

Research Briefing
14 November 2024
Number 10143

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What is the Global Combat Air Programme (GCAP)?

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The Global Combat Air Programme (GCAP), established in 2022, is an international partnership between the UK, Japan and Italy which will design, manufacture, and deliver a next-generation crewed combat aircraft.

In 2018 the UK Government published its [Combat Air Strategy](#) (“the Strategy”). In what it described as “an ambitious vision for the future”, the strategy formally established a new acquisition programme to identify and deliver the next-generation combat air capabilities to replace the Eurofighter Typhoon, which will begin to leave service during the 2030s.

The strategy noted that experience on Typhoon and other multilateral fighter programmes such as Tornado and F-35 had positioned the UK as a world leader in combat air manufacturing. One of its key aims was to retain and develop the sovereign capability to design and manufacture combat aircraft within the UK.

The capability acquisition programme established by the strategy is now referred to as the Future Combat Air System (FCAS). FCAS encompasses the UK's next-generation combat air capability development, including uncrewed aircraft and weapons. At its heart is a next-generation crewed combat aircraft, commonly referred to in the UK as "Tempest", which is the capability that the Global Combat Air Programme will deliver. Tempest is expected to enter service in 2035.

1 Who is involved?

1.1 International partners

The Combat Air Strategy made clear that the UK Government intended to collaborate with other countries on the development of its new fighter, as it had with Typhoon.¹ Early exploratory work was undertaken in conjunction with Sweden,² but it was with Japan and Italy that the UK eventually formally partnered. In December 2022, the leaders of the three countries signed an agreement bringing the Global Combat Air Programme (GCAP) into existence and announcing that they would work together on delivering a next-generation combat aircraft by 2035.³

A year later, in December 2023, the partnership was given Treaty status and further details were formalised when the Defence Ministers of the partner nations signed the [Convention on the Establishment of the Global Combat Air Programme – GCAP International Government Organisation](#).⁴ The UK Government [ratified](#) the Treaty in October 2024.

There has been speculation that other countries may seek to join GCAP as it progresses: Saudi Arabia has regularly been mentioned as a potential partner.⁵ The addition of further partners has not been ruled out, but meeting the 2035 in-service date is considered a "fundamental requirement".⁶

¹ Ministry of Defence, [Combat Air Strategy: an ambitious vision for the future](#), 16 July 2018, p20

² Ministry of Defence, [UK and Sweden partner on future combat air](#), 12 July 2019

³ Prime Minister's Office, [Joint Statement from Prime Ministers of UK, Italy and Japan](#), 9 December 2022

⁴ Ministry of Defence, [UK, Japan and Italy sign international stealth jet fighter programme treaty](#), 14 December 2023

⁵ [Britain could let Saudi Arabia join fighter jet building programme](#), The Telegraph, 11 August 2023

⁶ [UK fighter jet alliance on course for 2035 despite Saudi overture](#), The Financial Times, 28 August 2023

1.2 Industry

Industry teams within each of the three partner countries are led by a national “lead systems integrator”. For the UK, the lead systems integrator is BAE Systems. Leonardo S.p.A. and Mitsubishi Heavy Industries fulfil the role for Italy and Japan respectively.

The group of key UK industry partners working on GCAP in conjunction with the Ministry of Defence (MOD) is known as “Team Tempest”. Alongside BAE Systems, Team Tempest includes Rolls Royce (power and propulsion); Leonardo UK (sensors, electronics and avionics) and MBDA UK (advanced weapon systems). In total, almost 600 organisations are involved in the UK supply chain, including academia and SMEs.⁷

Delivering GCAP will require a significant skilled workforce. Approximately 3,000 people across industry were working on Tempest as of November 2023 and the MOD has said that it expects that number to increase significantly in the next phase of the programme.⁸

1.3 Delivery structures

Key to the programme’s ability to keep to time and to budget will be the efficient operation of its delivery structures. These will bring together government and industry representatives from each of the three countries into centralised organisations to act respectively as the customer and supplier for the new aircraft.

On the government side, the December 2023 Treaty established the GCAP International Government Organisation (referred to as the GIGO). It will be headquartered in the UK, with its first CEO from Japan.⁹ In July 2024 Parliament approved the [Global Combat Air Programme International Government Organisation \(Immunities and Privileges\) Order 2024](#), a [Statutory Instrument](#) enabling the establishment of the GIGO within the UK as an independent international organisation with relevant immunities and privileges.

⁷ Ministry of Defence, [UK, Japan and Italy sign international stealth jet fighter programme treaty](#), 14 December 2023

⁸ Defence Committee, Future aviation capabilities, [written evidence submitted by the Ministry of Defence](#) (PDF), 16 November 2023 (FAVC0018)

⁹ Ministry of Defence, [UK, Japan and Italy sign international stealth jet fighter programme treaty](#), 14 December 2023

Details of the industry equivalent organisation are expected to be confirmed in 2024.¹⁰ It will also be headquartered in the UK and will initially have an Italian CEO.¹¹

It has been widely acknowledged that the structure and operation of the government and industry delivery organisations for the Eurofighter programme (NETMA and Eurofighter GmbH) were sub-optimal. A 2011 National Audit Office report on the programme described the arrangements as “complex and inefficient”, concluding that this had been a contributing factor to cost increases.¹² The Ministry of Defence and others told the Defence Committee, for its inquiry into future aviation capabilities begun in 2023, that the delivery organisations were insufficiently empowered to take centralised decisions without continually referring back to individual governments and companies, building in delay and increasing costs.¹³ Both the MOD and industry have recognised that the delivery constructs for GCAP will need to be structured with greater autonomy to avoid a repeat of these issues.¹⁴

2 “Tempest”: what is it and why is it needed?

2.1 Countering the evolving threat

The UK’s combat air fleet currently consists of 4th generation [Eurofighter Typhoon](#) and 5th generation [F-35B Lightning](#) aircraft.¹⁵ The Typhoon, which forms the bulk of the fleet, is a land-based multi-role fighter capable of both air-to-air and air-to-ground missions. Typhoon will begin to leave service in the 2030s and will need to be replaced by an aircraft capable of countering the advances made by potential adversaries in the context of an increasingly contested threat landscape.¹⁶

¹⁰ [GCAP joint venture to be set in next 2 to 3 months: Leonardo exec](#), Breaking Defense, 24 July 2024

¹¹ As above

¹² National Audit Office, [Management of the Typhoon Project](#), 2 March 2011

¹³ Defence Committee, [Future aviation capabilities, written evidence submitted by the Ministry of Defence](#) (PDF), 16 November 2023 (FAVC0018); [Oral evidence: Future aviation capabilities](#) (PDF), 9 January 2024 Q4, Q31; [Oral evidence: Future aviation capabilities](#) (PDF), 24 January 2024, q 46-7

¹⁴ Defence Committee, Future aviation capabilities, [written evidence submitted by the Ministry of Defence](#) (PDF), 16 November 2023 (FAVC0018); [Oral evidence: Future aviation capabilities](#) (PDF), 24 January 2024, q 46-7

¹⁵ A guide to the differences between different generations of combat aircraft can be found in [‘Trillion dollar trainwreck’: US super stealth fighter is eating the next generation](#), The Telegraph, 29 June 2024.

¹⁶ The Ministerial Foreword to the [Defence Command Paper 2023](#) described a shift “from a competitive age to a contested and volatile world.”

Other countries have also initiated programmes to replace their 4th generation aircraft. France, Spain and Germany are partnering on the Système de combat aérien du futur/ Future Combat Air System (SCAF/FCAS), whilst the US has established its Next-Generation Air Dominance (NGAD) programme.¹⁷

2.2 A next-generation aircraft

Tempest has been characterised as requiring a “step change in capability” from its 5th generation predecessors.¹⁸ However, with the programme in its [concept and assessment phase](#) there is limited detail available about the specifics of the aircraft’s capabilities. Grant Shapps MP, then Secretary of State for Defence, told the Commons in September 2023 that the advanced capabilities being developed in the “early but crucial” concept assessment phase included machine learning, open systems architecture to allow for “rapid and continual upgrade” and “extensive digital networks linking forces across air, land and sea to bolster our overall operational advantage”.¹⁹

According to BAE Systems, Tempest will be “one of the world’s most advanced, interoperable and connected fighter jets in service”:

It will boast an advanced intelligent weapons system, a software-driven interactive cockpit, integrated sensors and a powerful next generation radar capable of providing 10,000 times more data than current systems, giving it a battle-winning advantage.²⁰

The new aircraft will be land-based, with the F-35B continuing to fulfil the carrier strike role.²¹ It is envisaged that Tempest and F-35 will operate together with a high degree of interoperability alongside uncrewed aircraft in an integrated system of systems.²²

An updated concept model was exhibited at the Farnborough International Airshow in 2024, featuring a larger wingspan than previous iterations for improved aerodynamics.²³

¹⁷ Airbus, [Future Combat Air System](#) (accessed 22 September 2024); Congressional Research Service, [Air Force Next-Generation Air Dominance Program](#) (PDF), June 2022

¹⁸ Trevor Taylor and Isabella Antinozzi, [Unlocking Sixth-Gen Air Power: Inside the Military Capability for GCAP](#), Royal United Services Institute, 15 May 2024

¹⁹ HCWS [[Combat Air Strategy update](#)], 12 September 2023

²⁰ [Global Combat Air Programme](#), BAE Systems, accessed 22 September 2024

²¹ PQ631 [[Future combat air system: Sea and oceans](#)], 17 May 2021

²² HL7313 [[Future combat air system](#)], 4 May 2023

²³ [Global Combat Air Programme partners unveil new concept model of next generation combat aircraft](#), Leonardo, 22 July 2024

3 Costs and potential economic benefits

3.1 Cost

At this stage, the unit price of each aircraft and the size of the UK order are unknown, meaning that the total cost of the programme remains unquantified. The Ministry of Defence has committed £2 billion to GCAP since 2021 and has budgeted over £12 billion for the programme over the next ten years.²⁴ Further budget approvals will be required in the 2024/2025 financial year to launch the development phase. According to the MOD, the eventual costs will depend on “the solutions proposed, how efficient the international delivery model is, and our ability to deliver at pace”.²⁵ It has been suggested that digital engineering could play a key role in keeping costs under control.²⁶

The MOD has said that affordability will be crucial to GCAP’s success.²⁷ It is, however, also likely to be one of the major challenges for the programme, which will need to break a decades-long trend of successive combat air systems increasing in cost.²⁸ Professor Justin Bronk has suggested that there is a lack of transparency and realism within the MOD about the scale of investment required for the programme: the National Audit Office has previously found that cost increases on Typhoon were in part due to over-optimistic cost estimates prior to the aircraft’s production.²⁹

Alongside investment into GCAP, the MOD also plans to expand the UK’s F-35B fleet, procuring a further 27 aircraft beyond the 48 already ordered to bring the total fleet size to 74.³⁰ The F-35 Joint Strike Fighter is a US-led international programme on which the UK is one of several partners. F-35s are produced by Lockheed Martin in batches known as lots, with the unit price varying for each lot as production has progressed. The MOD has stated

²⁴ Defence Committee, Future aviation capabilities, [written evidence submitted by the Ministry of Defence](#) (PDF), 16 November 2023 (FAVC0018)

²⁵ Defence Committee, Future aviation capabilities, [written evidence submitted by the Ministry of Defence](#) (PDF), 16 November 2023 (FAVC0018)

²⁶ Trevor Taylor with Isabella Antinozzi, “[The Tempest Programme: Assessing Advances and Risks across Multiple Fronts](#)”, Royal United Services Institute, November 2022

²⁷ Defence Committee, Future aviation capabilities, [written evidence submitted by the Ministry of Defence](#) (PDF), 16 November 2023 (FAVC0018);

²⁸ Ministry of Defence, [Combat Air Strategy: an ambitious vision for the future](#), 16 July 2018, p16

²⁹ Professor Justin Bronk, [The Global Combat Air Programme is Writing Cheques that Defence Can’t Cash](#), Royal United Services Institute, April 2023; National Audit Office, [Management of the Typhoon Project](#), 2 March 2011

³⁰ [Correspondence from the Minister for Defence Procurement to the Chair of the Defence Committee](#), 8 March 2024. The 27 aircraft will include a replacement for the F-35 lost in an accident at sea in 2021.

that the unit price for each aircraft in lot 14 was \$101 million.³¹ Aircraft costs reduced by 32% from 2014-2022 but are expected to rise by 6% for lots 15-17.³²

3.2 Prosperity

The previous government highlighted GCAP's potential benefits for UK prosperity, arguing that there was "a robust economic and industrial case" for investment in the programme:

In addition to the £1.1 billion invested by the MOD in R&D, industry has committed to investing a further £800 million, one of the largest ever private investments in R&D by UK defence industry. The great majority of this investment is outside the South-East, reflecting the locations of the UK's key combat air hubs, in the North-West and South-West of England and Edinburgh.³³

A 2021 report produced by Pricewaterhouse Coopers on behalf of Team Tempest industry partners concluded that the Tempest programme was expected to contribute £26.2 billion to the UK economy from 2021 to 2050, and that it would support on average 21,000 jobs per annum from development to operational service.³⁴

3.3 Exports

With the cost of the programme likely to face ongoing scrutiny, it has been suggested that export success could be key to GCAP's financial viability.³⁵

Combat air has traditionally been a strong export market for the UK, with defence aerospace accounting for 68% of the UK's defence export orders between 2018 and 2022; export sales of the Eurofighter Typhoon totalled £7.5 billion over the same period.³⁶ The 2021 Defence and Security Industrial Strategy described the UK's defence sector as "extremely reliant" on the

³¹ PQ93484 [[F-35 aircraft: Costs](#)], 30 November 2024

³² [Correspondence from the Minister for Defence Procurement to the Chair of the Defence Committee](#), 8 March 2024

³³ Defence Committee, Future aviation capabilities, [written evidence submitted by the Ministry of Defence](#) (PDF), 16 November 2023 (FAVC0018)

³⁴ [Tempest: Innovation for UK Security and Prosperity](#), BAE Systems, May 2021

³⁵ Simon Chelton and Dr Philip Shetler-Jones, "[The Global Combat Air Programme: The First Round of Hard Choices?](#)", Royal United Services Institute, 13 September 2023

³⁶ UK Defence and Security Exports, [UK defence export statistics 2022](#), 17 November 2023; [The impact of the Eurofighter Typhoon programme on the UK economy](#), Oxford Economics for BAE Systems, July 2022

export of air platforms to the Middle East in particular.³⁷ More information about UK arms exports revenue can be found in the Commons Library briefing on [UK arms exports: statistics](#).

The MOD has said that exportability is at the heart of GCAP and has been built into the programme from the outset.³⁸ Japan, which has traditionally taken a highly restrictive approach to defence exports, has relaxed its rules to enable GCAP-linked exports.³⁹ In August 2024 the Department for Business and Trade published an Open General Export Licence (OGEL) for GCAP.⁴⁰ The Commons Library briefing [An introduction to UK arms exports](#) provides more information on the operation of OGELs.

4 Timescales

Tempest is expected to enter service in 2035, a target date which has been emphasised as critical to the partner nations.⁴¹

The programme's concept and assessment phase is expected to complete in 2025. It will be followed by a design development phase during which the first flight of a demonstrator aircraft is due to take place in 2027.⁴² The demonstrator passed its Critical Design Review in May 2024 and is reported to be on track for its maiden flight.⁴³

BAE Systems have noted that delivering the aircraft to the 2035 target date will mean developing the core platform in half the time taken for Typhoon and F-35.⁴⁴ The MOD has said that delivering at pace must be the priority over both performance and cost.⁴⁵

³⁷ Ministry of Defence, [Defence and Security Industrial Strategy: A strategic approach to the UK's defence and security sector](#), CP 410, March 2021, p75

³⁸ Defence Committee, Future aviation capabilities, [Oral evidence to the Defence Committee](#) (PDF), 21 February 2024, q162

³⁹ "[Japan relaxes defence export rules to allow sales of new fighter jet](#)", The Financial Times, 26 March 2024

⁴⁰ Department for Business and Trade, [Open general licence \(global combat air programme\)](#), 14 August 2024

⁴¹ Defence Committee, Future aviation capabilities, [Oral evidence to the Defence Committee](#) (PDF), 21 February 2024, q144, q146

⁴² Ministry of Defence, [UK builds momentum on combat air programme with demonstrator set to fly within five years](#), 18 July 2022

⁴³ [Farnborough 2024: Tempest demonstrator passes critical design review, first flight on track for 2027](#), Janes, 25 July 2024

⁴⁴ Defence Committee, Future aviation capabilities, [written evidence submitted to the Defence Committee](#) (PDF), 23rd October 2023 (FAVC0009)

⁴⁵ Defence Committee, Future aviation capabilities, [Oral evidence to the Defence Committee](#) (PDF), 21 February 2024, q148

5 Parliamentary scrutiny

Below are relevant parliamentary reports and debates.

The Defence Committee published a report on aviation procurement in September 2023.⁴⁶

The Committee subsequently launched a follow-on inquiry into future aviation capabilities, including GCAP, which was interrupted by the dissolution of Parliament in May 2024. In October 2024 the Committee decided to continue with its inquiry into [future aviation capabilities](#). The Committee has said it does not expect to hold further evidence sessions on this inquiry.⁴⁷

5.1 House of Commons

- [Debate on the GCAP International Government Organisation \(Immunities and Privileges Order\) 2024](#), 24 July 2024
- Defence Committee inquiry: [Future aviation capabilities](#)
- Defence Committee, [Aviation procurement: Winging it?](#), 10 September 2023, HC 178 2022-23

5.2 House of Lords

- [Debate on the GCAP International Government Organisation \(Immunities and Privileges\) Order 2024](#), 29 July 2024
- International Agreements Committee, [Scrutiny of International Agreements: Convention on Establishment of the Global Combat Air Programme](#), 9 April 2024, HL 97 2023-24
- International Agreements Committee, [Government response to the GCAP Convention scrutiny report](#) (PDF), 9 September 2024

⁴⁶ Defence Committee, [Aviation procurement: Winging it?](#), 10 September 2023, HC 178 2022-2

⁴⁷ Defence Committee, [Defence Committee: update on inquiries from the previous Parliament](#), 8 November 2024

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