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PRESERVING THE UK-US SPECIAL RELATIONSHIP: A TACTICALLY CAPABLE AND INTEROPERABLE ROYAL AIR FORCE IN 2036

by

Wing Commander James Radley RAF
United Kingdom

A Research Report Submitted to the Faculty

In Partial Fulfillment of the Graduation Requirements for the Degree of

MASTER OF OPERATIONAL ARTS AND SCIENCES

Advisor: Lt Col Pruitt

Maxwell Air Force Base, Alabama

July 2015 / June 2016

Disclaimer

Abstract

This paper considers the future operating environment out to 2036 and identifies key challenges for the Royal Air Force in the context of the United States' pivot to Asia, pursuit of the 'Third Offset, and the potential for future warfare in an Anti-Access/Area-Denial (A2/AD) environment. Given the continued dominance of the United States in the international system, shared values, and a common commitment to upholding the contemporary rules-based international order, the United Kingdom is likely to remain committed to maintaining a close strategic partnership with the United States. Consequently, the author argues that the Royal Air Force will need to remain capable, agile, and interoperable with United States forces.

The author reviews the United Kingdom's 2015 Strategic Defense and Security Review and sets the planning horizon out to 2036, exploring the challenge of integrating new capabilities such as the F-35 with a view to moving toward a 5th generation Royal Air Force. The paper identifies the imperative to create a connected and networked joint force that can leverage the full capability of platforms such as F-35 and ensure continued interoperability in coalition. The essential requirement to modernize legacy Intelligence, Surveillance, Target Acquisition, Reconnaissance (ISTAR) platforms, in addition to developing a modern communications and datalink architecture to integrate 4th and 5th generation capabilities is discussed. Finally, the paper provides a brief survey of doctrinal deficiencies, highlights the importance of enhancing distributed synthetic training, and warns of the risk to future interoperability of not maintaining adequate research and development and a defense industrial capacity in the context of the United States' pursuit of the Third Offset. The paper proposes that some of these focus areas could be addressed within the framework of the Royal Air Force's recent 'Think to Win' innovation initiative.

PRESERVING THE UK-US SPECIAL RELATIONSHIP: A TACTICALLY CAPABLE AND INTEROPERABLE ROYAL AIR FORCE IN 2036

The UK's recent Strategic Defense and Security Review (SDSR 2015) envisages no 'strategic shrinkage' and commits national strategy to preserving a "secure and prosperous United Kingdom, with global reach and influence."[2] Given the continued dominance of the United States in the international system, shared values, and a common commitment to upholding the contemporary rules-based international order, the UK remains committed to preserving a UK-US special relationship. Indeed, the SDSR 2015 identifies the relationship as "essential to UK national security."[3] The implications for the UK's armed forces, including the Royal Air Force (RAF), are clear: in 2036, they must continue to be agile, capable, and globally deployable, while remaining highly interoperable with the United States military. The advent of new platforms such as the F-35, and the United States' quest to achieve a 'third offset', provide the necessary impetus to modernize the RAF's aging intelligence, surveillance, targeting, and reconnaissance (ISTAR) capabilities, and their supporting communications and information systems. Achieving a successful transition towards a network-centric philosophy of warfare, supported by modern distributed training systems, will be essential to fully exploit emerging capabilities and ensure interoperability with US forces. Tactical capability and interoperability leverages operational influence in any coalition. Without this operational influence, the military foundation of the UK-US special relationship will be severely compromised.

The future operating environment for UK and US armed forces will be increasingly contested, congested, cluttered, connected, and constrained (the '5Cs').[4] Operating successfully in a 5C environment puts a premium on capabilities that enhance situational awareness or the 'understanding function'[5]. Potential state adversaries, such as China, have increasingly modern

and capable military capabilities that, in the event of a conflict, will limit the survivability of Western legacy air platforms. In addition to being contested, the future battlespace will be increasingly congested with a plethora of state and non-state civilian and military actors. The resulting clutter makes it difficult to distinguish between individuals, such as combatants and non-combatants; it challenges the ability to deliver precise military effects and increases the chance of collateral damage. Modern ISTAR capabilities will be required to achieve the necessary fidelity to resolve this clutter. Furthermore, globalization and advancing technology is creating an increasingly connected operating environment. A network or systems approach to warfare will be required to optimize weapons and sensors within this complex environment. Finally, the use of UK military force will likely remain highly constrained. Legal and societal norms will influence the degree and manner in which the UK can apply lethal force and harness new technologies such as automated systems. However, the coalition's potential adversaries may not be so constrained, conferring them advantage in battle. Acquiring new capabilities, or upgrading existing ones to be effective in a future 5Cs environment, will be critical to ensuring the RAF can remain tactically capable and interoperable with the US in 2036.

SDSR 2015 sets the conditions for establishing a "Joint Force 2025" to ensure that the UK's armed forces continue to be the most capable in Europe and able to deploy independently, or as part of a coalition, to tackle a wider range of increasingly sophisticated adversaries. The plan aims to create a deployable Joint Force of up to 50,000 personnel with supporting capabilities, out of an overall force structure of approximately three times this size. This will include: a maritime task group centered on a Queen Elizabeth Class aircraft carrier with F-35B Lightning combat aircraft; a land division with three brigades including a new Strike Force; an air group of combat, transport and surveillance aircraft; and a Special Forces task group.[6]

The F-35B 5th generation fighter will be central to the RAF's future combat airpower. The UK is committed to purchasing 138 of these fighters over the life cycle of the program. In addition, the Eurofighter Typhoon will be retained in significant numbers to provide essential fighter mass to augment the RAF's combat power. In addition to being an extremely capable tactical fighter, the F-35 will be an unrivaled ISTAR asset; its low observable (LO) technology and advanced sensors will give it the capability to conduct combat ISTAR well inside contested environments. It is expected to achieve Initial Operating Capability in 2020 and the initial focus will be on restoring the Royal Navy's maritime strike capability, absent since the retirement of the Harrier in 2010.

Legacy ISTAR platforms such as E-3D AWACS (for air/maritime surveillance and Air C2), RC-135 Rivet Joint (for signals intelligence), and Sentinel (for ground surveillance), are due for replacement or upgrade by 2035. Their timely modernization will be critical to supporting new combat platforms such as the F-35 effectively. In addition, the existing 10 MQ-9 'Reaper' platforms, a favorite in current counter-terrorism operations, will be replaced by approximately 20 'Protector' platforms, that will expand the long-loiter persistent surveillance and strike capabilities of the RAF. Finally, new P-8 aircraft will augment the existing triad of ISTAR platforms, and will restore the capability gap in fixed wing maritime patrol created in 2010 by the retirement of the Nimrod MR2.[7]

In terms of platform capability, Joint Force 2025 is a positive step towards meeting the UK's strategic military ambition for the future; however, the introduction of the F-35 represents a significant step-change in capability for the RAF. The UK needs to go beyond the requirements for Joint Force 2025, making commitments to modernize legacy ISTAR platforms and supporting information systems. In addition, there must be a concerted move towards a network-

centric approach to warfare and away from the platform dominated paradigm of the present; service organizational structures and training systems will need to be adapted accordingly. Failure to do so will critically debilitate the UK's ability to operate in a 5C environment and compromise its privileged position in a future coalition with the US.

The RAF vision, to maintain a composite force of F-35s and Typhoons, is a prudent mix of low quantity 5th generation capability with high quantity 4th generation assets. One of the key lessons from high-intensity large-force exercises, such as Ex RED FLAG, is that Blue Forces, despite superb situational awareness, will quickly run short of fuel and missiles against a large-force aggressor. Having situational awareness is vital, but so is having sufficient platforms with which to concentrate force. Given the incremental incorporation of F-35 over the course of the next 15 years, it is critically important that the RAF retains Typhoons, in significant quantity, for as long as possible. Where the F-35 can provide the enhanced situational awareness and survivability in a contested environment, the Typhoon can provide the mass of air-air and air-surface munitions.

Operating a mixed force of F-35s and Typhoons has important consequences for the RAF's offensive concept of operations and the force mix it will bring to any coalition operation. Unlike earlier generations of fighter, including Typhoon, the F-35 will be able to operate deep inside contested Anti-Access/Area Denial (A2/AD) areas, delivering its own internal stores or acting as a target designator for standoff weapons fired from other platforms. Similarly, the F-35's superior sensor capabilities will provide the ability to manage complex air-air engagements, sorting and allocating targets within a composite package of F-35s and Typhoons, with the latter providing the bulk of the weapons capability. F-35 air-air engagements will typically remain beyond visual range (BVR) as the F-35 lacks the turning performance of 4th generation fighters

like Typhoon. However, this is another advantage of keeping a mixed F-35/Typhoon force - the Typhoon offers post-merge capability in the event that targets close within visual range. Nevertheless, to leverage the benefits of a mixed F-35/Typhoon force and maintain interoperability across the joint force and with the USAF, the RAF must invest heavily in a modern joint communications network.

The RAF's existing datalink architecture will not exploit the full potential of modern LO platforms such as F-35 in an increasingly network-centric coalition environment. Link 16 has been the datalink of choice throughout NATO for some time; all fighters and legacy ISTAR platforms have connectivity to this vital air-air data network. Modern 5th generation fighters, like F-35, will also be Link 16 compatible. This enables all platforms to be interoperable and will facilitate F-35/Typhoon composite package operations. However, in the future F-35s will need to operate in contested environments, flying inside system threat envelopes that will require the aircraft to exploit its inherent LO technology. Use of Link 16, which can be detected by modern electronic warfare systems, will compromise the F-35's ability to remain covert.[8] To communicate in an LO environment, F-35s will use their own Multifunction Advanced Datalink (MADL). However, this datalink is not interoperable with 4th generation fighters (such as Typhoon) or legacy ISTAR platforms such as RAF or USAF E-3 AWACS, which will be responsible for executing air C2 of air-air assets. Justin Bronk, a defense analyst at the Royal United Services Institute, has identified that this issue can be mitigated by using the US Battlefield Airborne Communications Network (BACN) that can translate stealthy datalinks such as MADL and convert the product into data that can be broadcast over a legacy Link 16 network.[9] BACN, or an equivalent, could provide the capability to leverage fully F-35 mission data while the aircraft is operating covertly in a contested environment.

In the future, F-35s could remain covert while their sensor information is harvested by BACN capable platforms operating at extended range from the threat. The RAF currently lacks BACN or an equivalent capability and should work with the United States to acquire access to this technology. A possible future solution (for around the 2036 time-frame) would be to equip long-loiter ISTAR platforms, such as the 'near-space' Zephyr UAV that has recently been procured by the UK, with a BACN-style communications relay system.[10] A stop-gap, that could see rapid fielding of the capability in time for F-35 IOC, would be equipping existing ISTAR platforms such as E-3D AWACS. However, this solution would necessitate placing F-35s outside the threat area to act as communications relay between the covert F-35s and BACN-equipped air platforms such as E-3 that are unable to operate inside a contested environment. This has a potential opportunity cost as it ties-up scarce 5th generation fighters outside the contested areas that they are optimized to operate within. It should be noted that the issue of integrating 5th and 4th generation assets into a common network is one that concerns the US as well. However, the US DoD, unlike the UK MoD, appears to be actively pursuing technical solutions and identifying funding.[11]

Without the use of BACN, or an equivalent system, full integration of F-35 sensor information in a contested A2/AD environment will be impossible. In addition to the intrinsic ISTAR that the F-35s will need within their specific mission, F-35 sensors will also harvest a vast amount of battlefield information that will be beyond the pilot's needs at any given time. Getting access to this data onboard airborne C2 platforms, at the Air Operations Center, or onboard maritime vessels such as the Royal Navy's new carrier or Type 45 Destroyers, will be useful at the operational level for Joint Intelligence Preparation of the Operating Environment. The lack of BACN highlights a wider issue with the RAF's tactical information networks - the

increasingly antiquated communications systems onboard legacy ISTAR platforms, such as the E-3D AWACS.

The RAF's legacy platforms, such as E-3D AWACS must undergo radical mission system updates to remain relevant. Low bandwidth data connectivity greatly limits the utility of air ISTAR platforms in supporting network-centric operations within a US-led coalition. In Afghanistan and Iraq, the UK and US have enjoyed the benefits of operating in a low-threat environment with a mature system of ground-based data-fusion and C2 facilities. Operating in a contested A2/AD environment and facing the tyranny of distance will severely challenge this operating model. Therefore, the wider communications architecture within the Joint Force must be critically re-examined. The UK's Joint Data Network, which was to address modern high-bandwidth data connectivity in light of F-35 integration, was cancelled in 2011.[12] A new initiative is needed that addresses the connectivity requirements of a plethora of joint platforms, either legacy or undergoing acquisition, in the context of an increasingly connected and contested operating environment. More fundamentally, UK armed forces must move towards a network philosophy and away from the legacy platform paradigm that continues to dominate thinking.

The tactical building block of the RAF is the flying squadron based around a particular aircraft type. Although capability sponsors at the operational and strategic level tend to group 'like' platforms within a single portfolio of responsibility, at the tactical level the platform-specific flying squadron is the DNA of the RAF. There are clear incentives to maintain this structure as it brings together operators and support personnel focused on the specific demands of operating a particular weapon system. The flying squadron has great historical pedigree and promotes *esprit de corps*. However, operators typically train and operate in platform 'stove-

pipes'. This limits interoperability and stifles an appreciation of the wider joint and combined force. The orthodox mitigation is the conduct of regular joint training exercises. However, the constraints of time and budgets often restrict the quantity and quality of these events. European air forces are being increasingly squeezed out of busy airspace and face declining numbers of aircraft and austere deployment budgets. In the author's own experience, the opportunity for high-quality large-force training exercises with US forces has been declining over the last 10 years.[13] The continued demands of counter-terrorism and counter-insurgency operations in the Middle East has also conspired to reduce the opportunities to conduct training in simulated high-threat operating environments where control of the air is contested.

Military operations in 2036 will demand that the RAF operate as part of a networked coalition under 5C conditions and against increasing sophisticated opponents. Robin Higham and Stephen Harris, in *Why Air Forces Fail*, argue that "means must be matched to ends in the long term, when there is time to think and plan…failure to do the math beforehand has left air forces in the precarious position of having to fight the wrong battle at the wrong time, given their equipment, training, and resources."[14] A commitment to invest in modern distributed simulation training will help mitigate some of the worst effects of 'stove-pipe' structures and declining 'live-fly' opportunities, and promote coalition interoperability.

Given the practical constraints associated with conducting frequent and high-quality flying training within Europe, the RAF must focus on realistic distributed synthetic training to remain capable and interoperable with the US in 2036. The RAF's Air Battlespace Training Center (ABTC) is an excellent example of what can be achieved to replicate combat conditions in simulation. However, the ABTC's simulator complex has traditionally required participants to be co-located within their facility at RAF Waddington. Expanding the ABTC's distributed

capability will enable geographically dispersed flying squadrons, and potentially maritime and land units as well, to connect remotely to the simulated exercise, reducing the imperative to co-locate for increasingly scarce 'live' training events. Although the RAF's Typhoon force already conducts as much as 50% of their training in the simulator, the vast majority of this is Typhoon-specific and not part of a wider distributed synthetic environment. The RAF must now make a concerted effort to create distributed, networked training systems that build on the success of the ABTC's recent Ex VIRTUAL FURY that witnessed the first UK distributed joint collective synthetic training exercise involving the air and maritime domains.[15] The ABTC, and its successor, must now go further and explore connectivity with US training systems such as Ex VIRTUAL FLAG and the US Air National Guard's Distributed Training Operations Center.[16] In a recent speech, Air Marshall Sir Baz North argued that "the Air Battlespace Training Centre at RAF Waddington has given us a glimpse of the 'art of the possible' as far as the front-line is concerned but its successor, the Defense Operational Training Capability (Air) will need to go much further, and it will need to be easily up-scalable to connect to Joint, and Combined."[17] The RAF must prioritize resources accordingly, ensuring that distributed training systems such as the ABTC can seamlessly connect to the US coalition networks necessary to promote interoperability.

Modern distributed training through simulation reflects an important part of what must be an organizational paradigm shift away from the platform/flying squadron mentality of the present, towards a network-centric future. Platforms and aircraft should be situated as sensors and weapons within a federated network; data must be fused rapidly and tailored precisely to the needs of an increasingly de-centralized C2 system. The RAF should follow in the footsteps of the USAF and USN, developing doctrine and operational concepts akin to Air-Sea Battle (ASB), and

its successor Joint Concept for Access and Maneuver in the Global Commons (JAM-GC).[18] The last update to the UK's JDP 6-00 'Communications and Information Systems Support to Joint Operations' was in 2011; no equivalent to either ASB or JAM-GC currently exists in UK doctrine, and the last Joint Doctrine Note for future air and space operations was published in 2012.[19]

One essential aspect of this doctrinal evolution must be to prepare the future RAF to operate with increasingly de-centralized execution. Despite the traditional doctrinal mantra of 'centralized control, de-centralized execution', execution of air operations in recent COIN operations has been increasingly constrained with target engagement authority typically held well above the lowest tactical level. This has been necessary given the requirement for the judicious and constrained application of kinetic force in an uncontested environment. However, this will not be a pragmatic strategy against a peer or near-peer rival with advanced A2AD capabilities. For a generation of airmen who have fought in the relatively benign and uncontested COIN environment of the 2000s, a return to large-force employment with de-centralized execution will be a significant culture shock unless training systems are adapted now.

The RAF's Chief of the Air Staff has recently launched a new project entitled 'Thinking to Win', in order to "refresh the Royal Air Force's conceptual component."[20] It is an attempt to re-ignite an innovation culture within the service and is one of eight new initiatives to develop new ways of applying air power.[21] Developing a joint operational concept for future networked and de-centralized air warfare would be an excellent new project to develop within this initiative and would ensure the RAF remains 'in-step' with US forces.

As the United States vigorously pursues a 'third offset' (3OS), in order to address its eroding technological advantage, the RAF risks being left behind. Washington has stated that it

wants European militaries on-board with 3OS but only in an operational or doctrinal role.[22] However, unless European R&D can maintain technological pace with the 3OS, NATO air forces will fall increasingly behind the USAF. There has always been a significant technology gap between NATO and the US; however, the widening gap threatens to make future European coalition partners, such as the RAF, a liability at the tactical level.

In the context of 3OS, the UK cannot assume that it will be the recipient of technology transfers that will allow it to keep pace with the United States. Membership of the F-35 program, and intelligence sharing agreements such as the Rivet Joint project, are excellent examples of privileged and successful UK-US technology partnerships. However, 3OS is intimately related to supporting the 'pivot to Asia'. Therefore, there is a growing risk that US defense partnerships will increasingly privilege Asian nations over Europe. The UK must respond to this challenge by ensuring that national innovation in R&D is sustained through adequate defense investment and the promotion of a healthy industrial base. As Higham and Harris argue, "underestimating the need, time, or industrial competence or capability required to keep pace with adversaries is a common component of defeat and fall, regardless of whether a country is self-sufficient or reliant on others for supply."[23] The UK should show leadership within both NATO and the EU to ensure that Europe remains engaged with 3OS, not just operationally and doctrinally, but with respect to defense R&D.

Maintaining tactical relevance out to 2036 is the key to the RAF retaining the operational-level influence with the United States that it currently enjoys. As the most capable air force in Europe today, the RAF remains the 'go to' partner in coalition. As the United States shifts its attention increasingly to the Pacific theater, the RAF must transition to a networked 5th generation force that remains tactically capable and highly interoperable. This will enable the

RAF to retain operational influence in coalition and effectively support the evolving UK-US special relationship.

Notes

(All notes appear in shortened form. For full details, see the appropriate entry in the bibliography.)

[1] I wish to thank LCDR Broderick and Major Strickler for their useful comments and suggestions. Any errors contained herein are my own.

[2] HM Government, *National Security Strategy and Strategic Defence and Security Review 2015* (HMSO, 2015), 9.

[3] Government, *National Security Strategy and Strategic Defence and Security Review 2015*, 14.

[4] HM Government, *Strategic Trends Programme - Future Operating Environment 2035* (HMSO, 2014), 44.

[5] The purpose of understanding, as defined by UK Joint Doctrine, is to equip decision-makers at all levels with the insight and foresight required to make effective decisions as well as manage the associated risks and second and subsequent order effects. See JDP-04. Concepts and Doctrine Centre Development, *Joint Doctrine Publication 04 - Understanding* (UK Ministry of Defence, 2010).

[6] HM Government, *National Security Strategy and Strategic Defence and Security Review 2015*, 29-32.

[7] HM Government, *National Security Strategy and Strategic Defence and Security Review 2015*, 29-32.

[8] Justin Bronk, "Maximum Value From the F-35 - Harnessing Transformational 5th Generation Capabilities for the UK Military," *RUSI Whitehall Report 1-16*, February 2016, 3.

[9] Justin Bronk, "Maximum Value From the F-35 - Harnessing Transformational 5th Generation Capabilities for the UK Military," *RUSI Whitehall Report 1-16*, February 2016, 4.

[10] Andrew Chuter, "British MoD Acquires Solar-Powered Zephyr UAV," *Defense News*, February 2016, http://www.defensenews.com/story/defense/air-space/isr/2016/02/17/british-mod-acquires-solar-powered-zephyr-uav/80513364/

[11] Amy Butler, "5th-To-4th Gen Fighter Comms Competition Eyed In Fiscal 2015," *Aviation Week*, June 2014, http://aviationweek.com/defense/5th-4th-gen-fighter-comms-competition-eyed-fiscal-2015

[12] Justin Bronk, "Maximum Value From the F-35 - Harnessing Transformational 5th Generation Capabilities for the UK Military," *RUSI Whitehall Report 1-16*, February 2016, 7.

[13] The author served for over 10 years on the RAF's E-3D force. Subsequently, he was the Branch Chief for Training and Tactics Policy at HQ NATO Airborne Early Warning & Control Force Command.

[14] Robin Higham and Stephen J. Harris, *Why Air Forces Fail: The Anatomy of Defeat* (University Press of Kentucky, 2006), 349.

[15] QintecQ Blogs, http://www.qinetiq-blogs.com/blog/2015/11/30/qinetiq-creating-new-links-in-the-synthetic-training-world/

[16] The NATO E-3A mission simulator was recently connected to the US Distributed Training Operations Center under an FMS project managed by the author during his tenure at HQ NATO Airborne Early Warning & Control Force Command. The UK's E-3D force would benefit from similar connectivity to improve routine training for air battle managers and ensure common UK-US TTPs are regularly rehearsed.

[17] Air Marshal Sir Baz North. "Air Power and the Defence Aerospace Industry in the Whole Force Era." Address. The Royal Aeronautical Society, London, 8 June 2015, http://www.airpowerstudies.co.uk/sitebuildercontent/sitebuilderfiles/SydneyCamm15transcript.pdf

[18] Sam LaGrone, "Pentagon Drops Air Sea Battle Name, Concept Lives On," *USNI News*, January 2015, http://news.usni.org/2015/01/20/pentagon-drops-air-sea-battle-name-concept-lives

[19] UK Defence Development Concepts and Doctrine Centre, https://www.gov.uk/government/groups/development-concepts-and-doctrine-centre

[20] Air Chief Marshall Sir Andrew Pulford, Chief of the Air Staff. "Thinking to Win." Address. Defence and Security Equipment International, London, 17 September 2015, https://www.gov.uk/government/speeches/thinking-to-win

[21] Royal Air Force Air Media Centre – Thinking to Win, http://www.raf.mod.uk/rafcms/mediafiles/28DBDA58_5056_A318_A8AA043B147E9F02.pdf

[22] Daniel Fiott, "Europe and the Pentagon's Third Offset Strategy," *The RUSI Journal* 161:1

[23] Higham and Harris, *Why Air Forces Fail: The Anatomy of Defeat*, 351.

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