It is estimated that it could take at least 20 years from project inception to entry into operational service.

- Using NH90 as an example:
  - Pre Feasibility Studies 1985
  - Development Contract Signed 1992
  - First Flight 1995
  - First Aircraft Deliveries 2006
Future Rotorcraft Requirements

• In 2013 the NATO Science & Technology Organization (STO) initiated a working group managed under the Applied Vehicle Technology (AVT) Panel to:
  ▶ Identify the roles and requirements for the next generation of military rotorcraft.
  ▶ Investigate the relevant technologies applicable to future rotorcraft and to assess their maturity and potential significance.
  ▶ Provide direction for future NATO activities relating to future rotorcraft technologies.

• A NATO Specialists Meeting (workshop), AVT-245: Future Rotorcraft Requirements, was held in Prague in Oct 2015 to debate the issues.
Future Rotorcraft Requirements

• AVT 245 Output
  - Formation of Next Generation Rotorcraft Capabilities Team of Experts sponsored by the Joint Capability Group Vertical Lift.
  - Establishment of new AVT Teams:
    - AVT-312 Airworthiness Tools & Processes for Complex Rotorcraft Systems Safety
    - AVT-319 High Speed Rotorcraft Analysis & Evaluation
    - AVT-329 Next Generation Rotorcraft impact on Military Operations
    - AVT ST-005 Future Rotorcraft Technologies
AVT-ST-005

- Specialist Team established specifically to support the NGRC TOE in terms of Science & Technology developments.

- Participation
  - Co Chairs
    - Pat Collins (UK: DE&S)
    - John Preston (US: AMRDEC)
  - 8 Organisations from 7 Nations

- The co-chairs represented STO on the TOE and were members of the NIAG SG.219 Quick Reaction Team (Customer Representatives)

- Deliverable
  - Technical Memorandum, June 2018
NIAG SG.219

• The NIAG Study Group focussed on rotorcraft technologies that would enable increased Alliance Capability. Other areas of interest included cost, reduction of force structure to operate and sustain the next generation rotorcraft, as well as the identification of system integration issues to anticipated and recommended methods to reduce the integration risk.

• Participation:
  ➢ Chair  Dan Newman (US: Boeing)
  ➢ Vice Chair  Dr Thomas Muensterer (Germany: Hensoldt)
  ➢ Rapporteur  Dr Leigh Moore (US)
  ➢ 33 companies took part from 13 nations

• Deliverable
  ➢ Study Group Report, June 2018
NIAG SG.219

• Key Findings & Way Ahead
  - 18 Conclusions & 18 Recommendations were derived from the Study.
  - Develop & deploy hardware and software interface standards enabling NGR mission systems, structures and propulsion to be “born modular”.
  - Examine 100% Condition –Based Operations, to evaluate value and assess feasibility.
  - Regulatory & Airworthiness authorities to facilitate understanding and acceptance of modularity and rapid re-configurability to achieve common standards.
  - Explore DEW, as both a capability (offensive/defensive) and a threat.
  - Explore hybrid propulsion for reduced emissions/signatures and high-power payloads.
  - Accelerate development of standardized, cyber-secure open modular architectures.
  - Leverage the potential of MUM-T, with corresponding UAS certification.
Technical Focus Areas

- Key Enabling Technologies were identified within AVT ST-005 and NIAG SG.219 grouped into 8 broad categories:
  - Flight Control & Performance
  - Avionics & Mission Equipment
  - Human Factors
  - Materials & Manufacturing
  - Teaming
  - Survivability
  - Lethality
  - Cost of Ownership
Next Generation Rotorcraft Capability (NGRC)

Team of Experts (TOE)
• Initial Meeting was hosted by JAPCC in Kalkar, Germany in July 2016.

• Terms of Reference were reviewed and approved with minor changes.
  – Name of the Team of Experts was changed to Next Generation Rotorcraft Capability (NGRC) from Future Rotorcraft Requirements to be more descriptive.

• NGRC Mission
  – Identify and assess current and evolving applicable rotorcraft technologies, force structure, force capabilities and operational concepts leading to the development of an integrated NGRC.
  – Two year effort
Membership

- Chairman: Mr Dan Bailey, US Army
- Vice Chairman: Lt Col Miklos Szabo, JAPCC
- Rapporteur: Dr Leigh Moore, US Army
- Sustaining member organizations included:
  
  **NATO Nations:**
  - US Army
  - UK MOD

  **NATO Organizations:**
  - ACT SEE
  - JAPCC
  - STO
  - NIAG
• Existing Rotorcraft will reach the end of their useful life in the 2035-2045 time period and need to be replaced.
• The next generation rotorcraft should be designed modular, to enable nations to procure only those capabilities they require.
• Modularity can reduce Life Cycle Costs, enhance interoperability and sustainability.
• Investment in key enabling technologies is required today.
The NGRC TOE Final Report took into consideration the findings and recommendations contained in the NIAG SG.219 and STO AVT-ST-005 studies, as well as the projected future operating environment.

The report speaks to the design, development and deployment of a modular rotorcraft that can be modified and tailored in the field to address specific mission requirements.

Acquisition lead times dictate national decisions that must be taken now to enable fielding the next generation of rotorcraft in the 2035-45 timeframe.
• An outline generic NSR for a Next Generation Rotorcraft was included as an Appendix to the Final Report.

• Joint Capability Group Vertical Lift (JCG VL) was encouraged to:
  – Review the NGRC TOE Final Report & outline NSR.
  – Endorse recommendations made in the NGRC TOE final report
  – Establish a group (or groups) of nations to tailor the NSR to their specific needs, with the objective of initiating a Next Generation Rotorcraft development programme in 2020.
JCG VL Sponsored Activity

- NGRC TOE reported to JCG VL in September 2018.

- Special Session Briefing to NAAG on collective activities and way forwards in February 2019.

- UK has agreed to lead “Project NGRC” on behalf of JCG VL, this will undertake the pre-concept stage that will identify outline requirements across multiple nations for a Next Generation Rotorcraft.

- The formal concept stage is expected to commence in late 2020 subject to national requirements.
Conclusions

• The importance of rotorcraft in past and current military operations is widely recognized.

• The current state of technology is such that significantly enhanced capability is now achievable.

• Significant numbers of NATO rotorcraft will reach the end of their programmed life by 2045 and will need to be replaced.

• Traditionally, rotorcraft take approximately 20 years from the pre-concept stage to entry into service.

• NATO sponsored activities are ongoing aimed at setting detail requirements for Next Generation Rotorcraft and initiating development programme(s) to commence early in the next decade.