CURRENT OPERATIONAL AIRCRAFT OF THE RAF: Part 1

In this publication we introduce a series of articles on the current aircraft operational in the RAF, starting at the 'sharp end' with the Typhoon GR4 (above) and the F35B Lightning (below) which can, when required, operate together as a formidable team.

The Typhoon FGR. Mk4 is a highly capable and extremely agile fourth generation multi-role combat aircraft (often referred to as a 4.5 generation because of its updates and enhanced capability) capable of being deployed for the full spectrum of air operations, including air policing, peace support and high-intensity conflict. Initially employed in the air-to-air role as the Typhoon F.Mk 2, the aircraft now has a potent, precision, multi-role ability.

The pilot performs many essential functions through the aircraft's hands on throttle and stick (HOTAS) interface which, combined with an advanced cockpit and the Helmet Equipment Assembly (HEA) renders the Typhoon superbly equipped for all aspects of air operations. Although Typhoon has flown precision attack missions in all its combat deployments to date, its most essential role remains the provision of quick reaction alert (QRA) for the UK and Falkland Islands airspace. Deployments also reinforce NATO air defence in the Baltic and Black Sea regions.

With its multi-role capability and variety of weapons the Typhoon FGR4 is capable of engaging numerous target types. In the air-to-air role it employs the infra-red guided Advanced Short Range Air-

to-Air Missile (ASRAAM) and ramjet powered, radar guided, beyond visual range Meteor, as well as the Advanced Medium Range Air-to-Air Missile (AMRAAM). These weapons, used in conjunction with the aircraft's Captor radar and PIRATE electro-optical targeting system, combined with the Typhoon's superior performance and manoeuvrability, make it a formidable platform

For ground attack and close air support (CAS) missions, Typhoon is compatible with the GPS/laser-guided Enhanced Paveway II and Paveway IV bombs, and Brimstone guided missiles, usually in conjunction with the Litening III targeting pod. Its regular configuration for the armed reconnaissance and CAS roles includes Litening III, Paveway IV, Brimstone and the internal 27mm cannon. Paveway IV offers cockpit programmable impact angle, impact direction and fuse delay features for precisely tailored target effects. The 27mm cannon is ideally suited to providing warning shots or for accurate attacks against targets including light vehicles and personnel.

In 2022 the UK signed a £2.35 billion contract covering the delivery of ECRS Mk2 active electronically scanned array radars for part of the RAF's Typhoon fleet. The award will see 40 Tranche 3 Typhoons equipped with the Leonardo UK-developed sensor by the end of this decade.

The then RAF Chief of the Air Staff, Air Chief Marshal Sir Mike Wigston, described the modification activity as "the single biggest capability jump for Typhoon since its introduction to service", and "a transformational upgrade". Conducted as part of a P4E package of enhancements, the project will also involve equipping the aircraft with replacement mission computers and a new sensor management and cockpit interface.

Referred to as 'task-based management', the latter "simplifies the access of information and exploits the radar's capability to the fullest extent", Air Chief Marshal Wigston says. This update will also be made to the RAF's Tranche 2 aircraft, which could later also be equipped with the new sensor. Leonardo UK will deliver a first flight-test example of the ECRS Mk2 to BAE Systems' Warton site in Lancashire in 2022, with trials activities due to commence in 2023. Initial operational capability is expected to be achieved in 2028.

Once equipped with the ECRS Mk2 radar, the UK's Tranche 3 Typhoons will be able to perform new roles such as the suppression of enemy air defences and electronic attack. New weapons will also be introduced for performing such tasks, including MBDA's Spear Electronic Warfare air-to-surface missile.

Sir Mike Wigston noted that Russia's war in Ukraine "has underlined the importance of control of the air, and the decisive edge that it gives to any operational activity in the land or maritime domains. It has also shown us the importance of control of the electromagnetic spectrum." "These technological enhancements will maintain the cutting-edge capabilities of Eurofighter Typhoon and help underpin the development path towards the UK's Future Combat Air System," said Minister for Defence Procurement, Jeremy Quin.

The UK will retire its Tranche 1 Typhoons later this decade, leaving it with a 107-strong fleet of multi-role fighters to remain in use until the 2040s. The UK's Tempest programme should deliver a new manned platform to enter service from 2035.

The F-35 Lightning II is an American family of single-seat, single-engine, all-weather stealth multi-role combat aircraft that is intended to perform both air superiority and strike missions. It is also able to provide electronic warfare and intelligence, surveillance, and reconnaissance capabilities. Lockheed Martin is the prime F-35 contractor, with principal partners Northrop Grumman and BAE Systems. The aircraft has three main variants: the conventional take-off and landing (CTOL) F-35A, the short take-off and vertical-landing (STOVL) F-35B, and the carrier-based (CV/CATOBAR) F-35C.

The aircraft descends from the Lockheed Martin X-35, which in 2001 beat the Boeing X-32 to win the Joint Strike Fighter (JSF) program. Its development is principally funded by the United States, with additional funding from programme partner countries from NATO and close U.S. allies, including the United Kingdom, Australia, Canada, Italy, Norway, Denmark, the Netherlands, and formerly Turkey. Several other countries have ordered, or are considering ordering, the aircraft. The programme has drawn much scrutiny and criticism for its unprecedented size, complexity, ballooning costs, and much-delayed deliveries. The acquisition strategy of concurrent production of the aircraft while it was still in development and testing led to expensive design changes and retrofits.

The F-35 first flew in 2006 and entered service with the U.S. Marine Corps as the F-35B in July 2015, followed by the U.S. Air Force as the F-35A in August 2016 and the U.S. Navy as the F-35C in February 2019. The aircraft was first used in combat in 2018 by the Israeli Air Force. The U.S. plans to buy 2,456 F-35s through to 2044, which will represent the bulk of the crewed tactical aviation of the U.S. Air Force, Navy, and Marine Corps for several decades; the aircraft will be a cornerstone of NATO and U.S. allied air power and is expected to operate until 2070.

The United Kingdom's Royal Air Force and Royal Navy both operate the F-35B, known simply as the Lightning in British service; it has replaced the Harrier GR9 which was retired in 2010, and Tornado GR4 which was retired in 2019. The F-35B is to be Britain's primary strike aircraft for the next three decades. One of the Royal Navy's requirements for the F-35B was a Shipborne Rolling and Vertical

Landing (SRVL) mode to increase maximum landing weight by using wing lift during landing. When operating on the aircraft carriers HMS Queen Elizabeth and HMS Prince of Wales, British F-35Bs use ski-jumps. British F-35Bs are not intended to use the Brimstone 2 missile. In July 2013, Chief of the Air Staff, Air Chief Marshal Sir Stephen Dalton, announced that No. 617 (The Dambusters) Squadron would be the RAF's first operational F-35 squadron. The second operational squadron will be the Fleet Air Arm's 809 Naval Air Squadron which will stand up in April 2023 or later.

No. 17 (Reserve) Test and Evaluation Squadron (TES) stood-up on 12 April 2013 as the Operational Evaluation Unit for the Lightning, becoming the first British squadron to operate the type. By June 2013 the RAF had received three F-35s of the 48 on order, initially based at Eglin Air Force Base. In June 2015 the F-35B undertook its first launch from a ski-jump at NAS Patuxent River. On 5 July 2017 it was announced the second UK-based RAF squadron would be No. 207 Squadron which reformed on 1 August 2019 as the Lightning Operational Conversion Unit. No. 617 Squadron reformed on 18 April 2018 during a ceremony in Washington, D.C., becoming the first RAF front-line squadron to operate the type; it received its first four F-35Bs on 6 June, flying from MCAS Beaufort to RAF Marham. On 10 January 2019 No. 617 Squadron and its F-35s were declared combat ready.

In April 2019 No. 617 Squadron deployed to RAF Akrotiri, Cyprus, the type's first overseas deployment. On 25 June 2019 the first combat use of an RAF F-35B was reportedly undertaken as armed reconnaissance flights searching for Islamic State targets in Iraq and Syria. In October 2019, 617 Sqn and No. 17 TES F-35s were embarked on HMS *Queen Elizabeth* for the first time. No. 617 Squadron departed RAF Marham on 22 January 2020 for their first Exercise Red Flag with the Lightning.

As Peter Felstead wrote in the June 2022 edition of AERO SPACE, perhaps the most significant deployment for UK F35s so far was the May to December 2021 deployment of eight 617 Sqn Lightnings on HMS Queen Elizabeth as part of UK Carrier Strike Group 21 (CSG21). On 4 March 2022 it was announced that UK F35Bs would take part in NATO Enhanced Vigilance Activity over Eastern Europe providing policing of NATO airspace in response to the Russian aggression against Ukraine.

The UK received another six F35s in 2022 and will receive another seven in 2023. According to the RAF's website, the last of the UK's initial batch of 48 F35s "is expected for delivery in January 2025 by which time a schedule for the remaining 90, and the formation of further squadrons, is anticipated." Meanwhile, before the F35B can move toward full operating capability in both the land and maritime domains, there is more work to be done on weapon integration, most obviously with the MBDA Meteor beyond visual range air-to-air missile, but also with weapons like MBDA's Selective Precision Effects At Range (SPEAR 3) air-to-ground missile.

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