

Viewpoint

Operation Granby: A Personal Perspective

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Biography: After a 35-year military career, Air Commodore Byford is currently the Defence and Political Adviser to MBDA, where he is principally responsible for strategic engagement between the company and the Front-Line Commands. During his RAF Service, which started as a University Cadet at Cambridge, he flew 4,000 hours as a Tornado pilot in the strike, attack and reconnaissance roles, commanding at every operational level. Staff appointments included a spell as Director Defence Studies (RAF) and his last appointment as Assistant Commandant (Air) at the Joint Services Command and Staff College.

Introduction

Context

It is over thirty years since I flew my first combat mission. Since then, I have taken part in many operations, but inevitably, my first experience of battle made the most powerful impression on me, and with hindsight shaped my subsequent career. In January 1991 I was a first tour Tornado strike/attack pilot destined to play a very minor role in Operation Granby, the UK's contribution to the coalition created to free Kuwait after its invasion by Saddam Hussein's Iraq. I can still clearly remember the heady mixture of excitement, anticipation and dry-in-the-mouth trepidation I felt as I pushed the throttles through the gate, engaged reheat and thundered into the night sky of the Gulf at the back of an eight-ship formation. I needed all the power on offer because my newly desert-pink painted jet was heavily laden with eight 1,000lb iron bombs on draggy, twin-store carriers. Like the other fifteen aircrew in the formation, I had no previous combat experience, but a very clear expectation of what an air war would look like. This was shaped by the culture of the force I was part of, the equipment I flew and the way I had been trained and indoctrinated since arriving on a front-line squadron as a junior pilot three years previously, and I will return to these themes below.

Arguably, the 1991 Gulf War represents the most significant watershed in the RAF's post-Second World War history. Although the air force has been involved in many conflicts since 1945, up to Operation Granby the active involvement of its combat air elements were relatively brief and niche in nature.¹ In the Cold War, the RAF was essentially a peacetime deterrent, untested in actual combat. The Gulf War changed all this. The majority of the available fast jet force was committed to battle,² giving a whole generation of RAF personnel – including myself – their first taste of combat. It also transpired that the end of the conflict did not mark the expected return to peacetime flying and the *status quo ante*, but rather the beginning of a period termed by a former Chief of the Air Staff as the 'Age of Uncertainty'.³ This saw the RAF committed to continuous combat operations which endure to the present day: at first in Iraq again, and then subsequently and in quick succession, Bosnia, Kosovo, Afghanistan, Libya and most recently, Syria and Iraq once more.

However, the Gulf War is more significant for the RAF than merely being a point of transition between the uneasy peace of the Cold War and the ceaseless combat operations of the succeeding three decades. The intensity of combat at scale challenged and then forced us to change our assumptions, doctrine and eventually our very culture; or what Clifford Geertz describes as 'the stories we tell ourselves about ourselves'.⁴ It also led to changes in equipment and training and, in particular, drove the transition from a static, home-based, Cold War force construct based on numbers, mass and attrition to a paradigm centred upon the expeditionary delivery of highly precise effects in support of the joint campaign. It is no coincidence that these changes paralleled transformation in the strategic context. The Gulf War is neatly bookended chronologically by the fall of the Berlin Wall in November 1989 and the dissolution of the Soviet Union itself in December 1991. This heralded a switch in planning and purpose

from force-on-force Clausewitzian wars of national survival to wars of choice fought 'amongst the people.'⁵

However, history tends to be cyclic, not linear, and although the RAF has spent most of the period since the Gulf War supporting counter-insurgency operations with the benefit of almost total air superiority,⁶ the Ukraine conflict is now challenging this model. The emergence of a bellicose Russia and the rise of China had already led to the proliferation of freely exported, highly capable anti-access and area denial weapons (particularly sophisticated surface-to-air systems such as the Russian S-300 and Chinese H-9 family) threatening Western air supremacy. The Ukraine war and the techniques and technologies employed (both top-end and innovative and novel) have demanding a renewed focus on peer or near-peer combat at scale. This in itself makes the Gulf War worth examining as the RAF's last experience of something like this kind of operation.

The recent development of concepts such as 'Agile Combat Employment' and 'Hostile Risk Operations' demonstrate the RAF is rediscovering some of the Cold War ideas such as dispersal and survivability, the need to protect the home base and the requirement to generate combat mass. Perhaps most importantly – and most problematic, as it requires a cultural shift from where we have been over the last thirty years – is the growing understanding that risk may need to be approached in a different way when the threat is existential and casualties and attrition simply inevitable. This involves not just the risk we accept on operations, but also the way we develop and procure capability and equipment. UK support for Ukraine has been a useful reminder that cheap, quick and agile capability development is possible, but only if our current procurement system, which insists on a near-zero risk approach which inevitably adds huge cost and delays to any programme, is mitigated or even bypassed completely.

What follows is unashamedly a personal reflection based on my own experience as a junior pilot, and in no way reflects any officially sanctioned view of the war. This was a formative and sometimes visceral experience early in my career and I am very conscious it shaped my subsequent outlook, thinking and approach. Indeed, I often had to question whether my responses to later leadership or decision challenges were a logical response to the particular circumstances at the time, or a lazy reversion to an early experience of combat not necessarily appropriate to a very different context. So, I will not seek to assess strategy or analyse operational-level decision-making in 1991, but instead reflect my impressions at the sub-tactical level. My interpretation of events is purely my own; many of those also there will have seen and experienced the same events in a different way and will, no doubt, wish to challenge my assertions. So be it.

The RAF in 1990

What did the RAF that went to war in 1991 look, feel and think like? First and foremost, it was a peacetime air force, or at least my part of it, the fast jet force or combat air element, was. At a mess dinner at a Tornado base in the early nineties it was exceptional to see anyone wearing a

campaign medal, because there was simply no recent combat experience. A few hardy souls had been involved in the Falklands War nearly a decade previously and, of course, the support helicopter force was actively engaged in Northern Ireland, but these experiences were virtually non-existent within the Tornado force.

However, although we had no direct experience of war, we thought we knew what a war would be like. For almost fifty years the RAF had configured itself to fight the Warsaw Pact in North-West Europe. This meant developing pragmatic ways of countering numerical superiority and operating in the face of a sophisticated, integrated air defence system. Because we could not resource a suppression of enemy air defence capability to counter the surface-to-air missile threat at altitude (where the North European weather would likely preclude operations anyway), the solution was to attack at low level, under the radar to exploit surprise. It was accepted that casualties would be very heavy. For example, the planning assumption for the RAF Marham Tornado Wing's 'Day One' of the war 'Option Alpha' pre-planned conventional attack mission was up to a 50% attrition rate. Cold War calculus determined this was a price worth paying in a war of national survival to suppress a key enemy airfield and help buy time for the cavalry, in the shape of the USA, to cross the Atlantic and ride to NATO's rescue. There were many consequences of this philosophy and these are worth exploring because of the impact they had on the conduct of the Gulf War. Three broad areas are worth considering: doctrine, equipment and training. In combination these generated a fourth: the particular mind-set and institutional culture they engendered.

Doctrine

As has now been well documented, the RAF took a 'doctrine holiday' for a protracted period leading up to the Gulf War. This was because of the accepted premise that the only conceivable use of UK air power was as part of NATO operations in Europe. Events such as the Falklands War were dismissed as aberrations and, despite the efforts of individuals such as the then Director of Defence Studies, Group Captain Andy Vallance, to promote broader thinking about the wider employment of air power,⁷ the overwhelming consensus was that there was little point in expending intellectual effort on the strategic or even operational use of air power. Instead, the focus was firmly fixed on tactical excellence in the execution of tactics, training and procedures ('TTPs'), based on an expert knowledge of NATO SOPs (Standard Operating Procedures) and STANAGs (NATO Standardization Agreement). Only tactical thought was therefore required to determine how we could best execute the various NATO SUPPLANS (NATO Supporting Plan) by meeting our obligations to fill the slots allocated to us on the Air Tasking Order. Pre-scripted and carefully choreographed plans were rehearsed endlessly, but procedural excellence came at the price of a certain rigidity in outlook. It is easy to be sceptical about the value of doctrine, but at the very least it shapes mind-sets and sets institutional cultures and expectations. Without it - or at least thinking about it - the natural tendency of airmen to focus on the technical and the tactical at the expense of broader and more imaginative thinking was exacerbated. Undoubtedly, in 1991 this hindered our ability to understand and adapt quickly enough to the demands of a different sort of war in a very

different sort of place to the war we had prepared for in such depth over such a long period of time.

Equipment

The commitment to low-level operations drove equipment procurement, in terms of both platforms and weapons. The Tornado itself is a good example. With a small wing area and high bypass turbofan engines, at low level it provided a smooth ride, excellent gust response, good fuel economy and a very stable weapons aiming platform. However, this all came at the expense of altitude performance, and a war-loaded Tornado struggled to reach half the cruising height of a typical airliner. Clearly this hindered its subsequent adaptability, and although the Tornado provided absolutely sterling service and was repeatedly updated to keep it current as a weapons platform, this was in spite of (rather than because of) its fundamental design and aerodynamic qualities.

The Tornado's weapons suite was also optimised for low-level employment: 1,000lb retard and ballistic bombs,⁸ the JP233 anti-airfield weapon, BL755 anti-armour cluster bomb and twin 27mm Maser cannons were all designed to be used at low level. The only exceptions, and only guided weapons in the arsenal, were the AIM-9L Sidewinder for self-defence and the Air Launched Anti-Radiation Missile (ALARM) for suppressing air defences, although it was envisaged that both would be launched principally at low-level anyway.

The focus was on cheap, unguided weapons to provide big stockpiles and generate the mass effects required for large-scale attrition if and when the Cold War turned hot. The inherent inaccuracy of these weapons was offset by large warheads (so a near-miss would hopefully still achieve the desired outcome), or area effects (such as the football-field sized footprint provided by the cluster of 147 bomblets delivered by the BL755). The logical corollary of this philosophy was the WE177 tactical nuclear weapon, which like the rest of the Tornado's weapons was unguided and intended to be dropped from a low-level profile, but could generate an effect which would more than make up for any lack of accuracy. Clearly, the potential collateral damage effect of all these weapons was huge, but this was not expected to be a major factor in the kind of existential (and probably nuclear) conflict foreseen in a European Third World War.

Training

Operating at low-level is demanding and requires continuous practice, especially because the continuing dependence on unguided weapons meant the skill of the crew in aiming them, not technology, would determine if the desired effect could be achieved. Using dumb weapons at very low-levels required extremely accurate flying and set parameters to be achieved, demanding a very rigorous training regime which carried its own inherent risks. Bird strikes, controlled flight into terrain, mid-air collisions in uncontrolled airspace (in an environment where much larger numbers of aircraft were operating than today) and pilot error all imposed a steady toll of casualties which would be unacceptable and unsustainable

in today's RAF. In the late eighties, peacetime training attrition in the military fast jet force was running at 10-20 aircraft and aircrew every year (the equivalent of an entire squadron), but this was universally accepted as absolutely par for the course.⁹ In itself, this loss-rate reinforced the prevailing mind-set that fast jet flying was an inherently risky business where casualties could not only be expected but were inevitable, in peacetime as well as war. It is sobering to reflect that the RAF lost nearly fifty of the original 220 Tornado GR aircraft originally procured: seven in combat, but over forty in flying accidents, mainly in the pre-Gulf War era.

Culture

The doctrine (or lack of it) and focus on low-level equipment and training tailored to a specific purpose, war against the Warsaw Pact in Western Europe, produced a powerful organisational culture and drove a particular mind-set. The Tornado force expected to fight from its well-found, hardened, permanent main operating bases in the UK and Germany and this was frequently tested and practised when we were called to demonstrate our readiness at no-notice by the siren call of the TACEVAL (NATO Tactical Evaluation)¹⁰ hooter. The expectation of what war would be like was shaped by the requirement to don nuclear, biological and chemical protection (flying even a simulator sortie wearing the AR5 aircrew respirator assembly still sends a shiver up the spine of Tornado aircrew of a certain age) and display our competence in our primary role: nuclear strike using the WE177 tactical nuclear weapon. All this cemented the widely held view that a future war would be so devastating that conflict was almost inconceivable; so in all honesty, very few of us joining the Tornado force in the late eighties truly expected to have to fight, unlike the situation today. After all, over the preceding fifty years, several generations of our predecessors had served full careers – those non-campaign medal wearing seniors at mess dinners – without having to do so. But if we did engage in conflict, our training and indoctrination led us to believe casualties would be very high, in both the conventional and nuclear stages. Within the expected context of global Armageddon and the near certainty of our eventual demise, the emphasis was on buying time and selling ourselves as expensively as possible, reflected in the number and type of weapons we would drop, from tactical nuclear bombs at one end of the scale to cluster munitions at the other. The focus was firmly on doing as much damage to the enemy as possible before our own inevitable destruction; almost regardless of the consequences, including any associated collateral damage effects.

In summary, the pre-Gulf War RAF fast jet force had very little or no experience of war, and did not, in its heart of hearts, ever expect to fight, because the consequences would be so dire (for itself and everyone else) if it did. Events were to prove that it was very difficult to break the mind-set generated by almost fifty years of preparation solely for a certain kind of war. The force I flew with believed that in the unlikely event of being committed to combat, our fundamental purpose was to maximise weapon effects rather than put a premium on our own survival, and heavy casualties were inevitable. This perception was only reinforced by the steady drumbeat of peacetime attrition that was accepted at the time as a matter of course. If anything, it was heightened, when the Kuwait crisis erupted in the summer of 1990, when

we learned the Iraqi armed forces were largely equipped with the same types of Soviet aircraft and air defence systems we expected to encounter in Europe, so it was easy to assume this would be the sort of conflict we had prepared for: *'the war'* rather than *'a war'*.

Deployment and Preparation

One manifestation of the lack of previous combat experience was a certain naivety and the rules-free, 'all bets are off' approach that was sometimes apparent in the preparation phase in theatre. There was an unspoken assumption that tiresome peacetime rules and regulations were no longer necessary now we were 'on operations', an unaccustomed novelty for virtually the entire force. Unfortunately, this resulted in the avoidable loss of an aircraft and two crew members in a low-flying accident immediately prior to the war, and demonstrates the importance of maintaining supervisory control and discipline even (and perhaps especially) under war-time conditions.

There was a widespread perception that this was a 'once-in-a-generation' event which was very unlikely to be repeated, and whilst some were dismayed at the prospect of impending combat (there was a very small 'I didn't sign up for this' element), a much larger cohort was more concerned about the career implications of 'missing out', so a degree of 'entry-ism' was also evident as we prepared and deployed.

With hindsight, these pressures contributed to some flawed decision-making about force selection and deployment. One squadron lost its commanding officer in a flying accident during a pre-deployment work-up sortie in the UK. His successor had already been nominated as part of the routine command rotation process and naturally wanted to go to war with his new squadron following the loss of his predecessor. However, he was still converting onto the Tornado from another aircraft type, so was rushed through the remainder of his course to deploy in time. Unfortunately, and with very limited hours on the Tornado, he was tragically lost on his first mission flying a very demanding low-level flight profile at night which was unfamiliar to him. An interim commander (an outgoing squadron commander) was temporarily appointed to lead the squadron on its return to the UK whilst a new permanent commander was put through conversion. Four squadron commanders in six months constitutes a Second World War-level of attrition and the effect on cohesion and morale may be imagined. The current force commander construct is obviously very welcome if one of the benefits is to free the principal decision-maker from the distractions of running a station, so he or she can concentrate on knowing and understanding the readiness and capabilities of the force he or she is responsible for more intimately. This should enable better and more informed operational judgements to be made, including selecting who is, and is not, fit and ready to deploy.

Another corollary of the perceived exceptional nature of the operation was the natural desire to assemble an 'A-team' (those considered as the best, most qualified and most experienced operators) to fight what was expected to be a one-off event as effectively as

possible. However, under the stress of combat age, experience and qualification did not necessarily provide a reliable indication of performance under pressure, and the 'all-star' concept was no guarantor of best results. The more experienced aircrew naturally tended to be older and therefore family men with more to lose, and the relatively small number of 'combat refusals' we experienced tended to be confined to this group rather than more junior aircrew, who generally performed at least well enough and often outstandingly, and most importantly were happier to fight a high-risk war.

The decision to cherry-pick crews rather than deploy as formed squadron units also had important implications for command. Core squadron cadres along with their commanding officers were deployed to the three main Tornado deployment bases used in the Gulf, but individual four-ship elements drawn from other squadrons were used to augment them into larger non-formed units. This meant individuals within the detachments could be entirely unknown to each other (the Tornado force was at its peak at this time, with four main operating bases split between the UK and Germany) and there was no, or at best limited, access to the Form 5000¹¹ and other supervisory tools. Given a squadron commander with the right leadership qualities and personality, the non-formed unit model might (and did) work well. However, at the location where I was based the model failed utterly and there was little effort, or even interest, in ensuring cohesion and inclusivity across the entire detachment. With a limited flow of information and direction, the individual four-ship force elements turned inwards and fought their own war in their own way.

One important lesson I drew from this was that there was a very good reason why Lord Trenchard saw the squadron as the building block of the RAF. Clearly, there will always be circumstances when augmentation or specialist skills are required on a detachment, but as a point of principle I would always prefer to commit to battle (either in command or under command) wherever possible as a formed unit. This might appear to provide less capability than selecting the best qualified individuals from across a force, but in my experience is more than offset by the cohesion and spirit built up over time; particularly the shared understanding of the strengths and weaknesses of the whole team, led by a known and established point of command.

Execution

Phase One – Low Level

For the reasons previously explained, the Tornado force's natural specialism, by dint of training and equipment, was suppressing the Iraqi Air Force's ability to generate a high-tempo sortie rate by attacking the operating surfaces of its major airfields. This was an important task, as at that time the Iraqis possessed the fifth largest air force in the world, including modern Soviet types such as the Fulcrum fighter, and was expected to put up a stiff fight after Saddam Hussein had promised the Coalition 'the Mother of all battles'.¹² Early missions were flown at night against Iraqi bases using the specialist JP233 anti-airfield weapon, which dictated a very low-level attack profile along or across runways. Sometimes the main attack force was

supported by aircraft lofting 'slick' (ballistic) 1,000lb bombs in an attempt to suppress flak (most airfields were heavily defended by anti-aircraft artillery), or ALARMs where intelligence had identified a surface-to-air missile threat. The attack formation was invariably part of a much larger package of aircraft, usually contributed by US armed forces and including fighter escort, stand-off jammers and 'wild weasels' with a hard kill, destruction of enemy air defence capability provided by the AGM-88 High-Speed Anti-Radiation Missile.

These missions had some success in denying the Iraqi Air Force the freedom to operate from its main operating bases, but the hazardous flight regime, demanding weapon release profiles and strong air defences resulted in four losses (in combat accidents and by enemy fire) in the first week of operations: over 25% of total Coalition losses for about 2% of the sorties flown at that time.¹³ However, this high loss-rate was neither unexpected nor surprising to us given our chosen modus operandi and pre-conceptions of what an air war at scale would look like. Although unwelcome and tragic at a human level, in the light of the heavy defences and testing flight regime, the casualties were in line, or even less, than our expectations for this sort of operation. It was only when we looked elsewhere, at the very low percentage loss rate experienced across the rest of the Coalition, that we began to think that this might be a very different kind of war from the one we had expected, and one which might need to be fought it in a different kind of way from that which we had trained for.

The need for a reappraisal was reinforced when it became increasingly clear that the Iraqi Air Force was not going to come out and fight. It seldom attempted to fly and, when it did mount sorties, these were to take refuge (and face internment with its erstwhile enemy) in Iran, so the absolute priority to deny operating surfaces to the enemy was no longer compelling; it was clearly pointless to suffer a very high casualty rate to deny the enemy a capability which he didn't appear to want to use. Consequently, the decision was made to switch to medium-level night operations, bombing from around 20,000 feet. At this altitude we were safely above most potential anti-aircraft fire, whilst the support package of jammers and weasels could adequately suppress the rapidly degrading Iraqi air defence system.

Phase Two – Medium Level

The difficulty was we had neither planned nor practised for medium level 'dumb' bombing operations. The Tornado's ground mapping radar and main computer were optimised and harmonised for low level, and we had to rediscover arcane planning features like mid-altitude winds and 'D'-factors. Just as importantly, we had no on-board or real time means of assessing where we had dropped our bombs or what, if any damage, we had inflicted (satellite imagery arrived days later and often not at all), so it was impossible to correct, adjust and adapt weapons-aiming methodology as we went along. The learning process included properly understanding safe separation when the relatively new multi-function bomb fuse was employed, and this cost another jet and captured crew when a bomb detonated prematurely beneath the aircraft. Steep angle dive by daylight was an exhilarating and enjoyable alternative to night medium-level bombing (at least for the pilot if not the

navigator), and potentially promised greater accuracy. However, it could still be rather too exciting to be properly effective, as I discovered when diving through a carpet of heavy, 85mm-calibre flak to bomb a Scud missile assembly facility, and in practice the results were not markedly better than level bombing in terms of accuracy. It became apparent that area targets, such as oil refineries or barracks complexes, were the only targets we could attack from medium level with unguided weapons with any real prospect of success.

Phase Three – Precision

The limited effectiveness of medium-level bombing with unguided weapons underlined the need for a precision attack capability to be fielded as quickly as possible if the Tornado force was to retain its relevance in theatre. Ferranti had been running a programme since 1988 to develop a Thermal Imaging and Laser Designation (TIALD) pod, and two pre-production models (instantly named 'Sharon' and 'Tracey' after a pair of notorious characters in the 'Viz' adult comic) were rushed to theatre, along with the civilian technicians who would re-engineer and adjust them between sorties.

More significant heft was provided by a rapid deployment of Buccaneer aircraft equipped with Vietnam War-era Pave Spike laser designation pods. With the addition of Paveway laser seeker and fin kits to modify existing ballistic 1,000lb bombs, we now had the basis for a fair weather, daylight-only co-operative designation (or 'buddy-spiking' capability), with a Buccaneer marking the target for two Tornado 'bomb-trucks' with three Paveway Laser Guided Bombs each acting as the delivery platforms. My four-ship was withdrawn from operations for a couple of days to practise the choreography required, and subsequently executed the first successful Buccaneer/Tornado co-operative strike on 2 February 1991, against a highway bridge over the Euphrates. Thereafter the detachment operated with considerable success, dropping bridges, cratering runway intersections and picking off individual hardened aircraft shelters and their contents. However, the Pave Spike pods were old and weather-limited; the failure of one pod just after weapons release resulted in 'wild' (unguided) bombs and a major collateral event which, in a harbinger of things to come, attracted considerable press scrutiny and subsequently prompted a much greater focus on limiting collateral damage in the target selection and planning process.

We experienced only one more combat loss, our sixth, on St Valentine's Day 1991, when a Tornado at the rear of a long 'daisy chain' of aircraft prosecuting a single axis attack was destroyed by a surface-to-air missile at medium altitude. This prompted some soul-searching about complacency, especially whether ease of planning was trumping considerations of operational efficacy. I claim no particular prescience for earlier flagging this up as a matter of concern, but at this stage of seniority I was a career tail-ender and was, therefore, only too aware that nearly all of our combat losses were concentrated at the rear of formations. Consequently, I insisted (within my four-ship at least) that we compressed time on target brackets, planned multi-axis splits and varied ingress and egress routing. A lesson which has remained with me since 1991 is that however routine the operation appears to have

become, however tired you are and however tedious the planning process is, your own personal survival should provide sufficient motivation for you to take the time to persevere to produce the most operationally effective plan; and you owe this extra effort to those you are leading if not yourself. The 'Kiss principle'¹⁴ is admirable as far as it goes, but it only goes so far, particularly when you are flying as Number 8 in an eight-ship formation.

Consequences – the Dawn of the Precision Era

I returned from the Gulf in the spring of 1991 a little older if not necessarily wiser. After a sojourn as an instructor at Tornado Weapons Conversion Unit - seemingly entirely untouched and untroubled by the war and teaching the same weapons events in exactly the same way as it had when I had graduated three years beforehand - I returned to front-line squadron flying, and another dozen operational detachments over the next fifteen years. So what messages did I take away from those few intense and eventful weeks in 1991?

First and foremost, the Gulf War indicated that the age of precision had arrived. The RAF was already drawing down in size as UK governments sought to reap the post-Cold War 'peace dividend', and clearly a much smaller combat air element would need a more precise weapons effects capability if it was to generate the required outcomes. It was also clear that we would need to husband our resources better, as each aircraft and crew would be an even more valuable asset, so we needed to minimise combat losses as well as maximise weapon effects.

Events in 1991 demonstrated that these demands were not compatible with the unguided weapons we were principally equipped with. They might be cheap, simple and plentiful, but could only be delivered with little if any stand-off, forcing attacking aircraft to over-fly targets in the heart of enemy air defences. Weapons such as the JP233 limited operational choice by dictating that particular parameters were met, which forced us to adopt rigid weapon release profiles and made us predictable and therefore more vulnerable. The high workload and precise flying demanded expensive and risky training to assure proficiency, which also imposed significant costs. Furthermore, the inherent inaccuracy of dumb weaponry meant targets had to be attacked by large numbers of aircraft, or repeatedly re-attacked, to guarantee the desired outcome was achieved, exposing the force to extra risk. Finally, the lack of accuracy meant high numbers of weapons, weapons with a very large kinetic effect, or clusters of weapons were needed to neutralise targets, greatly adding to the risk of collateral damage. In the Gulf War, this became an increasing issue, and in the operations which followed, where popular and political consent was required to support continuing participation in conflicts widely regarded as discretionary 'wars of choice', it has become progressively more unacceptable. It is therefore no surprise that each operation subsequent to the Gulf War has seen an increasing percentage of precision or complex weapons used, and we have now reached the point where, other than the gun, we have no unguided weapons in the combat air inventory.

Again, it is interesting to see how events in the Ukraine are challenging this new orthodoxy. On the one hand, precision has been demonstrated to be more important than ever, but on

the other, cheap drone swarms and off the shelf capabilities rigged with rudimentary warheads have also proved effective in generating combat mass. In an existential struggle, sensitivity about collateral damage is proving a luxury and capabilities such as mines and cluster munitions have been used by both sides. This is no surprise: as a previous UK Air Component Commander pointed out, the Russian air campaign in Syria and Iraq was overwhelmingly based on dumb and cluster munitions to deliver mass effects to destroy infrastructure and coerce non-combatants.¹⁵

The challenge for the RAF is how to generate sufficient combat effect – probably through a mixture of mass and precision – in a way that is affordable, is sustainable and meets its ethical and legal obligations. The current all-guided weapon inventory certainly does not meet all of these criteria.

Conclusion

Inevitably, my reflections on the RAF's role in Operation Granby focus on the events that made the most impact on me personally, so these tend to be biased towards what went wrong rather than what went right. It is easy with hindsight to pick over the tactical detail, but I believe the most fundamental issue was our collective failure to comply with Clausewitz's famous dictum to understand the kind of war we were fighting.¹⁶ We failed to engage intellectually with the circumstances facing us and instead fell back too readily on our assumption of what kind of war it would be, and simply applied the tactical template we were most comfortable and familiar with. This is an enduring problem which we need to challenge properly every time we commit to operations, because each conflict will be different, and each will therefore demand a different approach.

In many ways, the Gulf War was the progenitor of the next three decades of operations and the current 'Western way of air warfare', based around the principle of minimum force and the delivery of low-collateral and highly precise effects in discretionary wars of choice. However, we should be equally wary of trying to apply this template to future air operations without very careful thought. Ukraine clearly demonstrates a conflict involving peer or near-peer adversaries employing sophisticated capabilities would look very different to our recent experiences. Numbers, mass and attrition will be vital again, and issues like the affordability of weapon stockpiles and the balance between collateral and kinetic effect require careful reappraisal.

In closing, I would like to redress the balance to some extent by highlighting some of the things we *did* get right. Although we may have been slower than we should have been in identifying the need to adapt, once the requirement for change was identified, transformation was quick and decisive, including the innovative adoption of novel and untried techniques and equipment and the insertion of new capability into theatre. It was particularly laudable that we demonstrated the flexibility to extemporise 'in contact' whilst conducting high intensity air operations, and in the end made a hugely significant contribution to the air campaign

and the ultimate success of the Coalition in freeing Kuwait from occupation. However, one note of caution is that in 1991 we had the force depth, capacity and resilience (with 25 fast jet squadrons) to make these sort of changes quickly: it would be much more difficult to generate rapidly additional resource from today's painfully thin combat air element.

I am also proud of the resilience the Tornado force showed in absorbing heavy initial losses, and morale never really dipped significantly, although unsurprisingly a certain gallows humour was evident. On a personal level, I was really only anxious about whether I could do the job properly without letting myself, my navigator and my squadron down by making simple or stupid mistakes under pressure. Ironically, I found it more difficult later, at a less dangerous stage of the campaign, when I knew I could do the job, so had more time to worry about the threats and risks involved. I have nothing but respect for the older and more experienced aircrew with extensive family commitments. Many clearly had very real concerns about their own personal safety, but nevertheless demonstrated the grit and courage to carry on regardless. I clearly remember one formation leader trying to plan a route when his hand was shaking so much that he couldn't hold a ruler. With hindsight, I now recognise he was a very brave man to find the courage to contain his feelings and continue to function effectively. I have certainly found my own response to danger was very different later in my career, with changing circumstances of family and personal life, than it was when I was a twenty-something junior pilot with very little to lose; so perhaps war really is a young person's business.

Finally, whilst the contribution of the Tornado force to Operation Granby may not have been flawless, it was significant and ultimately very effective. It also set the conditions for the Tornado's subsequent unprecedented and unbroken record of operational service where it – and the men and women who flew and supported it – provided the backbone of the RAF's combat capability for over a quarter of a century, continually evolving to deliver the hard edge of UK air power right through to Operation Shader. When the Tornado Force finally disbanded in 2018 it was far more capable and (dare I say) professional than the force I first went to war with back on that humid Gulf night in 1991. Nevertheless, I still count myself as being very fortunate to have benefited from the experience so early in my career, not least because as a military pilot, I believe the ultimate test of ability and professionalism can only be provided by performance in combat.

Notes

¹ Even in the Korea War RAF combat air engagement was limited. Suez and Malaya involved significant combat air elements, but involvement in the Falklands War was confined to a single Harrier GR1 squadron.

² Although the participation of the air defence force was constrained to rear area defence and the Harrier force was not deployed.

³ Air Chief Marshal Sir Stephen Dalton, Chief of the Air Staff, *'Air Power in an Age of Uncertainty'*, speech at the Royal United Services Institute, London, 13 July 2013.

⁴ Geertz, Clifford, *The Interpretation of Cultures*, London: Basic Books, (1973).

⁵ See Smith, Rupert, *The Utility of Force: War in the Modern World*, London: Allen Lane, (2005).

⁶ This is, of course, not to say western air-power has been completely uncontested: surface fire, improvised explosive devices and information operations have all been used to degrade the effectiveness of air operations whilst significant and sophisticated air defence threats existed in the campaigns in Iraq (2003), Bosnia, Libya and most recently Syria.

⁷ Vallance, Andrew, *Air Power – Collected Essays on Doctrine*, London: HMSO, (1990).

⁸ Ballistic or 'slick' 1,000lb bombs could be dropped from medium level, but before the War were almost exclusively delivered using a loft profile from low level.

⁹ In the five years prior to the Gulf War, UK military fast jet losses were as follows: 1986 – 13, 1987 – 18, 1988 – 14, 1989 – 11 and 1990 – 15.

¹⁰ The NATO Tactical Evaluation (TACEVAL) process culminated in major, no-notice exercises designed to test all aspects of readiness, force generation and tactical execution.

¹¹ The Form 5000 is an individual's personal flying record and includes any supervisory issues or concerns.

¹² Hussein, Saddam, speech marking the 70th Anniversary of the Iraqi Army, 6 January 1991.

¹³ RAF Tornado Losses During Desert Storm, www.defenceoftherealm.worldpress.com, accessed 13 April 2018.

¹⁴ KISS = Keep it Simple, Stupid!

¹⁵ Stringer, Air Commodore Johnny, press statement at MOD London, 3 November 2017.

¹⁶ Clausewitz, Carl von, *On War*, Princeton: University Press, (1976).

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