The Royal Air Force and the First Gulf War, 1990-91: A Case Study in the Identification and Implementation of Air Power Lessons

By Dr Sebastian Ritchie

Précis

Historians have long puzzled over the consistent failure of military organisations to learn from the lessons of past conflicts. An apparent tendency to repeat decisive errors may be identified throughout military history and this has generated substantial literature, as well as many different explanations for the military's inability to profit from past experience. Analytical approaches have varied from 'micro' surveys of different campaigns and periods of history to 'micro' investigations of specific conflicts or operations. However, the results have too often been based on theory rather than detailed consideration of the processes by which lessons are – or are not - implemented, and there has been little historical interest in the military's record in more recent conflicts.

This essay seeks to address this gap in the historiography of military lessons by focusing on a modern armed service – the Royal Air Force – and a relatively recent conflict – the first Gulf War. It describes the RAF's experiences in the Gulf War, the lessons process subsequently initiated, and the various factors that determined whether or not specific identified lessons were acted upon.

Introduction

Historians and other analysts have spilled rivers of ink on the apparent failure of military organisations to exploit the lessons of past conflicts and operations. It is often alleged that learning does not come naturally to the military, that they have a regrettable propensity to repeat past mistakes, and that, all too frequently, this trait more than any other has been responsible for failure or even outright defeat. Investigating what they term 'the anatomy of failure in war', Eliot Cohen and John Gooch singled out a failure to learn as one of the three principal sources of military misfortune. They also concluded: 'One of the most obvious ways to improve performance is by learning.'[1]

The UK defence community has devoted considerable effort to the improvement of lessons processes over recent years, but the shift in nomenclature from 'lessons learned' to 'lessons identified' has at the same time openly acknowledged that lessons exploitation may be far from straightforward. Yet it is often extremely difficult to pin down exactly why this should be, and many historians, although happy to blame military misfortune on a failure to learn, have been unable to explain this failure convincingly. The most common type of explanation highlights the role of 'guilty men', suggesting excessive conservatism and resistance to change on the part of particular individuals, groups or organisations. A variation on this theme, less overtly critical via the use of deliberately vague modern parlance, involves the assertion that organisations lack a 'culture of learning'.[2] However, while such allegations are easily made, they can often be far more difficult to substantiate with any reasonable degree of objectivity.

Individual case studies provide one useful means of addressing the problem but, while many have been conducted, surprisingly few have examined the lessons process in the specific context of the air environment. More work in this area would appear desirable, not least to test the common perception that air forces are not, as a rule, inclined to learn lessons from past events, but prefer instead to seek solutions to their problems through the acquisition of ever more advanced technology that tends to promise more than it can deliver. With this requirement in mind, this paper considers lessons exploitation by the RAF following the first Gulf War, an event that appeared all the more worthy of attention as it marked the dawn of the post-Cold War era and inaugurated a veritable revolution in military affairs with particularly far-reaching consequences for the application of air power. After a broad survey of the RAF's role and experiences in the conflict, focusing particularly on air combat, the aim is to highlight the main lessons identified in its aftermath, before assessing the progress of implementation in subsequent years, and finally offering some concluding observations.

In the winter of 1989 and the spring of 1990, world affairs were dominated by the collapse of the Warsaw Pact and the end of the Cold War. Statesmen across the globe heralded a new era of peace, and there was a headlong scramble to collect the so-called peace dividend - substantial savings in public expenditure based on defence cuts. The RAF and the other UK Armed Services nervously waited for the axe to fall. Then, without any warning, it was committed to its largest operation since the Suez crisis - the First Gulf War, known in the UK as

Operation Granby. Ultimately, the RAF's deployed force in the Gulf would number 157 aircraft, including 49 Tornado GR-1s, 12 Jaguars, 18 Tornado F-3 fighters, Nimrod maritime reconnaissance and intelligence collection platforms, Hercules transports, tankers and support helicopters. During the Desert Storm phase of the operation alone, they flew 6,108 sorties; in the Gulf operation as a whole, they flew many more. The RAF also deployed two RAF Regiment Wing Headquarters, two surface-to-air missile Squadrons and four Light Armoured Squadrons and Field Squadrons; the number of deployed RAF personnel totalled around 7,000 at peak.[3]

Yet Granby was inevitably very different from the type of operation that the RAF had been preparing to conduct in the later years of the Cold War, and it was accompanied by a multiplicity of challenges. The conflict raised serious questions about the utility of the RAF's basic offensive doctrine, a number of its most modern aircraft and several aircrew were lost in combat, and there were many other problems relating to equipment, weaponry and tactics that sometimes impacted upon its contribution within the US-led coalition.

Following the UK's withdrawal from empire, RAF training and equipment was overwhelmingly shaped by the perceived demands of a conflict with the Warsaw Pact on the Central Front. The various air combat platforms illustrate this point most clearly. The Tornado F-3 fighter was, for example, intended to fulfil the highly specialised role of low-to-medium altitude interception of Soviet long-range bombers flying missions against the UK through the Greenland-Iceland-UK gap. It was never viewed as a dogfighter, capable of matching contemporary Warsaw Pact fighters, and the F-3's performance and manoeuvrability at higher altitudes were poor. Moreover, its relative inferiority in air-to-air combat was rendered all the more pronounced at the end of the 1980s by the emergence of advanced Soviet fighters like the MiG 29. Additionally, as the F-3 was expected to operate in the UK Air Defence Region, its self-defence capability was limited; it was not well equipped to fly missions within enemy airspace - a feature that it shared with most other types of aircraft in the RAF at that time.

The two attack platforms deployed to the Gulf, the Tornado GR-1 and the Jaguar, had similarly been developed to fulfil the demands of NATO-area operations. The strength and sophistication of Warsaw Pact air defences had persuaded the RAF that medium or higher-altitude flying over Eastern Europe would be hazardous in the extreme. It seemed that offensive missions would stand a better chance of penetrating hostile airspace at very low levels, exploiting speed and terrain to impede detection and interception. Attack aircraft were therefore optimised for low-level flying and performed less effectively at higher altitudes, and they were largely equipped with weapons designed for low-level release, normally during direct over-flight of the target. Self-defence suites were likewise optimised for lower-altitude flying, and aircrew training was predominantly geared to low-level operations.

Beyond this, the F-3 and GR-1 were technically sophisticated platforms that made significant logistical and maintenance demands. These could be fulfilled without difficulty at their main operating bases in the UK and northwest Europe, but no deployed out-of-area role was

envisaged for either aircraft in 1990, and there had consequently been few preparations to address the logistical challenges involved. The Jaguar - an older and simpler aircraft - had a dedicated overseas role, for which it was very much better prepared, but in the majority of other respects it lacked the Tornado GR-1's operational capability.[4]

The initial deployment phase of the Gulf operation had the objective of establishing a defensive line to protect Saudi Arabia. If Iraqi forces crossed the frontier, they would initiate hostilities with coalition forces. It would ultimately transpire that they had no short-term plans to advance further south in August 1990, but their intentions were unclear at the time and, in the absence of any response from Western countries, Saddam Hussein might well have been tempted to threaten other Gulf States. It thus appeared essential to deploy forces to the Gulf immediately. As it was deemed that such forces should be defensive in character, the first RAF aircraft sent to the Gulf were Tornado F-3s, which had been on exercise in Cyprus at the beginning of the crisis. They were dispatched to Dhahran, Saudi Arabia, on 11 August 1990, and, after five days of theatre-familiarisation flying, mounted their first operational combat air patrols on the 17th.[5]

They were soon joined in theatre by a number of other force elements, including a detachment of Jaguars. Although the RAF would have preferred to send the Tornado GR-1 to the Gulf, the Jaguar force's declared mobile role ensured that it was far better prepared for rapid out-of-area deployment. However, the Jaguar detachment was positioned in Oman, well to the south of the potential area of operations, for its role was primarily symbolic: it was intended to bolster Arab support for the nascent US-led coalition. There were no plans to fight from bases in Oman.[6]

These first deployments, added, of course, to the movement of American forces to the Gulf on a very much larger scale, secured their primary objectives by quickly drawing what was termed a 'line in the sand'. It is true that the RAF's combat capability in theatre was at first limited. The F-3s initially deployed were later described by their detachment commander as 'blatantly below the minimum requirement' and 'manifestly non-operational',[7] while the Jaguars were based too far away from the potential battle area, and were by no means the most capable offensive platforms in the RAF's inventory. But such considerations were at first less important than the basic fact that a coalition presence had been established in the Gulf only days after Iraqi troops entered Kuwait.[8]

Between the end of August 1990 and the start of Operation Desert Storm on 16 January 1991, the RAF's presence in the Gulf was substantially reinforced, and all of the deploying aircraft - combat or otherwise - received an extensive series of enhancements. The F-3s initially flown out were replaced by aircraft that boasted environmental adaptations and upgrades to their weapons systems, engines, electronic warfare equipment and armament.[9] Their operational capability was thereby substantially improved, but the various modifications were never likely entirely to offset some of the more fundamental shortcomings of the F-3's original specification. Furthermore, having been rushed into service to meet the immediate

contingency of the Gulf conflict, it could hardly be expected that the enhancements would all be entirely successful. In such circumstances, normal evaluation and trial processes must necessarily be accelerated, and the potential for error may then be increased. Equipment defects may not be spotted, or it may be that equipment does not fully match specified requirements, or is installed in such a way that it is difficult to use in operational conditions. Deployed aircrew and groundcrew are likely to find innumerable upgrades hard to accommodate in the middle of large-scale and very demanding operations.

In the meantime, the RAF's offensive posture in the Gulf was also being strengthened. Tornado GR-1 detachments deployed to Bahrain and Tabuk, in Saudi Arabia, in August and October 1990 respectively, and a further eighteen aircraft arrived at Dhahran in December. The Jaguars were also repositioned forward to Bahrain.[10] More than 60 attack aircraft would thus be committed to the air campaign when Operation Desert Storm began in January 1991. But what role would they play?

It has been noted already that the Tornado GR-1 had been designed to undertake very specific low-level attack duties on NATO's Central Front. As its primary task, it was expected to conduct counter-air missions against Warsaw Pact airfields, using the runway-cratering bomb, JP-233, delivered via high-speed low-level overflight of the target. In the Gulf, the Iraqi Air Force was in a position to operate from a number of very large and well-prepared air bases, and the USAF lacked dedicated airfield-denial platforms and munitions, so the American Air Component Commander warmly embraced an early British offer to employ the GR-1 in this role.[11]

The Jaguars, on the other hand, were not so rigidly tied to specific tasking. The broad expectation was that they would execute ground-attack missions, targeting the Iraqi army in Kuwait with unguided 1,000 lb bombs and the cluster bomb, BL-755 - another munition designed for release at low altitude. However, within a short time, doubts were being expressed about this scenario. In October, the British Joint Headquarters pointed out that the Jaguars would be very vulnerable at low level, and suggested that they might operate at higher altitude. But the only munition in their inventory that was suitable for high-level release - the 1,000 lb bomb - was not an effective weapon with which to attack small, mobile or dispersed ground targets. An alternative was needed, and the Jaguar detachment commander therefore recommended the acquisition of the American CBU-87 cluster bomb. Not only did CBU-87 meet the requirement for high-altitude release; it was also immediately available from USAF stocks in theatre.[12]

There are several reasons why the risks of low-level operations were viewed more seriously in relation to the Jaguar than the GR-1. While the Jaguar could only operate in daylight, the GR-1 secured at least some protection by flying at night, and was also fitted with more effective electronic counter-measures. Furthermore, while Jaguar tasking was chiefly in the restricted airspace over Kuwait, where the Iraqis had positioned a formidable array of ground-based air defences (GBAD), the GR-1s were not so rigidly confined, and could thus make more use of

evasive routing. Finally, on missions with JP-233, which the RAF had effectively 'sold' to US commanders, there was no choice, but to operate at low altitude. Yet a shift to higher-level flying was also envisaged for the GR-1s after the Iraqi Air Force had been dealt with. The RAF proposed that they should fly interdiction missions employing laser-guided bombs (LGBs), and the USAF confirmed their willingness to provide F-15s as laser designators.[13]

It would be wrong to suppose that the RAF only began operational flying in the Gulf at the beginning of Desert Storm in January 1991. In fact, most detachments effectively became operational as soon as they reached the Gulf. The F-3s again provide an especially notable example. Ultimately, between August 1990 and March 1991, they flew in excess of 2,000 combat air patrol (CAP) sorties. Yet their limited performance and self-defence capability caused them to be employed overwhelmingly in a supporting role to the coalition's main air defence effort, flying rear CAPs to give protection to so-called high-value assets, like airborne C2 platforms. Their patrol areas were located some distance behind a forward barrier of American and Saudi interceptors, which proved more than a match for the meagre Iraqi opposition dispatched against them after hostilities began. Nor were the F-3s risked on offensive missions into Iraqi airspace. At best, it can only be noted that their absence could have caused the coalition air defence effort to become unduly stretched, as platforms with the capabilities that the F-3 lacked might have been burdened with the rear CAP task, so detracting from the offensive effort. Only once did airborne F-3s come remotely close to combat, and there were no opportunities to intercept Iraqi aircraft.[14]

Meanwhile, the GR-1s found themselves confronted by an exceptionally difficult baptism of fire. The RAF later assessed that their JP-233 attacks achieved their aim by disrupting Iraqi Air Force operations following the launch of Desert Storm, but it was hard to draw any more positive conclusions, as the coalition's offensive counter-air campaign effectively secured air superiority within days. Moreover, four GR-1s were lost during these early missions, four aircrew being killed, while four more were captured. Three aircraft were shot down by SAMs during low-level missions against Iraqi airfields with conventional free-fall bombs, and one was lost on a JP-233 mission, although it is not certain that enemy air defences were responsible.[15]

Low-level flying thus proved extremely hazardous. Consequently, as soon as any tangible threat from the Iraqi Air Force had been eliminated, the UK Air Commander decided that GR-1 missions should in future be flown at higher altitude. Their only effective higher-level weapon was the Paveway LGB, but the GR-1s had no laser self-designation capability at this time and had to rely on other aircraft to function as third-party designators. However, the American F-15s originally earmarked for this task had in the meantime been reassigned to counter-Scud operations. Laser-designating aircraft, in the form of ageing Buccaneers, had therefore to be flown out from the UK, along with two experimental Thermal Imaging Airborne Laser Designating (TIALD) pods, which the GR-1s themselves could carry. While waiting for this capability to become fully operational in theatre, the three GR-1 detachments had no option but to fly higher-level missions using unguided 1,000 lb bombs. These attacks were mostly

very inaccurate; aircrew were not trained to operate in this way, and the aircraft were not optimised to do so either.[16] On the other hand, no more GR-1s were brought down by the Iraqis during this phase of the campaign. The only aircraft loss resulted from self-damage caused by the premature explosion of munitions; the crew ejected safely, but were taken prisoner.[17]

Then, early in February, the GR-1s began laser-guided bombing and there was a pronounced change in their fortunes. Indeed, executing a wide range of interdiction strikes, they achieved what was, at the time, probably the most accurate bombing in the RAF's history. With TIALD alone, they hit 229 pin-point targets in a period of eighteen days.[18] One aircraft was shot down by an Iraqi SAM on 14 February, but this was the only casualty incurred during an LGB mission.[19]

By contrast with the GR-1s, the tactics to be employed by the Jaguar detachment remained uncertain during the final countdown to Desert Storm. Although concerns were mounting over the potential risks involved in operating over Kuwait at low altitude in daylight, the proposed solution - the procurement of CBU-87 cluster bombs for higher-level release - was subject to some delay. In the meantime, the Jaguar's lower media profile and a lack of clear direction from higher command levels left the detachment commander with greater freedom to decide how to deploy his aircraft. He duly concluded that they would face too great a threat at low level, and that they should therefore operate higher up, in an environment where they would at least derive some protection from coalition SEAD platforms, such as USAF Wild Weasels and EF-111 Ravens, and air superiority fighters.

Early Jaguar missions flown with free-fall 1,000 lb bombs provided ample evidence of extremely heavy Iraqi AAA throughout the area of operations, so the detachment continued to fly at higher altitude. Clearance to carry the CBU-87 was ultimately received at the end of January, increasing the range of targets that the Jaguars could attack, but a combination of software and carriage limitations reduced the weapon's effectiveness. These were a direct consequence of its relatively late acquisition. Until the final week of the campaign, the Jaguars therefore flew the majority of their missions with 1,000 lb bombs.

The Jaguars would eventually execute more than 600 sorties without loss during Desert Storm. They fulfilled their interdiction tasking to the extent that they delivered a high proportion of their weapons into their target areas, although with far less accuracy than the level associated with precision-guided munitions (PGMs). Moreover, they also mounted a number of anti-shipping missions, targeting Iraqi fast patrol boats with their cannon and with CRV-7 rockets. CRV-7 was, however, another late acquisition, and it proved difficult to launch accurately until computed weapon aiming became available during the final stages of the campaign. After that, it was successfully employed against a variety of Iraqi ground targets.[20]

In assessing the RAF's performance in the Gulf, it is important to consider the problems it faced in context. Nearly two decades had been spent preparing for a conflict in the NATO area conducted from British and European main operating bases. Personnel had exhibited

a high degree of resourcefulness and adaptability in deploying and sustaining so many aircraft beyond European frontiers and in mounting operations from unfamiliar, crowded and sometimes poorly prepared airfields. The logistical strain had been immense; as one RAF supplier later recorded, 'we had shown that we could effectively project air power, but the cost had been exorbitant: we had taken too much equipment, we had not used it at all well, and we had lost far too much'.[21]

And yet, with American and Saudi support, the challenges were in due course overcome.[22] Although they had all required extensive modification for Operation Granby, the air transport fleet, tankers, support helicopters and Nimrods all fulfilled their assigned tasks very effectively. RAF transport aircraft moved approximately 25,000 passengers and 31,000 tonnes of freight into the Gulf; in theatre, Chinook and Puma helicopters carried more than 12,000 troops and over 1 million kgs of freight. During the period of hostilities alone, the tankers offloaded 13,000 tonnes of fuel to both RAF and other coalition aircraft; Nimrod MR2s helped to enforce the UN economic embargo of Iraq, challenging no fewer than 6,552 ships in Gulf waters, and they subsequently assisted coalition naval units with the identification and interception of Iraqi naval vessels. The Jaguars and Tornado GR-1As proved their worth as reconnaissance platforms, providing valuable targeting and battle damage intelligence.[23]

Nevertheless, the Gulf conflict did to an extent undermine confidence in the RAF's front-line combat capability. The anticipated role within the NATO area had resulted in an over-commitment to a limited number of tasks, and a loss of tactical flexibility. A short-term solution of sorts had been found via the last-minute procurement of new weapons and equipment, and equally accelerated on-the-job training for the air and ground crew involved, but this was far from ideal. It worked - to the extent that it did work - because of the exceptionally high calibre of so many RAF personnel, and because the Service could still call on the support of a very large engineering, supply and industrial infrastructure. But short-term measures could never fully address some of the more fundamental questions that the Gulf War raised about doctrine, training and equipment.[24]

After British forces were withdrawn from the Gulf at the end of the war, a major lessons-gathering exercise was launched. Originating at unit level, identified lessons were then staffed upwards through the command chain, and compiled into overall reports for the air, land and maritime environments.[25] These were then endorsed by the high command, and finally by the Ministry of Defence.

There were good reasons why the RAF report might have been decidedly defensive in tone. Its operations had come under the media spotlight far more than those of the other Armed Services during Desert Storm; this reflected the fact that the RAF participated in the entirety of the campaign, whereas the Army only became involved at the very end, and maritime operations, although important, were peripheral in character. Some reporting had predictably been critical due to the losses sustained by the Tornado GR-1 force.

Additionally, there was the issue of the impending post-Cold War reductions in defence spending. While British forces were engaged in their largest overseas operation in decades, in London the Ministry of Defence was putting the finishing touches on the *Options for Change* defence review, which ushered in a series of swathing cutbacks. The Armed Services harboured no illusions about what was in store, and it would have been entirely logical, in the circumstances, to reason that compelling evidence of war-fighting prowess in the Gulf might offer a measure of protection from the forthcoming economies. Some such perspective could have led to pressure within the Services to ensure that the various after-action reports presented their respective contributions in a favourable light.

Finally, the truth is that the war had seriously undermined a number of the more basic assumptions that underpinned the RAF's operational posture. It suggested that low-altitude tactics did not provide the anticipated degree protection against GBAD, and simultaneously offered abundant evidence of the capability of precision-guided air weapons released from higher up. US SEAD had substantially reduced the threats that the RAF had identified to aircraft operating at this level. Hence, the war appeared to suggest that future air operations were likely to be conducted at higher altitude, something that implied a radical shift in RAF doctrine, training and tactics, which could well have been difficult to accomplish quickly even if appropriate equipment had been available. As it was, most combat aircraft were not due to be replaced for some years. In such circumstances, the RAF high command might reasonably have hesitated before accepting that some far-reaching reforms were required.

Viewed from this perspective, the post-Gulf War air lessons report can only be described as a very honest and thorough document. There was no attempt to deny that the conflict had raised some serious questions about war-fighting preparedness and operational capability. The front-line aircraft fleets were all in need of improved communications, navigation and self-defence equipment; better interoperability with potential coalition partners was required, together with enhanced logistical provisions to support future out-of-area operations, and more AAR capacity to provide greater reach to aircraft operating away from main or forward operating bases. More air transport was needed, and there had been an over-dependence on the US for SEAD. There were proposals to rationalise the provision of mission support, and it was argued that the offensive effort would have benefited from the supply of more up-to-date and accurate battle-damage assessment (BDA).[26]

The Tornado F-3 came in for some surprisingly direct criticism. However, this is not difficult to explain. By 1991, it was well known that the aircraft suffered from a number of serious shortcomings and it was hoped - optimistically - that the F-3's place in the RAF's order of battle would be taken by the Eurofighter at the turn of the century. Thus, while the report contended that the F-3 had broadly fulfilled the role for which it was designed, it also acknowledged the aircraft's limitations, although pointing out that these were fully understood and that measures had already been implemented to procure a very much more capable air defence platform.

It was when the report turned to the subject of offensive air warfare that its tone became noticeably more cautious. Full recognition was accorded to the vital role that PGMs had played in the Gulf, and the RAF stressed that more of these weapons would be used in future. Specific requirements were similarly identified for anti-armour munitions and stand-off missiles that would reduce the exposure of offensive aircraft to hostile GBAD. Equally, it was accepted that aircrew should be better trained and equipped to fly offensive missions at higher altitudes. And yet these matters were only addressed quite broadly, alongside an explicit commitment to the existing low-level capabilities. If there was now an acknowledged need for increased tactical flexibility, it did not appear that there was to be a general shift in offensive doctrine towards higher-altitude flying.[27]

The financial constraints imposed on the Armed Services during the 1990s inevitably complicated the task of implementing the lessons of the first Gulf War. Successive defence reviews were initiated by *Options for Change*, culminating in the *Strategic Defence Review* of 1998. In real terms, between 1990 and 2002, UK defence expenditure fell by more than 20 per cent; defence spending absorbed around 4 per cent of GDP at the beginning of this period but about 2.5 per cent at the end. The RAF's front-line force shrank from 63 squadrons to 43; the number of RAF personnel was reduced from 88,000 to 53,000.[28] Such reductions in scale did provide scope for improving the standard of equipment; one Conservative Defence Secretary championed the concept of 'smaller but better' in the early 1990s.[29] Yet this was only true to a limited degree, and it is quite clear that the funding cuts impeded the exploitation of some Gulf War lessons.

The operational environment imposed further restrictions. Behind the defence cuts of the early 1990s lay the assumption that, following the end of the Cold War, operational pressures upon the Armed Services would decline. Understandably, perhaps, at least some policy-makers and senior officers had difficulty envisaging how the changed situation would in fact generate entirely new commitments, with major resource and financial implications. No-fly zones were created over northern and southern Iraq, and NATO forces were deployed into the Former Yugoslavia. In 1995, Operation Deliberate Force was mounted against Serb forces in Bosnia, Operation Desert Fox marked the culmination of the UNSCOM crisis in 1998, and the Kosovo conflict followed in 1999. The central role of air power in all of these operations ensured that the RAF remained the British government's weapon of first choice, and yet this simple truth was seldom openly acknowledged, and it exerted minimal impact on defence policy. The Service was thus committed to a decade of live operations while simultaneously its front-line strength was drastically cut back - ironically on the basis that operational commitments were reducing.

Beyond this, it should be added that priorities inevitably changed as time went by. Managing the broader defence drawdown and the accompanying organisational changes, and simultaneously conducting a series of major operations - all of this represented a significant and challenging task, but also a current task. These were the dominant factors shaping present and future defence policy. It was difficult to maintain any comparable focus upon a past conflict, which faded further from view as each day went by.

It was possible to implement some lessons from the Gulf War quite easily. A new entity, the Air Warfare Centre (AWC), emerged from the recommendations for rationalising mission support, and was assigned responsibility for the development and implementation of operational and tactical doctrine, and for the provision of integrated mission support to RAF units. In addition to its doctrinal functions, the AWC's duties would range across operational analysis, equipment evaluation, air intelligence, electronic warfare, and air warfare training.[30] These activities, previously assigned to several different organisations, were now to be placed under one roof. However, as few new capabilities or additional personnel were required, the AWC's establishment did not have especially significant financial implications.

Otherwise, the 1990s would witness a substantial investment in the air transport fleet, including a C-130 upgrade, the procurement of new support helicopters, and ultimately the leasing of American C-17s.[31] It was deemed unnecessary to enlarge the air-to-air refuelling fleet, as reductions in the number of combat squadrons lowered the demand for AAR to levels more in line with existing provisions,[32] but there were changes in the RAF's logistical training and organisation, which reflected a renewed commitment to mobility and overseas deployments; augmentations were approved for certain dedicated mobile elements, notably the Tactical Communications Wing, despite the cuts being made across the Service as a whole.[33] To facilitate the task of deploying the Tornado out of area, air-portable spares packages known as Priming Equipment Packs were also prepared.[34] Thus, as the 1990s progressed, there was some improvement in the RAF's capacity to operate detachments from relatively austere overseas bases.

Yet it is probable that the need for enhanced mobility in the post-Cold War era would have led to the implementation of at least some of these measures in any case; the influence of the Gulf War should not be exaggerated. As the focus of British defence policy shifted outside the NATO area, some additional investment in air transport and mobile support units would have been essential. Furthermore, we should not overestimate the extent of such improvements as were achieved. The chief overseas commitments of the 1990s - in Saudi Arabia and Kuwait - exposed the RAF's support capabilities to a rather less rigorous audit than they received during Operation Granby. Indeed, they were quickly transformed into extended commitments, underpinned by significant logistical backing from the UK and vital host-nation support. And even this was not enough to ensure that aircraft of the Tornado's technical sophistication became much easier to operate away from their main bases. At the turn of the century, to fulfil a coalition mission involving just two aircraft, the RAF had six F-3s deployed in Saudi Arabia, which received priority in the allocation of spares over those based in the UK. For some key items, overseas spares holdings were twice the size of holdings at UK F-3 bases.[35]

The *Strategic Defence Review* cast doubt on the capacity of the UK's military logistics infrastructure to support extended or concurrent overseas commitments. It proposed 'enhancing the ability of the Royal Air Force to conduct operations from remote locations with

little or no infrastructure by providing logistic support needed for deployed operating bases.'[36] Very similar recommendations had been made following the Gulf War.

A variety of important aircraft enhancements were undertaken in the 1990s. As we have seen, virtually all of the aircraft originally deployed had required extensive modification during the operation to provide effective self-defence capabilities, including the installation of chaff and flare dispensers, radar warning receivers, electronic counter-measures, missile advance-warning systems and towed radar decoys.[37] In subsequent conflicts, aircraft normally deployed with this equipment already fitted.[38] But the ongoing reductions in defence spending prevented a number of the post-Granby equipment recommendations from being implemented. In 1999, the MOD's report on the lessons of the Kosovo conflict listed a series of requirements for the RAF, including improved anti-armour munitions, better electronic warfare equipment and secure air-to-air communications. It was also noted that the RAF had relied heavily on the US for SEAD, and that there had been a lack of timely BDA.[39] Eight years earlier, after the Gulf War, the same deficiencies had been recorded; at least some were being dealt with by specific measures, which had yet to deliver, but a number of noteworthy capability gaps were still in evidence.[40]

The scope for exploiting the air combat lessons of the Gulf War was predictably constrained by the fundamental design features of the various fast jets. Thus, while the F-3's self-defence capability could be enhanced, there was no point in attempting to transform it into an accomplished dogfighter, nor could its higher-altitude performance be significantly improved. For an aircraft with vastly superior air-to-air combat characteristics, the RAF would have to wait for Eurofighter. Unfortunately, however, its introduction was repeatedly delayed. To provide an improved interim air defence capability, it was necessary to undertake an F-3 upgrade programme, which primarily involved the installation of both ASRAAM and AMRAAM.[41] Similarly, while the Tornado GR-4 standard superseded the GR-1, the aircraft's operating parameters and performance did not represent a very substantial advance on the original GR-1 specification, with its emphasis on low-level missions. The employment of Storm Shadow, the stand-off missile ordered after the Gulf War, promised to reduce the GR-4's exposure to hostile GBAD, but it was only suitable for use against larger fixed targets, such as command bunkers, communications facilities and other military infrastructure.[42]

And yet, probably the most important air combat lesson identified during the Gulf War was in fact implemented. The main air lessons study may not have accepted outright that the war potentially marked a fundamental tactical shift, but subsequent combat operations were overwhelmingly conducted at higher altitudes by aircraft equipped with PGMs. The Paveway LGB was used by the RAF in preference to any other air weapon over Bosnia in 1995, Iraq from 1998, and Kosovo in 1999. Indeed, Paveway's utility was such that its carriage was extended beyond the Tornado fleet to the Jaguar and Harrier.[43] Bombing accuracy was in this way radically improved by comparison with the standards recorded when non-precision weapons were carried, adding at least some weight to arguments that more could now be achieved with less.

But the transformation of offensive air tactics had to be accomplished within rigid financial limits, with predictable consequences at squadron level. Following the withdrawal of the Buccaneer from service, together with its Pavespike laser designator, the only airborne designator left available to the RAF was the TIALD pod. The pods that had been intended for the Tornado then had to be shared with the Harrier and Jaguar fleets too, and assigned to detachments deployed in the Gulf, and on operations over the Former Yugoslavia. Very few were left behind in the UK for training purposes. At the turn of the century, ten years after Iraq invaded Kuwait, the UK Defence Procurement Executive advised the House of Commons Select Committee on Defence that a total of only 23 TIALD pods had been bought for the three aircraft fleets. The scope for further purchases was restricted by the pod's high unit price (£2.7 million per pod in the year 2000), which reflected the limited scale of production; TIALD was never manufactured in quantity, as it was not widely exported.[44]

The RAF published figures in the aftermath of the Kosovo conflict indicating that it had been unable to raise the accuracy of laser-guided bombing since the Gulf War; and yet very few of the Tornado GR-1 aircrew who deployed to the Gulf in 1990 had previous experience with LGBs. Officially, at least, the weather was blamed for many of the difficulties encountered over Serbia and Kosovo, but some aircrew felt that they had not been adequately prepared for the use of the TIALD-Paveway combination.[45] Despite the operational pressures confronting the RAF in the 1990s, and Paveway's critical importance within each consecutive operation, their views suggest that funding may have been insufficient to support the essential parallel training activity.

Additionally, there is a case for arguing that the switch to higher-level tactics and precision-guided bombing stemmed from the specific requirements of air warfare in the 1990s as opposed to a conscious implementation of post-Gulf War lessons. Higher-altitude flying reflected the need to align RAF tactics with those of the USAF, and also the SAM and AAA threats confronting low-flying aircraft over Yugoslavia and Iraq. A continued commitment to low-level tactics may at the same time be inferred from the fact that a new LGB, Paveway 3, was at first ordered in the early 1990s as a low-level munition, although it was also suitable for higher-level release.[46] Finally, broader considerations also lay behind the tactical reorientation. The popular perspective was that higher-altitude missions flown with PGMs were casualty-free and caused the absolute minimum of collateral damage - characteristics that inevitably appealed to politicians.[47]

Conclusion

The RAF did not ignore the main air lessons identified after the Gulf War. Having experienced an extremely challenging initiation into the problems of post-Cold War operations, it mounted an extended and thorough lessons-gathering exercise that exerted a significant influence in subsequent years. There was a Service-wide determination to learn the lessons of the conflict, which helped to ensure that, a decade later, a smaller front-line force could boast superior general war-fighting capabilities, and improved deployability, while the Tornado GR, Harrier

and Jaguar forces had undergone a veritable tactical revolution. Yet the lessons of the Gulf War could have been more fully acted upon. Some identified lessons were only implemented to meet the operational requirements of later conflicts over Yugoslavia and Iraq, some elicited only a slow or partial response, and others failed to secure the necessary funding or support.

There is nothing particularly unusual in this. Indeed, historically, it would have been far more remarkable if all the post-conflict lessons had been exploited. The difficulties involved have a variety of explanations. To begin with, there is the lessons report itself. The importance of learning lessons may be well understood; a robust lessons process may be in place; and yet this does not automatically ensure that the most fundamental deficiencies are pinpointed. Within military organisations, there is an entirely understandable reluctance to draw public censure, to invite criticism from other parts of the defence establishment, or to present senior officers or ministers with recommendations that are certain to be deemed unrealistic because they are too numerous, or too costly, or both. Viewed from this perspective, the RAF's Gulf War lessons report must be considered quite a pragmatic document, but it might have dealt more thoroughly with the issue of offensive tactics - with the wartime shift to higher-level flying and PGMs.

That more space was not devoted to this particularly important subject stemmed partly from entirely genuine concerns that past errors should not be repeated. The lesson was not that RAF combat aircraft should operate at low level or high level; rather, it was that there should be sufficient flexibility to operate at both. It also seemed certain that any general attempt to revise tactics would be hindered by the basic design features of the main offensive air platforms - by the fact that they were optimised for low-altitude flying. But the RAF high command was, nonetheless, unwilling to draw too much attention to the very obvious failure of low-level tactics in the specific circumstances of the Gulf operation.

If lessons reports must be honest, then it is also essential that they are focused. If, for example, an operational-level report is allowed to become submerged under a plethora of tactical details, the lessons implementation process may end up being spread across an excessive number of separate projects, to the detriment of many, if not all. It is better to identify a narrower range of realistic goals, and it is vital that these are understood to command priority status by all personnel concerned. This, in turn, is likely to have far-reaching organisational implications. It is possible that, to some extent, insufficient prioritisation lay behind the fact that some of the RAF's Gulf War lessons were exploited less fully than others. This was certainly the view held by a number of officers involved in later lessons studies.[48]

Third, we should note that lessons are rarely, if ever, implemented in a vacuum; attention and resources may well be diverted by competing pressures, and this was certainly true after the Gulf War. Indeed, even if the air lessons report had offered more direct criticisms and made stronger recommendations, even if prioritisation had been better, or follow-up action had been less constrained by technological factors, the 1990s political and financial environment would

have erected a series of truly formidable obstacles. At the time, defence was dominated by the fallout from *Options for Change*, the accompanying structural reforms, and the sequence of air operations mounted over Iraq and the Former Yugoslavia. There was minimal opportunity to pause and reflect on past experience. In this challenging environment, it is hardly surprising that the RAF should have become increasingly engrossed in issues of day-to-day command, management and planning for the future, even if this was, to an extent, detrimental to the Gulf War lessons exploitation process.

Finally, there is the more difficult question of whether or not the RAF can legitimately claim to possess a learning culture. The answer must inevitably be somewhat subjective and imprecise but, to this author at any rate, the picture appears mixed. On the one hand, it cannot be denied that a great deal of valuable work has been done in the tactical and sub-tactical lessons area since the first Gulf War. Subsequent operations have given rise to a multiplicity of detachment and unit lessons reports; IT modernisation across defence during the 1990s led to the development of improved lessons collection, storage and retrieval processes, and to the construction of lessons databases from which it has become far easier to spot recurring themes and monitor the progress of implementation. Augmenting the work of the individual Armed Services, the Directorate of Operational Capability (DOC) at the Ministry of Defence has been assigned responsibility for the preparation of defence lessons reports, which inevitably incorporate some air lessons, as do such joint reports as emanate from the lessons section at the Permanent Joint Headquarters (PJHQ).

On the other hand, however, there are indications that the RAF has not always paid sufficient attention to lessons exploitation at the operational level. The only operational lessons report that it produced between the Gulf War and the Kosovo conflict was a very brief paper on Operation Deliberate Force in 1995, written while hostilities were still in progress. No overall air lessons report was prepared on RAF operations in response to the crisis in Bosnia, in which eight types of fixed-wing aircraft flew more than 15,500 sorties over a period of five years, in addition to a very substantial flying effort mounted by the support helicopters and transport aircraft. The Tornado GR-1s and GR-4s between them flew 13,200 sorties in the southern Iraq No-Fly Zone over more than a decade, while GR-1s, Harriers and Jaguars mounted 9,700 in the northern zone;[49] a number of other aircraft types were also involved, such as tankers, reconnaissance platforms and F-3s; but the RAF did not conduct operational-level lessons studies of its contribution to Southern or Northern Watch.

Furthermore, the RAF did not create a permanent, dedicated, lessons staff during the 1990s, so temporary ad hoc teams had to be formed to prepare reports in the aftermath of the Kosovo conflict and following the manoeuvre phase of the second Gulf War (Operation Telic) in 2003. No overall air lessons report has been prepared on the subsequent counter-insurgency phases of Operation Telic, nor, after 12 years, have air operations over Afghanistan been the subject of an RAF lessons study. Ultimately, a permanent lessons cell was created within Strike (subsequently Air) Command Headquarters, but with a staff far smaller and of far more junior rank than that

of its counterpart at the Army's Lessons Exploitation Centre; again, it is primarily concerned with tactical lessons collection activity. The operational level has largely been left to PJHQ and the DOC. The disadvantages inherent in this situation from the RAF's perspective should be obvious. To all intents and purposes, there is currently no organisation within the defence community that is clearly tasked and resourced to conduct the identification of UK air power lessons. None of this necessarily means that the RAF lacks a culture of learning, but it is also hard to avoid the conclusion that this culture could be more deeply rooted and that, until it is, at least some opportunities for identifying, learning and exploiting lessons will probably be missed.

Notes

[1] Eliot A Cohen and John Gooch, *Military Misfortunes: The Anatomy of Failure in War* (Free Press, New York, 2006), pp. 26, 233.
[2] Cohen and Gooch, pp. 6-16.
[3] RAF press release, 'Operation Granby – Fact Sheet', 9 May 1991, pp. 2-4 (held at Air Historical Branch).
[4] Sebastian Cox and Sebastian Ritchie, 'The Gulf War and UK Air Power', in Sebastian Cox and Peter Gray (eds), *Air Power History: Turning Points from Kitty Hawk to Kosovo* (Frank Cass, London, 2002), p. 288.
[5] Ibid., p. 290.
[6] Ibid., p. 291.
[7] Air Publication 3040, 5th Edition, p. 3 (held at Air Historical Branch).
[8] Cox and Ritchie, 'The Gulf War and UK Air Power', pp. 290-291.
[9] John Lake, 'Panavia Tornado Variant Briefing Part Two, Air Defence Variant', *World Air Power Journal*, Autumn 1997, p. 126.
[10] RAF press release, 'Operation Granby – Fact Sheet', 9 May 1991, pp. 1-2.
[11] Cox and Ritchie, 'The Gulf War and UK Air Power', pp. 292-294.
[12] Ibid., p. 295.
[13] Ibid., pp. 295, 297.
[14] Ibid., pp. 290-292; Command Paper (CM) 1559, *Statement on the Defence Estimates, 1991* (HMSO, London, 1991), p. 18. Command Papers are British government publications presented to Parliament.
[15] CM 1981, *Statement on the Defence Estimates*, 1992 (HMSO, London, 1992), p. 75.
[16] Cox and Ritchie, 'The Gulf War and UK Air Power', pp. 297-298.
[17] CM 1981, p. 75.
[18] *TIALD: The Gulf War* (GEC Ferranti corporate publication, 1991), p. 48.
[19] CM 1981, p. 75.
[20] Cox and Ritchie, 'The Gulf War and UK Air Power', pp. 295-297; Lindsay Peacock, 'Cats in Action: Jaguars in the Gulf', *RAF Yearbook Special: Air War in the Gulf* (Royal Air Force Benevolent Fund, Gloucester, 1991), p. 28.
[21] Group Captain Robin Springett, 'Logistics in the Post Cold War Era', *Royal Air Force Historical Society Journal*, 19 (1999), p. 105.

[22] Air Commodore Paul Crotty, 'Logistics Support in the Gulf War', *Royal Air Force Historical Society Journal*, 19 (1999), pp. 103-104.
[23] RAF press release, 'Operation Granby – Fact Sheet', 9 May 1991; pp. 4, 6-9. Personnel and freight were also flown into theatre by civil charter aircraft.
[24] Cox and Ritchie, 'The Gulf War and UK Air Power', pp. 299-300.
[25] CM 1559, p. 26.
[26] Sebastian Ritchie, *Operation Granby: Jaguar Operations* (unpublished Air Historical Branch narrative), Appendix B.
[27] Ibid.
[28] www.dasa.mod.uk/natstats/ukds/2002, Tables 2.8 and 3.3, accessed 10 October 2008.
[29] CM 1981, p. 32.
[30] www.raf.mod.uk/rafwaddington/aboutus/airwarfarecentre.cfm; www.raf.mod.uk/rafwaddington/aboutus/otherunits.cfm; accessed 10 October 2008.
[31] CM 2550, *Statement on the Defence Estimates*, *1994* (HMSO, London, 1994), pp. 59-60; CM 3999, *The Strategic Defence Review* (The Stationary Office, London, 1998), p. 25.
[32] CM 4724, *Kosovo: Lessons from the Crisis* (The Stationery Office, London, 2000), Chapter 7, Air Operations – Conduct and Lessons, para 7.45.
[33] S. McLaughlin, 'Ubique Loquimur – Tactical Communications Wing', *RAF PR Magazine*, 1998, p. 16 (held at Air Historical Branch).
[34] Sebastian Ritchie, 'The Decline of Mobility: The RAF and Deployed Operations since 1945', *Royal Air Force Historical Society Journal*, 19 (1999), p. 72; Group Captain Robin Springett, 'Logistics in the Post Cold War Era', pp. 105-106.
[35] www.parliament.the-stationery-office.co.uk, Select Committee on Defence Thirteenth Report, 26 July 2000; Select Committee on Defence Sixteenth Special Report, 25 October 2000, ANNEX, accessed 10 October 2008.
[36] *The Strategic Defence Review: Supporting Essays* (The Stationery Office, London, 1998), Essay 6, p. 6-5, para 19.
[37] RAF press release, 'Operation Granby – Fact Sheet', 9 May 1991, p. 10.
[38] See for example Lake, 'Panavia Tornado Variant Briefing Part Two', p. 127.
[39] CM 4724, Chapter 7, *passim*.
[40] For example, the Brimstone anti-armour munition project, which dated back to the 1980s, was revived after the Gulf War. However, the weapon was not ready for service in 1999, and subsequent protracted delays finally resulted in the purchase of American Maverick anti-armour missiles in 2001 to provide a stop-gap capability.
[41] The Advanced Short-Range Air-to-Air Missile and the Advanced Medium-Range Air-to-Air Missile; see CM 3223, *Statement on the Defence Estimates*, *1996* (HMSO, London, 1996), p. 61.
[42] CM 4446, *Defence White Paper* (The Stationery Office, London, 1999), p. 26. Although the Storm Shadow stand-off munition was used during the second Gulf War (March-April 2003), the vast majority of GR4 offensive missions employed Paveway 2 laser-guided bombs and involved over-flight of the target.
[43] www.parliament.the-stationery-office.co.uk, 11 Feb 2000, Column 344W, John Howe, Chief Executive of the Defence Procurement Agency, to Menzies Campbell MP, 11 February 2000,

accessed 10 October 2008.
[44] Ibid.
[45] www.harrier.org.uk, *RAF's Kosovo Performance Revealed*, August 2000, accessed 10 October 2008.
[46] CM 2270, *Statement on the Defence Estimates*, *1993* (HMSO, 1993), p. 70.
[47] See for example CM 4724, Chapter 7, paragraphs 7.8-7.14. In this official report on the Kosovo conflict produced by the British government, the accuracy of bombing was primarily measured in terms of the minimization of collateral damage. The report also emphasized the link between higher altitude flying and casualty limitation.
[48] The author's conversation with the Kosovo Lessons Team, 6 September 1999.
[49] Data held at Air Historical Branch.