RAND EUROPE

Future collaboration opportunities for light and medium multirole helicopters in Europe

Marta Kepe, Richard Flint, Julia Muravska

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The present study was ordered by the EDA. The contractor who has undertaken the study remains responsible for its content.

Cover image: Airbus H215 Super Puma by Rafael Luiz Canossa (CC BY-SA 2.0)

Project objectives and scope

RAND Europe was commissioned by the European Defence Agency (EDA) in September 2018 to conduct a study on potential collaboration opportunities amongst the EDA participating member states (pMS) and select countries with administrative arrangements (AA countries),[1] specifically in the areas of light and medium multirole helicopters (MRHs). The overarching goal of the study was to support the EDA in identifying new collaboration opportunities throughout the MRH life cycle and analyse the possible costs, benefits and challenges of each potential opportunity.

There is no universally accepted definition of what constitutes a light or medium helicopter and, as the name suggests, a 'multirole' aircraft may be used for a wide variety of functions. For the purpose of this study, therefore, the 'light' and 'medium' categories were defined based primarily on the European Aviation Safety Agency's (EASA) classifications.[2] However, the upper weight limit of medium helicopters was expanded from 9,071 kg (as defined by EASA) to 11,000 kg, in order to include slightly heavier multirole helicopters, such as the NH90 and UH-60 Black Hawk, in order to alight with the classification of what would be most useful to the EDA and its pMS.[3] Further information is provided in Figure 1 below.

Overview of the methodologies used

The study was based on four research tasks and included a combination of methodologies. This approach is illustrated in Figure 2.

Figure 1: Scope of helicopters included in the study

For the purpose of the project, a multirole helicopter is defined as a **helicopter that is designed to be used for multiple missions**, such as transporting troops, command and control, logistics, casualty evacuation and may also be used to gain access to difficult-to-reach terrain in SAR missions.

LIGHT MULTIROLE HELICOPTERS

Maximum take-off weight (MTOW): **3,175kg or 7,000lbs**

MEDIUM MULTIROLE HELICOPTERS

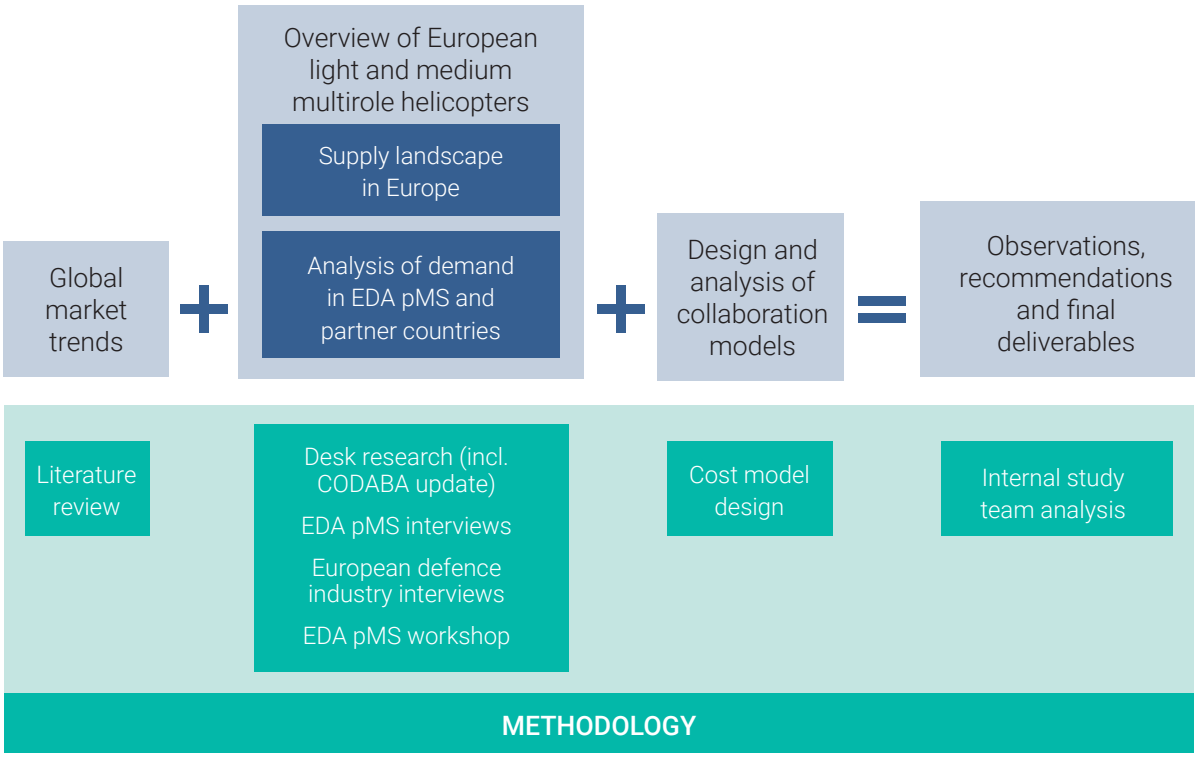
Maximum take-off weight (MTOW): **3,176kg (7,000lbs) – 11,000kn (24,250lbs)**

1 The scope of the study included the EDA pMS, Norway and Switzerland.

2 Definitions are based on the European Aviation Safety Agency's guidelines (EASA 2018a, 2018b). Note that the study excluded navy helicopters.

3 Study workshop with EDA pMS experts (2018).

Figure 2: Methodological approach to the study



SOURCE: RAND Europe

Study context

Air mobility is recognised as a priority in the EU's defence Capability Development Plan (CDP). The current version of the plan, approved by EU member states (MS) in 2018, emphasises tactical air transport as one of the capability development areas that is experiencing shortfalls and that could be a focus for increased collaboration in Europe.[4] NATO, with which the EU shares twenty-two member states, has also recognised the need to improve air capabilities in its 2018 Joint Air Power Strategy.[5]

Helicopters, and specifically MRHs, are versatile air transport platforms that may perform a variety of functions, such as medical and tactical transport, and which may also serve as a mobile command and control and reconnaissance platform. This versatility makes an MRH an important military asset not only in out-of-area missions, as proved by recent deployments in Iraq and Afghanistan, but also for domestic operations, including transport and search and rescue duties. Furthermore, the use of MRH to perform a wide variety of roles may lead to more efficiencies in terms of maintenance, repair and overhaul (MRO), reducing the logistics footprint that

4 EDA (2018).

5 Joint Air Power Competence Centre (2018).

would be necessary to support several different dedicated types of helicopters. MRHs may thus be a 'cost-effective' means of increasing the operational impact of other force elements and, therefore, European militaries' operational capability generally.[6]

Despite the significance of helicopters as a force multiplier, and recognition from both the EU and NATO of the need to invest in air capabilities, current MRH fleets across EDA pMS are fragmented and ageing. Moreover, reported low readiness levels in many pMS further reduce the availability of these helicopters, not only for national commitments but also for Common Security and Defence Policy (CSDP), NATO and UN operations. This is a significant issue, considering that over the last two decades the number of multinational operations that include the use of helicopters has increased, and CSDP, NATO and UN operations have already been affected by insufficient helicopter availability.[7] Furthermore, low operational availability can prevent pilots and support and maintenance personnel from reaching the necessary levels of flight-time to maintain their skills and certifications.[8]

Replacing ageing platforms and filling capability gaps via the procurement, upgrade or development of MRHs requires a significant time. Given this fact, advance planning is already needed today to consider future fleet replacements or upgrades aimed at ensuring that European fleets are able to respond to future operational needs. Collaboration between two or more member states may help offset some of the major costs associated with any helicopter procurement, maintenance, modernisation or development programme. Provided that key challenges, such as divergences in planning timelines, technical requirements and specifications, can be addressed, collaboration opportunities could be pursued throughout the helicopter life cycle.

Key findings

EDA member states and AA countries hold a significant proportion of the global light and medium MRH fleets

Together, EDA pMS and AA countries own approximately 20 per cent of the global MRH fleet (2,268 helicopters),[9] and are thus the single largest collective owner of MRH fleets (see Figure 3). France is by far the largest MRH owner in Europe, with almost 500 helicopters, followed by Italy, the UK and Germany, whose fleets range between 212 and 274 rotorcraft of this type. However, most European countries have comparatively smaller fleets of 66 or fewer.[10] Taken individually, European MS also lag behind countries such as India, China and the US in MRH numbers.

The European MRH landscape is fragmented and ageing, hindering both operational effectiveness and cost efficiency

Though large, the current MRH fleet landscape in Europe is highly fragmented, with thirty different types of platforms currently in use.

6 UK House of Commons Defence Committee (2009).

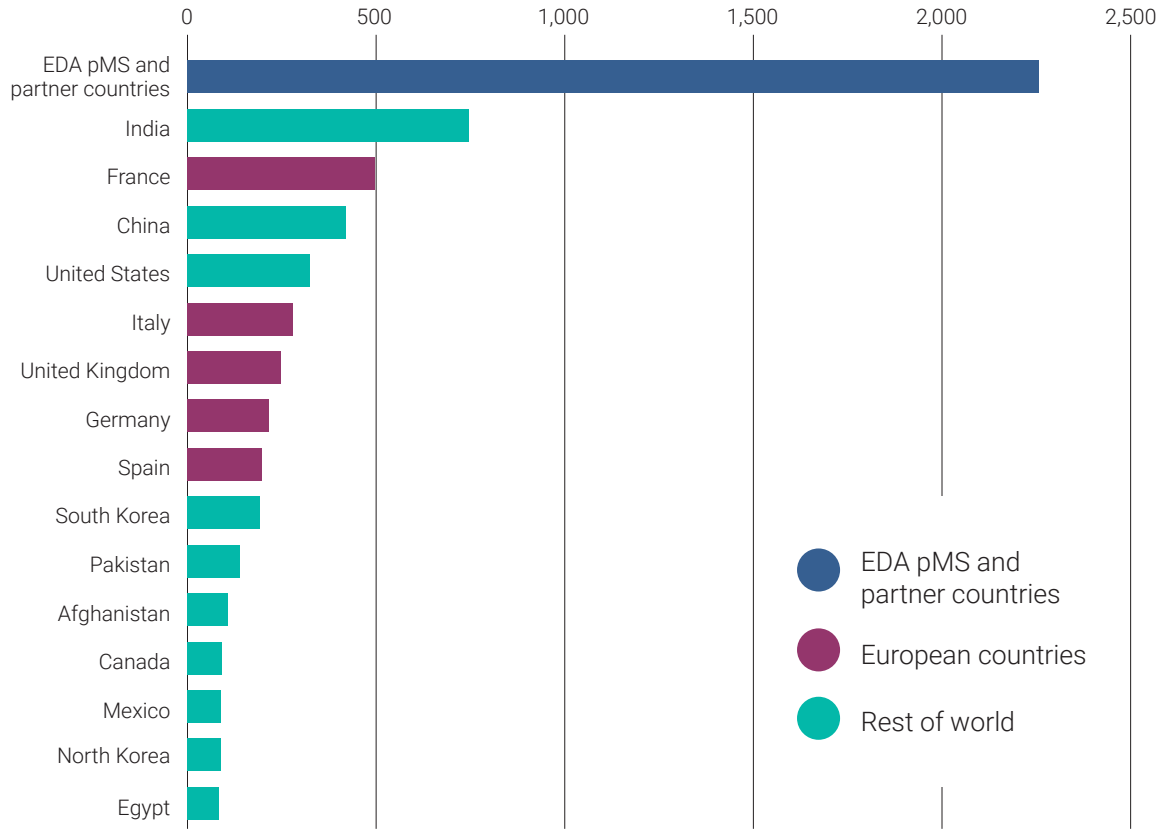
7 Joint Air Power Competence Centre (2012); Sherman et al. (2012).

8 Pearson (2018).

9 RAND Europe analysis of open-source materials. The study team made efforts to ensure that the data that it collected on current European MRH fleets only included helicopters relevant to the study and owned and used by the armed forces. However, the data used in the analysis may include some minor spillover of MRH owned and used by national internal and border security services.

10 RAND Europe analysis of open-source materials.

Figure 3: The top ten global multirole helicopter fleet holders (compared to EDA pMS and AA countries and the top five largest European fleet holders) (# of helicopters)



SOURCE: RAND Europe analysis based on open-source materials

While many countries tend to have fewer different helicopter models (ranging between one to four helicopter types), countries with larger fleets, such as France, Spain and the UK, may own as many as nine to thirteen different MRH platforms. Four MRH models are by far the most prevalent in European fleets: the US-made Bell 206 and Bell 212/412, the Airbus H215 Super Puma and the collaborative NHIndustries NH90. Not only is the Bell 206 the most numerous in terms of the number of helicopters in Europe, it is also the most widely used rotorcraft of the ones included in the study, with ten European operators, closely followed by the NH90 with nine and the Bell 206 with eight.

According to RAND Europe's analysis, some 33 per cent of the current MRH fleets included in the study were first introduced in the 1970s, 20 per cent in 1960s, 15 per cent in the 1990s, 13 per cent in the 1980s, and only 3 per cent in the 2010s. The oldest group of helicopters includes four of the five most represented helicopters in terms of the total European fleet: the Bell 206, the Airbus H215 Super Puma, the Bell 212/412 and the Aérospatiale Gazelle. Older aircraft face increasing challenges in terms of obsolescence, reliability, operational availability and effectiveness, and can be costly to maintain as they enter the latter stages of their life cycle. Many EU nations are expected to need to replace their MRH fleets in the coming decades

as a result – or else lose vital air mobility capabilities when ageing platforms retire.

The European MRH landscape offers opportunities for future multinational collaboration

On the demand side, analysis of the current MRH fleet landscape reveals a potentially promising base for future collaboration. Although European MRH fleets are currently highly fragmented and ageing, there is an ongoing trend towards rationalisation through a reduction of the number of platforms present in each member state. The overall age of MRH fleets is high, opening opportunities for cooperation in ongoing MRO as well as in fleet replacement, either through purchases of new off-the-shelf platforms (especially in light dual-use MRHs) or the development of a new medium military-specific MRH. Alongside interoperability, trust and operational drivers, the growing age of MRHs serves as an additional motivation for multinational collaboration, as maintenance costs may increase with time and countries are increasingly looking for opportunities to ensure more efficient and economical ways of maintaining their capabilities.

The return of a focus on defence and security in European policy in recent years, and the consequent interest in investing in military capabilities and increased defence budgets, may all lead to greater future activity in terms of the development of European MRH capabilities. Additional financial incentives may further encourage multinational collaboration through EU-level funding mechanisms, such as the European Defence Fund (EDF).[11]

The European MRH industrial landscape is highly consolidated

On the supply side, the current European industrial landscape exhibits several characteristics that may encourage future multinational collaboration in MRHs. Firstly, the current R&D and production landscape is already consolidated around two major manufacturers, Airbus Helicopters and Leonardo Helicopters, which together account for between 60 and 70 per cent[12] of the current in-service European MRH holding. Although they may be in competition with each other for the European helicopter market, they also face stiff competition from US imports, offering incentives for cooperation in certain contexts. Secondly, their Europe-based suppliers of components and sub-systems also overlap, with the same component manufacturers often delivering to both original equipment manufacturers (OEMs). Thirdly, recent successful European exports to the US (for example of the MH-139, UH-72 Lakota and EC145) illustrate the global competitiveness of European MRH designs, which serves as an encouraging basis for further focus specifically on MRH. Areas for future European defence industrial collaboration may include sharing MRO supply chains, maintenance of the collaborative NH90 helicopter, as well as development of advanced helicopter components and a competitive next-generation MRH for both local and global markets.

Political, operational and technical factors shape the logic for EDA pMS to collaborate

According to the RAND Europe study team's observations, based on interviews and a workshop with the EDA pMS, the main

11 The European Defence Fund aims to provide the EU's co-financing of collaborative capability development projects and fully fund collaborative defence research that is aimed at addressing emerging and future security threats. European Commission (2018).

12 Excluding MRH that are currently or due to be phased out.

preconditions for multinational collaboration are seen to be political *will*, operational *need*, and '*ways* of collaboration' or the presence of multinational collaboration programmes. According to pMS, interest in cooperation may be boosted by such motivational factors as:

- The ability to save money and increase the operational availability of MRHs by maintaining equipment in a more efficient manner.
- The ability to promote 'strategic autonomy' in Europe and break away from dependence on the US in terms of the supply of air transport capabilities and their maintenance (i.e. spare parts).
- The ability to decrease dependence on OEMs by increasing the negotiating leverage of multiple collaborative partners working together as a single customer.

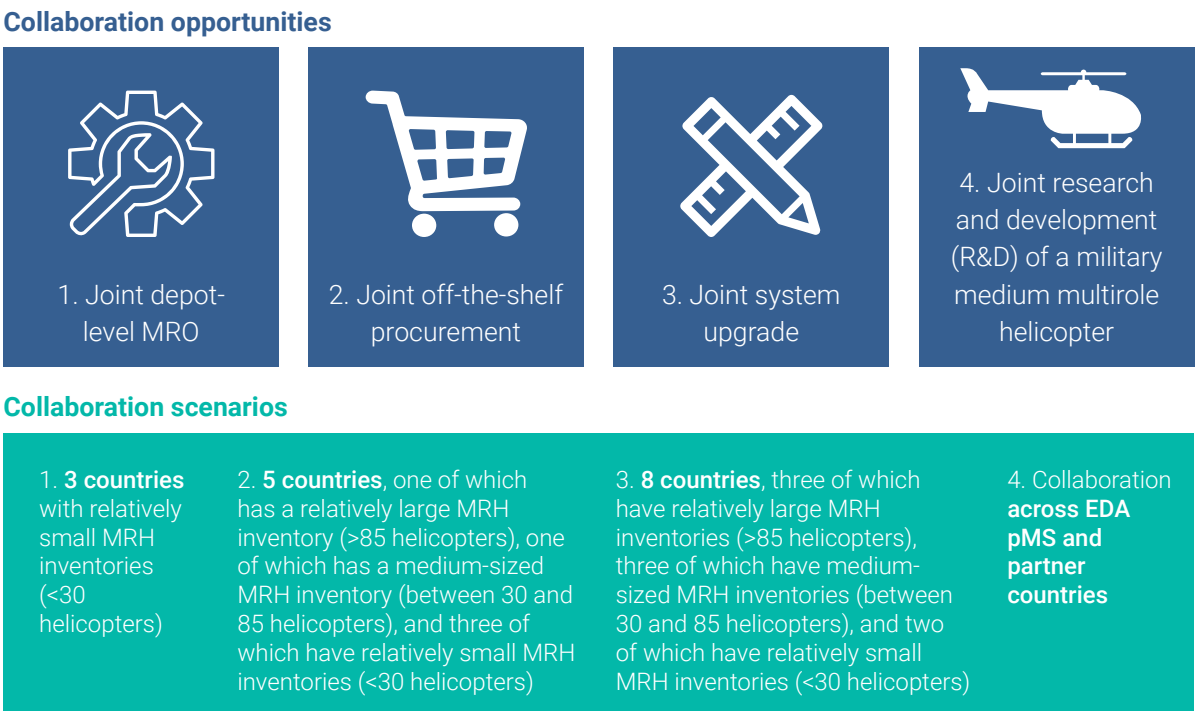
Furthermore, a number of preconditions for multinational collaboration emerged during the study team's engagements with EDA pMS, as shown in Figure 4.

Figure 4: Summary of key preconditions for multinational collaboration as identified by national representatives of responding EDA pMS

SOURCE: RAND Europe analysis[13]

13 Based on RAND Europe interviews with EDA pMS and the EDA workshop.

Figure 5: Approach to collaboration models and scenarios



Note on key assumptions: *The models are based on publicly available cost information and the operational knowledge of the study team, experts and inputs from the study team's interviewees. Where no cost or benefit data is available, the study team used a parametric cost estimate by drawing comparisons with historic data or a comparable capability.*

The study identified and modelled – in high-level terms – four potential collaboration opportunities for European MRHs that could lead to cost savings and other benefits

Based on the analysis of European MRH inventories, current procurement, maintenance and upgrade plans and approaches, EDA pMS's views on multinational collaboration as well as the European industrial landscape, the RAND Europe study team identified four key collaboration opportunities or models: joint depot-level MRO, joint off-the-shelf procurement, joint upgrade of a given system (e.g. the engine) and joint research and development of a new medium military MRH. The purpose of these models was to support the EDA in its work towards European collaboration throughout the MRH life cycle. Seeking to accommodate different applications of each model, based on different fleet commonalities, numbers of helicopters per fleet and geographic proximity, each model was applied to four different plausible collaboration scenarios. This approach is shown in Figure 5.

The models and the related potential rough order-of-magnitude savings (assuming that key motivational factors, preconditions and potential challenges to collaboration are successfully addressed) are summarised in Figure 6.*

Figure 6 Summary of potential collaboration models and related savings

Model 1: Joint depot-level MRO				
Scenario				
• Multinational collaboration in operating a single depot-level facility for both depot-level repairables (DLRs) and depot-level maintenance • Countries conduct joint repair and/or replacement of a specific key system or sub-system such as an engine, gear-box or landing gear. Sub-systems are sent to a joint depot-level repair facility that manages the repair and/or replacement for all participating countries				
Key sources of potential cost savings				
• Direct labour, material and capital costs leading to reduced annual operating and support costs				
Scenario number	*1*	*2*	*3*	*4*
Scenario description	Three countries	Five countries	Eight countries	All EDA pMS
Light dual-use MRH Estimated cost savings (%):	23%	23%	32%	44%
Medium military MRH Estimated cost savings (%):	22%	21%	30%	41%

Model 2: Joint off-the-shelf procurement				
Scenario				
• Multinational collaboration in procuring an already developed and certified MRH from industry or via gov-to-gov contract. It is assumed that the platform does not require additional changes or redesign to fit divergent national requirements				
Key sources of potential cost savings				
• Lower procurement unit costs are achieved through greater economies of scale of production (e.g. labour, material and capital costs) and larger collaborative purchase (focus on non-recurring costs)				
Scenario number	*1*	*2*	*3*	*4*
Scenario description	Three countries	Five countries	Eight countries	All EDA pMS
Light dual-use MRH Estimated cost savings (%):	22%	22%	31%	42%
Medium dual-use MRH Estimated cost savings (%):	21%	21%	29%	41%
Medium military MRH Estimated cost savings (%):	22%	22%	31%	42%

Model 3: Joint system upgrade					
Scenario					
• Collaboration in development and acquisition of a new upgraded system or sub-system that has not previously been developed • Participating countries share the costs of developing, testing and certifying the system and carry out collaborative procurement					
Key sources of potential cost savings					
• Lower unit costs of production achieved through efficiencies in labour and material/capital components and shared R&D costs (focus on non-recurring costs)					
Scenario number		*1*	*2*	*3*	*4*
Scenario description	Sub-system (illustrative example)	Three countries	Five countries	Eight countries	All EDA pMS
Light dual-use MRH Estimated cost savings (%):	Rotor blades	48%	42%	46%	63%
	Engine	42%	34%	37%	52%
Medium military MRH Estimated cost savings (%):	Rotor blades	38%	33%	40%	55%
	Engine	32%	26%	32%	45%

Model 4: Joint R&D of a military medium multirole helicopter				
Scenario				
• Joint R&D and acquisition of a new military-specific medium-weight MRH. Includes an initial collaborative approach to the development, testing and certification of a new platform, followed by collective purchase • Scenario also includes through-life activities, specifically joint depot-level MRO and system upgrade (avionics) • Model only includes medium weight military-specific MRH based on feedback from the EDA pMS workshop				
Key sources of potential cost savings				
• Cost savings emerging from economies of scale in production and sharing the fixed R&D cost • Efficiencies in later-in-life depot-level MRO and system upgrade activities leading to savings in direct labour, material and capital costs and reduced support costs				
Scenario number	*1*	*2*	*3*	*4*
Scenario description	Three countries	Five countries	Eight countries	All EDA pMS
Medium military MRH (upgraded system: avionics) Estimated cost savings (%):	49%	42%	43%	60%

NB: The percentage cost savings quoted refer to the estimated cost savings across all countries participating in the collaboration scenario. The figures represent the difference in total cost between a collaborative and non-collaborative scenario, and are quoted as a percentage relative to the total non-collaborative cost.

SOURCE: RAND Europe analysis

** The cost models presented in this report aim to provide rough order of magnitude (ROM) upper-bound estimates of the cost savings that may be derived from European multinational collaboration in MRH. The economies of scale modelling is based on a relatively simplistic approach and assumes the same types of economies of scale are achieved across each model. The project team recognises that the proposed collaboration models may indicate potential cost savings. However, the realisation of these savings would in practice be contingent on a number of factors, including, but not limited to, strategic decisions, aligned budgets, MRO and fleet replacement timelines, and harmonised technical specifications and configurations. The experience of past multinational development programmes shows that efficiencies are not guaranteed – given that collaboration introduces a further level of complexity as well as disagreements over requirements, timelines and industrial workshare – but rather depend on good policy, governance and programme choices. Furthermore, the cost modelling effort was also impacted by the availability of open-source cost information on MRH. While the team made every effort to ensure that current cost-benefit data were used, a parametric cost estimate was used where necessary, drawing on comparison with historical data or a similar capability.*

Note on cost modelling results: Several models show slight fall in the percentage cost savings for Scenario 2 compared to Scenario 1. The fall in percentage savings arises due to differences in the size of the countries modelled in each scenario, with size in this instance referring either to number of helicopters or helicopter systems involved. More specifically, in Scenario 1, the total number of helicopters or helicopter components is always less than Scenario 2, but each country benefits from a similar increase in total quantity - and hence similar economies of scale improvements - when moving to a collaborative approach. In Scenario 2, improvements in economies of scale vary considerably between participating countries. For the larger country in Scenario 2, the economies of scale improvements are likely to be relatively small, as the country itself experiences only a small increase in quantity through the collaboration model. For the smaller countries, the relative savings from economies of scale improvements are likely to be much larger, but when these cost savings are considered collectively across all five participating countries they are somewhat dwarfed by the much larger total cost (and lower percentage cost saving) experienced be the larger country.

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