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SELECTED GLOSSARY

ABC	Airborne Cigar
ACOS	Air Crew Officers School
ACRC	Air Crew Reception Centre
ADGB	Air Defence of Great Britain
AI	Air Interception
ALI	Air-Land integration
ASC	Air Support Controls
CSBC	Close Support Bomber Control
CFE	Central Fighter Establishment
EATS	Empire Air Training Scheme
ECM	Electronic Counter Measures
EFTS	Elementary Flying Training School
FASL	Forward Air Support Link
FC/GCI	Fire-Control/Ground-Controlled Interception
FIU	Fighter Interception Unit
FRL	Flight Refuelling Ltd
FTS	Flying Training School
FuMG	*Funkmessgerät*
GCI	Ground Controlled Interception
IADS	Integrated Air Defence System
LAM	Long Aerial Mine
LCT	Landing Craft, Tank
MAAF	Mediterranean Allied Air Forces
MEDME	Mediterranean and Middle East Command (RAF)
MOS	Ministry of Supply
MU	Maintenance Unit
NWACAF	North West African Coastal Air Force
OPCON	Operational Control
ORB	Operations Record Book
ORS	Operations Research Section
OTU	Operational Training Unit
PGM	Precision Guided Munition(s)
QDM	Magnetic bearing *to* a station
RAFME	Royal Air Force Middle East
RATG	Rhodesian Air Training Group
RCM	Radio Counter Measures
SDR	Strategic Defence Review
SEAD	Suppression of Enemy Air Defence
SWF	Special Window Force

Our Guest Speaker, following the Society's Annual General Meeting at the RAF Club on 13 June 2018, was

Air Chief Marshal Sir Richard Johns GCB CBE LVO FRAeS

DEFENCE – MONEY, POLITICS AND TECHNOLOGY

At the end of WW II more than a million men and women were serving in the RAF with a front-line operational strength of 9,035 aircraft. When I was commissioned at Cranwell in 1959 the uniformed strength of the Service had shrunk to a little under 200,000 with 1,051 aircraft in the front line. In 1998, my second year as CAS, the uniformed strength was 55,466 with 593 front line aircraft. These numbers are taken from the second edition of Air Chf Mshl Sir Michael Armitage's history of the RAF.[1]

I have written an autobiography that covers my career in the Service, so I have gone no further than the year 2000. But as I got to the point of handing over to Peter Squire I was left wondering how and why the RAF had diminished in size so spectacularly during my own years of service, so I set out to try and answer the question and that's what I am going to talk about this evening.

Several of Trenchard's foundation stones were removed during my career. The unremitting search for 'efficiency savings' led to the closure in 1992 of the Apprentice School at RAF Halton with all RAF recruit training subsequently undertaken there. The Staff College at Andover had long gone and was to be followed by its successor at Bracknell in 1997. The Flight Cadet entrance to a permanent commission was abandoned in 1971 in favour of a graduate entry scheme. So the Air Force I led from 1997 to 2000 was very different from the service that fought World War II and which I had joined in 1957.

At the end of the Second World War the country was broke. Waging total war for five years had destroyed the basis of the UK's economy. Any hopes that the Americans would be generous in helping the UK to recover from straightened circumstances were dashed when the US refused a request for an interest-free loan of $6bn. Our former enemies were to enjoy far more generous American largesse than their

[1] Armitage, Michael; *The Royal Air Force – An Illustrated History* (Arms and Armour, UK, 1993).

ally who had fought the Germans earlier and longer. Eventually the Americans agreed a 50-years loan of $3.75bn at 2% interest with the pound sterling freely exchangeable for dollars. The loan was finally paid off in 2006 after the country had endured a succession of financial crises under Prime Ministers Atlee, Eden, Macmillan, Wilson and Callaghan.

Many years of financial austerity were imposed with varying degrees of vigour by Treasury officials as guardians of the UK's solvency that brought them into an unavoidable collision with the guardians of the nation's security – the Chiefs of Staff. The confrontation was complicated by political aspirations. Successive Prime Ministers wished to adorn the world stage as leaders of a major military power that was a permanent member of the United Nations Security Council. On the other hand, the protection and enhancement of key elements of the welfare state remained a top political priority. At the end of the Cold War, in a strategic environment that posed no evident and immediate threat to national security, it was inevitable that the Treasury's grip on defence spending would be tightened.

Economic difficulties and the quest for the peace dividend were not the only factors that conditioned a gradual decline in our national combat power. As an airman I have always understood that air power was based on a foundation of scientific and technological superiority. This fundamental truth was illustrated during my own career by leaps in technology that have seen, for example, the RAF move forward from the Hunter to the Tornado to the Typhoon with the F-35 soon to enter service. For some time now satellite derived technology and target acquisition sensors have provided the capability to attack individual targets with terminal precision at night and in all weather. But the cost of technology in the development of airframes and weapons has continued to grow to accommodate the demands of a complex electronic and cyber environment that affects communications, navigation, target acquisition, weapons delivery and precision guidance. One Tornado armed with a single PGM that has the destructive power of 25 dumb bombs can deliver a devastating impact equivalent to that achievable by a squadron of Lancasters. This figure work may be no more that, a back of the hand estimate, but it illustrates the point that the loss of one Tornado is equivalent to the loss of a squadron of Lancasters. And that introduces the issue of

numbers.

With a unit cost of approximately £90m for a Typhoon comparatively few aircraft can be afforded within a fixed or declining defence budget, nor can the aircraft be quickly replaced. While many more much cheaper aircraft of lesser capability could be bought, there would be a concomitant increase in infrastructure and manpower costs. But as aerospace technology will not stand still it is imperative that the smaller the RAF is numerically, the more important it is that the combat performance of its aircraft should be second to none with the technological superiority to overcome an enemy of greater numerical strength. Mastery of the air will remain the perennial requirement in all operations. Acceptance of this precept assumes that the RAF will be equipped with sufficient aircraft to meet its defence missions as mandated by the government.

It has thus been a combination of national economic circumstances and consistent growth in the cost of equipment and associated rapid advances in technology that has generated irresistible pressures for a steady decline in the size and mass of the Service. The RAF is not alone. At the end of the Strategic Defence Review (SDR) (1997/8) the RN was left with 33 destroyer/frigate warships. That number has now subsided to 19. The Army's manpower, more than 110,000 as agreed in the SDR, has now sunk below the 82,000-target set in the 2015 Strategic Defence and Security Review. All this was in the future when I retired in 2000, but there were factors already evident that were to exercise a malign influence on the size and capabilities of our armed forces.

When I took over as CAS I was surprised by the limitations of my authority. The job specification, as set out in the Annual Appraisal Report, read that I was responsible for, 'The operational effectiveness, efficiency and morale of the RAF. Advice to ministers on all aspects of RAF business and the RAF's contribution to jointery. To contribute to the formulation of defence policy and increased efficiency and to implement such policy within the RAF.'

This rather convoluted description of key responsibilities was presumably mirrored in those set out for my RN and Army colleagues. Looking back with the benefit of hindsight I can claim to have made a contribution to 'jointery'. But, as already explained, the Service I left behind was less operationally effective than the one I inherited.

Professional efficiency may have remained a constant while morale had, arguably, been stabilised, not least by avoiding a further cut in the uniformed strength of the RAF. I had won the argument over the future of the Jaguar force while the leasing of four C-17s represented my only procurement success. I would have liked eleven, but the Service was already committed to the procurement of the A400M. The scant attention paid to my concerns about the viability of Nimrod MRA4 illustrates the limitations of my influence on procurement decisions.

While I supported the policy of maintaining continuity of an at-sea nuclear deterrent and the sustainment of the necessary forces to project military power with intervention capabilities, I was not involved in any strategic discussion. Throughout the Cold War and its aftermath successive governments had launched reviews to cut defence expenditure under a cloak of readjusting strategic objectives. But strategic thinking had withered on the vine during the Cold War as the UK accepted US military hegemony. Although the major European contributor to NATO, the UK invariably followed the American lead as her most useful ally to protect in part political addiction to the 'special relationship'. But the strategic certainties of the Cold War, based on the prevention of conflict through nuclear deterrence, ended with the dissolution of the Soviet Union. As NATO grappled with the consequences of this unexpected collapse, strategy became confused with policy; both lacked clarity of definition and strategy within the Alliance became largely synonymous with policy.

In the UK, post-Cold War repercussions, including the search for the peace dividend, complicated the definition of a national defence strategy that reflected the essential differences between strategy and policy. Military strategy, the servant of politically defined policy derived from national strategic objectives, concerns the application of military resources to implement government policy. If the principal policy objective is the security of the nation, potential threats must be identified and how best to deal with them decided after all options and associated difficulties have been thoroughly analysed. In theory this process requires senior military commanders to respond to political ambitions with practical realism that reflects their understanding of the nature of war. But this process appears to have been supplanted by another that decides how much money is available and then squeezing

the Armed Forces to fit within the allocated budget. Without a clearly defined national defence and security strategy, policy is made on the hoof and subject to the whims and prejudices of those in government and particularly those holding the purse strings. And, if policy is *ad hoc*, military strategy has to be infinitely flexible and that tends to undermine consistency of thought and process. Perhaps this in part explains the deployment in 2006 of our Armed Forces on concurrent operations in two theatres of war without adequate resources and against all planning assumptions set out in the SDR.

In recent years politicians have been ever keen to stress that the UK's defence budget is the fourth largest in the world. Expenditure is invariably equated with capabilities but seldom with any convincing explanation of their strategic relevance. There is an obvious difficulty in doing so when the political horizon stretches no further than the next election and particularly so when the cynical cliché 'there are no votes in defence' is as true today as it was in the early 1930s. Competition between government departments to spend the taxpayer's money favours those with short term relevance to personal well-being. That said it should be acknowledged that, when the country's finances are in a mess, national stability is an essential element of national security. And for better or worse, that is the priority the Treasury will always give.

Fear alone as experienced in the late 1930s and sustained at a lower level of public awareness throughout the Cold War provided a rationale for defence spending taking a larger share of GDP than at present – some 5% rather than the current 2% that owes more to creative accounting than strategic realities. If politicians gloss over the dangers associated with global instability and ignore perilous uncertainties of the future, it is difficult for defence professionals to present a case for more spending on defence with persuasiveness that resonates with the voting public. Moreover, it would appear that the MOD's budget setting process has time and time again failed to match costs to available budgets. The consequence is recurrent huge affordability gaps – black holes – that end up with equipment projects being scrapped or delayed.

During my years of service, the story of equipment procurement has included a number of expensive failures that grabbed the headlines. That said, and in all fairness, the introduction to service of

many lesser but operationally important systems has been achieved on time and within budget notwithstanding rapid technological advances in all dimensions of warfare. But as intelligence staff assessments sway in their judgement of the most potentially damaging threat to national security, there is an inevitable temptation to readjust procurement decisions. Within a given defence budget, the reality is to rob Peter to pay Paul. Threat assessments are subject to one eternal military truth best expressed by one of the most clever and wise men it has been my privilege to know. Sir Michael Quinlan, one-time Permanent Under-Secretary at the MOD, wrote:

> 'In matters of military contingency, the expected, precisely because it is expected, is not to be expected. Rationale: What we expect, we plan and provide for; what we plan and provide for we thereby deter; what we deter does not happen. What does happen is what we did not deter, because we did not plan and provide for it, because we did not expect it.'

There is perhaps no better argument for maintaining a balance of defence capabilities and to resist the temptation to counter an emerging threat by budgetary adjustments that block one potential capability gap while uncovering another threat of continuing relevance.

The authority and standing of the individual Service Chiefs have been gradually eroded over the years. Power is now concentrated in the MOD centre with the Chiefs rusticated to their operational headquarters albeit with access to an MOD office when called to attend meetings. Remote from the centre, the Chiefs remain responsible to the Secretary of State for Defence for the operational efficiency and morale of their Service while now also having to carry the burden of responsibility for their budgets. Taken together morale and operational efficiency depend on the provision of the necessary equipment, manned and supported by adequate numbers of well trained and motivated personnel. But sustaining morale in circumstances of constant financial stringency is problematic when, for example, demanding exercises necessary to maintain operational effectiveness are cancelled at short notice for budgetary reasons. Doing so in response to a political requirement inverts both responsibility and accountability but it is the Chiefs who suffer

reputational damage.

As threats to our national security continue to increase and indeed change in nature the Armed Forces cry out for strong political leadership. Notwithstanding earlier comment about Treasury priorities, it is reasonable to expect that the Services are kept in a high state of efficiency with the social and economic consequences accepted as the cost of our safety and freedom. But the appointment of eight Secretaries of State for Defence within the last decade is symptomatic of political indifference in the high echelons of government. The cost of training sailors, soldiers and airmen to combat readiness varies in degree according to specialisation but is universally expensive. But service personnel are the only defence asset whose value appreciates with time. Once trained their value to their parent service continues to increase as experience is gained and wider responsibilities accumulated. Retention of such people makes both military and economic sense, but successive reviews to cut defence spending leave serving personnel and possibly potential recruits doubting the sincerity of political commitment to the well-being of the Armed Forces and the security of the nation. ‘Efficiency savings’ almost invariably involve an erosion of benefits and quality of life. Retention difficulties are consequently inescapable.

Within the RN, the Army and the RAF self-respect, an important constituent of morale, is influenced by public approbation. The popular public attitude to our Armed Forces is one of pride as clearly evidenced in welcome home parades for units returning from Afghanistan and the spectacular success of supportive fund-raising activities such as ‘Help for Heroes’. Such high esteem is, however, sadly lacking in some minority elements of contemporary society and indeed in Whitehall and Westminster. Ritual and unctuous references to our brave men and women cannot disguise the unpalatable fact that complimentary platitudes go hand in glove with the imposition of economies that reduce both combat effectiveness and personal benefits.

Defence of the realm is the first duty of government. The threats we face and the pace of technological change may be transforming some aspects of warfare but traditional armed force is still relevant to our national interests in deterring armed conflict and assisting friendly allies in unstable regions of the world. Our Armed Forces can, if

adequately equipped, trained and manned make an effective contribution to global security in the interests of sustaining a strong economy so essential for national prosperity. But in focusing on material aspects of combat power – a common political trait – it should always be remembered that it is ultimately the man or woman behind the gadgets that finally count in war. Without adequate equipment the bravest can accomplish little. Without brave people equipment has no value. This simple but eternal military truth should be writ large in the consciousness of all concerned with our national security and international clout.

Acceptance of The Queen's shilling and enlistment in the Armed Forces is a commitment to a life that is one of 'unlimited liability' as most tellingly defined by General Sir John Hackett. It is this liability, setting servicemen and women apart from the civilian world, that merits respect for all who wear The Queen's uniforms. And nor should it be forgotten, that the men and women of our Armed Forces are ever ready to assist civil authorities struggling to cope with natural disasters let alone to respond to acts of terrorism.

As a former CAS I still on occasion wear my uniform. And I do so with pride as I share with many others memories of the RAF's accomplishments in peacetime and at war. Today conflict, that defies simple categorisation, remains commonplace. Since the end of the Cold War not a day has gone by when the RAF has not been committed to operations somewhere in the world that have ranged from high intensity conflict at one end of the scale to humanitarian relief at the other. The men and women of the Service, of every branch and trade, have done their duty with commendable discipline and no small measure of courage. One hundred years after its formation as the world's first independent air force the RAF now faces a future clouded by strategic uncertainty. But it can do so confident in the knowledge that size for size it still remains second to none. Long may it remain so.

DISCUSSION

Wg Cdr Andrew Brookes. Could I just ask for your views on the fact that, next year, we will not have even one bomber squadron? We will have some Typhoons – which have an emergency capability – but, for those of us who were members of Bomber Command in the days when we had a real strike force, it's a bit sad that we no longer have any *real* bombers – just a limited amount of 'combat air'. Mr Putin's single squadron of 35 aeroplanes provides him with awesome leverage. I'm not saying that we should be doing the same, but if we really want to compete, is it not sad that by next year we won't have one bomber worthy of the name.

Air Chf Mshl Sir Richard Johns. Well, I have to say that I really can't agree with that. Single-role aeroplanes are simply passé. Today, we need aeroplanes with a genuine multi-role capability. The Tornado has given us outstanding service for more than 30 years but it is an old airframe now, and it shows. But it's not really the airframe that matters – it's the weapons it carries, and a Tornado armed with Storm Shadow and Brimstone is a formidable combination. As to Typhoon, when it entered service it was solely as an air superiority fighter, but it had the potential to become a multi-role aeroplane, and that potential is now being realised. By the time that the Tornado finally goes out of service, the Typhoon will have inherited its weapons while retaining a first-class air combat capability with advanced short- *and* long-range air-to-air missiles. The future clearly belongs to multi-role aeroplanes, exemplified by the F-35, which will shortly be entering squadron service. While we can look to the past, and take pride in what earlier generations did with role-dedicated aeroplanes, like the V-bombers, that really is – history. The future lies in technological development and highly adaptable aeroplanes.

To flesh that out a little, it is worth considering what our current aeroplanes are achieving. During 2017, the Royal Air Force deployed over 2,400 personnel to 23 countries, directly supporting 15 operations across five continents. In the course of doing that, its Typhoons and Tornados flew more than 2,000 strike/attack missions against Daesh and ISIS targets in Iraq and Syria. So the RAF is certainly earning its keep, and I believe that, in the future, whenever the government decides that it is necessary to intervene directly – to

exercise coercive force – it's first choice to apply that force will, inevitably, always be the Royal Air Force.

You don't look too impressed with that answer . . .

Brookes. It doesn't get around that fact that there aren't going to be any Tornados – any bombers – next year . . .

Johns. I know there won't, but, on the other hand, there are going to be more Typhoons. The Tranche One Typhoons, that were due to be withdrawn from service, are being retained in the purely air defence role. They will form two additional squadrons dedicated to covering the QRA commitment, both in this country and down in the Falklands. Retaining these early production models, without investing in the very expensive upgrade programmes that would be necessary if they were required to carry sophisticated attack weapons, will leave the other, eventually six (once No 12 Sqn has reformed) squadrons to focus on the multi-role tasks. But, to reiterate a point made in my address, the issue of mass is also a question of expenditure. An air force of only 33,000 men and women – albeit supported by a large number of contractors – imposes finite limits on what we can actually *do*. Unless it is a case of national survival, we will always, inevitably, be participating in 'coalitions of the willing', but probably making a disproportionate contribution. If you consider Gulf War I, Kosovo and other operations in the Balkans, in terms of offensive air power, we have done something like 10 to 15% of NATO operations mandated by the UN.

Wg Cdr Jeff Jefford. That figure of 33,000 uniformed personnel causes me some concern. You can get 90,000 in Wembley Stadium so it can accommodate the whole of the RAF almost three times – it's not even a respectable football crowd. Perhaps even more worrying, you can get the *entire* British Army in there – with room to spare! Is there sufficient resilience, robustness if the system were to be put under stress?

Johns. To be quite honest, I don't know the answer to that one. The only person who could really answer that question is the current Chief of the Air Staff. What I do know is that, in my time, the air force was numerically stronger than it is today, because we still had the Jaguar Force, the Harrier Force and quite a lot of Tornados. And we were

busy, with operations over north and south Iraq, and ongoing commitments in the Balkans and the Falklands. When we got down to 55,000 uniformed personnel, I wrote a personal letter to the Minister for the Armed Forces, John Reid, saying that we really could not go below the 50,000 that the previous government had required us to do. I wanted to stay at 55,000 and I put in a caveat that said, 'We can do this *and* stay within our budget.' I was pretty confident that I would get a 'Yes' and that's precisely what I got.

But that was eighteen years ago. When I see that the Service has now gone down to 33,000, I do wonder about the implications of that. I have no real feel for the rotational impact – how many detachments people are doing in a year – where they're going, and so on. That said, when I occasionally go up to see my old squadron – a Typhoon squadron these days – it is clear they are very, very busy. But they do seem to be capable of sustaining the rate of operations currently put upon them. While the uniformed numbers may be low, they do have substantial contractual back-up, and the availability of Typhoon is quite remarkable, certainly compared with what we used to have to put up with in the Harrier Force. Typhoon's day-to-day availability on the flight line is significantly higher than any type of aeroplane that I ever flew. So, despite the numbers, the Service is able to do its job.

There is a problem, however. How many people can you keep in? How many people become disenchanted with this rate of operational effort? How many highly trained technicians and aircrew decide they have had enough and/or that their investment in the air force does not realise, in cash terms, the pay-back that they had perhaps anticipated? I don't know the answer to those questions either – they would have to be answered by people who were currently serving.

Wg Cdr John Stubbington. In the context of Strategic Defence Reviews, I think that we have to recognise a change in the nature of warfare or, at least, the way in which it is conducted. I am thinking of the advent of unmanned aircraft. Would you agree that they are going to become a larger part of the air inventory and, potentially, a less expensive part?

Johns. Let me start by saying that the purpose of the Royal Air Force is not to keep people in cockpits – people like me, and others in this audience, who enjoy flying aeroplanes. The purpose of the Royal Air

Force is to generate air power. So what of drones? At the moment, we operate Reapers, controlled both from this country, at Waddington, and from the United States. They do a very useful job in places like Afghanistan and, indeed, the wider Middle East. Compared to a Typhoon, a Reaper is relatively cheap to make, and it can stay on station for – how long? I'm not familiar with the specifics of the Reaper's performance, but its endurance will certainly be in excess of 12 hours – without the complication of AAR – permitting it to provide persistent surveillance of a particular incident or an area of interest, relaying images in real time. Furthermore, if it is armed, typically with Hellfire missiles, it can be used also to destroy a target. But – you can only do all that when you have control of the airspace, because drones are extremely vulnerable to both air- and ground-based threats.

It is theoretically possible, of course, that later generations of drones may be able to engage each other in a form of drone-on-drone warfare but I don't believe that it will ever be possible to dispense completely with the man-in-the-loop. Someone has to be personally accountable for deciding which targets to attack when there is such political sensitivity about collateral damage. Sometimes, he may well be in a bunker on the ground, but I cannot see manned aircraft going out of business for many years – perhaps ever, not least because of drones' inherent vulnerability – they can only really be deployed in a benign air environment.

Gp Capt Jock Heron. Sir Richard, you have spoken about offensive air and air defence, but not the maritime world. They have been without a patrol aircraft since 2010. There is soon going to be a ramp-up of P-8 Poseidons but, as with the F-35, we could be held to ransom by the Americans, because we cannot support these aircraft independently. Can you see any lever that we can pull to ensure that we can continue to operate outside a collective arrangement with the USA?

Johns. I think that the decision, in the SDSR of 2010, to do away with MPA, was probably one of the most stupid and disastrous decisions ever made within the Ministry of Defence. Having said that, I recall that, when I first became CAS, I inherited from my predecessor a very strong, forward-looking equipment programme. But there was one aeroplane about which I thought, 'Hmm – I'm not

Following the demise of the 'NimWACS' project in 1986, at least one Nimrod AEW 3 survived for a while. Photographed in 1993, this is ZE263/8967M, which served as a ground instructional airframe at Finningley for the benefit of trainee air engineers. (Aviation Photo Company)

so sure about that'. It was Nimrod, or the replacement Nimrod – the MRA4. Why? Because, I could remember the trouble over 'NimWACS' – remember 'NimWACS'? We were looking for an airborne early warning system in the 1980s and we tried to cram into a 1950-type airframe everything that would be needed. Many people said, 'It won't work,' but we went ahead anyway in response to political direction, if my memory is correct. I forget how much money went down the drain before the project was cancelled in favour of Boeing's off-the-shelf E-3.

Moving on a generation, we needed a new MPA aircraft and, once again, we were looking at the Nimrod airframe. I said, at the time, instinctively – intuitively – 'It won't work'. Why? It was going to involve new wings (which they had an awful lot of trouble persuading to fit), new engines and a new glass cockpit. It all *looked* terribly modern but, as before, they were still trying to squeeze into a 1950's fuselage all the kit you need to provide the full scope of capabilities that you need in an MPA aeroplane. It might have been possible to get it all in, but could it all be knitted together to produce the coherent plot that maritime people need? I had serious doubts and I said as much to the then Secretary of State, George Robertson, who listened very carefully. Needless to say, BAE Systems were somewhat put out and they had the advantage of being able to table facts and figures, against

which my mere intuition carried little weight. Nevertheless, George Robertson asked me what I would do if the MRA4 programme were to be cancelled. I replied that I would approach the Chief of Naval Staff in Washington, Adm Jay Johnson, whom who I knew very well from a previous NATO appointment, and ask him for 24 of the many surplus USN P-3 Orions that he had stored in the Arizona desert. We would only need to buy the bare airframes and the engines and we would then fit all the necessary systems into that capacious fuselage.

It sounded good – I thought – but, when we next discussed this it was clear that BAE Systems had successfully deployed a counter-argument, essentially that cancellation of Nimrod would cost, I forget the precise number but, probably something of the order of 1,500 jobs, and from the Secretary of State's point of view, Warton was within the footprint of three Labour constituencies. So the outcome was a foregone conclusion – an unbeatable combination of the economy, employment and politics meant that the MRA4 programme would be sustained for another ten years. Nevertheless, it was eventually cancelled and, when it was, it was still not really capable of doing the job that it was supposed to do.

There was another possibility. We could have run-on the remaining Nimrod MR2s until we managed to acquire those P-3 Orions. I still think that we could have worked with those and that they would still have been working very well today. We are now obliged to buy a brand new aeroplane, and the only place that we can get an aeroplane from, that will actually meet the Royal Air Force's needs, is the USA. That does involve, as Jock suggests, a degree of vulnerability and we will surely be dependent on the Americans for the support of some systems in the Poseidon – certainly software – so I do hope that this aspect – along with the price – is being very carefully contracted.

Having said all that, there may be another problem here. President Trump is shortly to attend a NATO meeting and it will be interesting to see how that plays out. There could be some long-term consequences – only time will tell.

AVM Nigel Baldwin. In the context of President Trump's visit – I recently read that the German Air Force has just four serviceable Typhoons. Please someone tell me that it's not true! If it is, Trump is really going to go for that. So – perhaps a final question. Do you have

any feel for the serviceability rates, of both aircraft and aircrew, in the Typhoon Force, for example – and the Tornado Force? Are we fairly comfortable, despite all the constant detachments?

Johns. Well, these are personal views, of course – but, clearly, it's all about serviceability rates and the Typhoon is a success story. The people who work on them tell me it's an easy aeroplane to work on. It's 'black box technology'. If something goes wrong, you simply whip out the appropriate black box and put in a new one. And it works! So the availability of Typhoons, on all the operations they are undertaking at the moment, is very high. On the other hand, as a consequence of their age, and spares availability, they do struggle with the Tornado, but even they are still managing to cope.

If you consider the air transport force, the most significant aeroplane to come into service, certainly since I left, is probably the Voyager. I understand that, in terms of air-to-air refuelling, it can do, in a single mission, what it would probably have taken a whole squadron of Victors to do. As an example – I think I've got these figures right – last year, operating over Syria and Iraq, Rivet Joint and the Sentinel flew some 9,500 hours of intelligence gathering, supported by over 600 Voyager tanker sorties. Much the same is true of tactical aircraft. The longest flight I ever did in a fighter was about five hours, but Typhoon pilots seem to think nothing of doing eight hours strapped to an ejection seat!

And then there's the C-17 and, again, its availability is absolutely outstanding and, as a result, many people in the British armed forces owe their lives to that aeroplane. This never received much publicity, but the fact is that if a soldier was wounded in Afghanistan, and our helicopter people were able to get him back to Camp Bastion within an hour, he would almost certainly live, because the quality of medical care was absolutely superb. From there he would be flown up to Kabul, probably in a Hercules, and then transferred to a C-17 for the flight back to East Midlands Airport where ambulances would be waiting. Having been sedated, he would quite likely be comatose throughout and, when he finally woke up, he would be in the new hospital in Birmingham! Many such cases would *never* have survived ten or fifteen years ago. Having delivered the patient, a replacement crew would fly the aircraft straight back to Afghanistan. We would

sometimes run out of aeromedical evacuation teams – the folk who looked after the casualties while they were on board – in which case, the team currently on duty simply bedded-down in the aircraft and returned to Afghanistan to pick up the next batch. Again, I don't think that the people who did this job ever received the recognition that they so richly deserved.

At our Committee meeting this afternoon we considered devoting a seminar to the Hercules, which prompts another statistic – between 1992 and 1996, RAF Hercules contributed more than 20% of the support flights into Sarajevo. They were flying-in 200 tons of supplies, every week – for four years! Who remembers that these days? It's another case of the Royal Air Force's achievements not attracting the level of publicity that they should. Sometimes I think that the British media are simply not interested in good news, only in *bad* news. For instance, Amnesty International – of *all* people! – recently alleged that we had killed many civilians in places like Raqqa and Mosul. That is absolute rubbish, because the targeting is so tightly controlled. So why pick on us? Is it because, rather than attempting to tackle the USAF juggernaut, they go for a softer target, the air force that has made the next most significant military contribution? – the RAF.

I can get very excited about this – so perhaps this is a good place to stop . . .

SUMMARY OF MINUTES OF THE THIRTY-SECOND ANNUAL GENERAL MEETING HELD IN THE ROYAL AIR FORCE CLUB ON 13 JUNE 2018

Chairman's Report.

AVM Baldwin noted that the recently published Journal 68 contained last year's AGM minutes and the address by Dr Peter Lee on the ethics of bombing in WW II compared with today. Further articles included the RAF in the Irish War of Independence and the Berlin Airlift, together with nostalgic memories of service in Oman.

There had been two seminars since the last AGM. The first, in October at the RAF Museum, Hendon, under the chairmanship of Air Chf Mshl Sir David Cousins, had covered the subject of Women in the RAF. Well attended, the audience heard a concluding presentation from Gp Capt Sara Mackmin, who had commanded flying units from squadron leader to group captain. The second, in April, again at the RAF Museum, Hendon, under the chairmanship of Air Chf Mshl Sir Richard Johns, covered significant developments and achievements by the RAF in its first 100 years. The coming autumn seminar, at Hendon, on Wednesday, 3 October 2018, under the chairmanship of AVM George Black, would examine the history of the English Electric Lightning in the RAF.

The Society's finances remained healthy in 2017 and there was a balance of some £22,500. Accordingly, annual subscriptions would remain at £18 and seminar fees at £20 per head. The Chairman also drew attention to the unfailing support of the RAF Museum in this challenging centenary year and wished them every success for the grand re-opening at Hendon. He noted, also, that many members of the committee had been long serving and there was a need for new volunteers to help continue with the work of the Society, and to prepare an orderly succession.

Concluding, the Chairman thanked the committee for their continued hard work and expressed his appreciation of the support and encouragement of the President, Air Chf Mshl Sir Richard Johns, and the Vice-President, Air Mshl Sir Frederick Sowrey.

Secretary's Report.

Gp Capt Dearman reported that since the last AGM, eleven new members had joined, one had resigned and three had died.

Membership stood at 634, but the slow decline in numbers had begun to level off. Nevertheless, efforts to recruit new members would be most welcome.

Treasurer's Report.

Mr Boyes reported on the 2017 accounts. The year had achieved a small deficit of some £3,700. Income of £18,731 was a slight reduction over 2016, but costs in 2017 had risen. Total funds at 31 December 2017 stood at £22,466 which the committee considered to be comfortable.

A proposal by Mr Cox, seconded by AVM Roberts, that the accounts be accepted, and that Mr Bryan Rogers be re-appointed independent examiner, was carried.

Appointment of the Executive Committee.

The Chairman noted that all of the committee were prepared to continue serving. A proposal by Air Cdre Tyack, seconded by Wg Cdr Andrew Walters, that the Executive Committee be re-elected was carried. The Executive Committee members so elected were;

AVM N B Baldwin CB CBE	Chairman
Gp Capt J D Heron OBE	Vice-Chairman
Gp Capt K J Dearman FRAeS	Secretary
Wg Cdr C J Cummings	Membership Secretary
Mr J Boyes TD CA	Treasurer
Wg Cdr C G Jefford MBE BA	Editor & Pubs Manager
Air Cdre G R Pitchfork MBE MA FRAeS	
Wg Cdr S Chappell MA MSc RAF	
Mr P Elliott BSc MA	

The *ex-officio* members of the committee are:

J S Cox BA MA	Head of AHB
Maggie Appleton MBE	CEO RAF Museum
Dr Ross Mahoney BA PGCE MPhil	
Gp Capt J R Beldon MBE MPhil(Cantab) MA BSc FRAeS RAF	DDefS(RAF)
Wg Cdr J Shields MA RAF	JSCSC

Discussion.

The Cranwellian Association had instigated an appeal to raise funds for a statue of Lord Trenchard to be erected at Cranwell in 2020 on the centenary of the College. Cranwell is scheduled to become the single point of entry for all RAF personnel and the committee had supported the appeal with a grant of £500. Members were invited to make individual contributions to this statue of the founder of the RAF.

Two Air Forces Award.

The President, Air Chf Mshl Sir Richard Johns, presented the Two Air Forces Award to Wg Cdr David Smathers for his paper on Air Land Integration in the Western Desert in WW II.

In 1996 the Royal Air Force Historical Society established, in collaboration with its American sister organisation, the Air Force Historical Foundation, the Two Air Forces Award, which was to be presented annually on each side of the Atlantic in recognition of outstanding academic work by a serving officer or airman. It is intended to reproduce some of these papers from time to time in the Journal. This one was the winning RAF submission in 2017. ***Ed***

'WE NEVER TALK ABOUT THAT NOW': AIR-LAND INTEGRATION IN THE WESTERN DESERT 1940-42

Wg Cdr Dave Smathers

The achievement of effective Air-Land integration (ALI) has been elusive and difficult to achieve. Whilst numerous examples of successful co-operation exist, the ability to project air power in support of ground forces has proven to be a major challenge for over 90 years.[1] Perhaps the greatest irony is that during the Great War, the British created an effective process of air support to ground operations and possessed what many people believed to be 'the finest tactical Air Force in the World'.[2] Due to inter-war cuts in annual defence budgets, the relationship between the Army and RAF in 1939 was burdened by friction and deep-rooted prejudices.[3] Certainly, the two Services had developed irreconcilable differences over the conceptual employment of air support to land operations and the lessons learnt from the Great War were forgotten. When war commenced in Europe in 1939, both Services were underequipped and unprepared for the co-operation necessary for joint warfare. Indeed, in the early years of the War, air support was inadequate and the Army lost every campaign; it was held in some quarters that the RAF 'trained and equipped to fight a separate war, could not give much support to the Army and begrudged what it gave.'[4] This has inevitably coloured judgements about the delivery of ALI, but the importance of combining air and land power was widely recognised, perhaps best exemplified in 1943, when, in one of his regular observations about the importance of ALI, General Sir Bernard Montgomery noted:

> 'If you can knit the power of the Army on land and the power of the air in the sky, nothing will stand against you.'[5]

Montgomery had been in command of 3rd Division (and briefly II

Corps) in the British Expeditionary Force in France and had seen at first-hand some of the problems in ALI during 1940. His appointment to command the Eighth Army in 1942 occurred as steps to correct many of the failings which had become apparent in 1940 were underway; although his relationship with his senior airmen was to collapse spectacularly in 1944, his part in the development of effective ALI was significant.[6]

Any understanding of the evolution of effective ALI in the Second World War requires a study of its development in the North African campaign. This article considers how fundamental weaknesses were overcome in the Western Desert between late-1940 and the Allied victory in 1943 to produce an efficient and effective system of ALI. It will examine how processes evolved after the 'calamitous Battle of France' to create a joint approach to warfare.[7] First, it will consider initiatives developed in the UK and will show how these were learnt in parallel – and then eventually adopted – by the joint forces in the Western Desert. Using operational case studies from Operation COMPASS in 1940 through to the Battle of Alam el Halfa in late 1942, it demonstrates how control of the air, willingness to co-operate, joint planning and headquarters, effective communications and sound doctrine became the critical tenets of successful ALI. As John Terraine put it, the gradual adoption of these principles 'ultimately provided a landmark in the development of air support organisation and technique during the war.'[8]

A way forward.

Although the War provided an obvious distraction from the peacetime hostility between the two Services, the defeat in France demonstrated how woefully unprepared the Army and RAF were to meet the demands of joint warfare. Indeed, the consensus of the War Cabinet and highest political office was that 'significant improvements […] increasing the fighting potential of the Army, particularly in the air, must be made.'[9] The success of air support depended on requests from ground forces being forwarded to air units in a timely fashion, with targeting co-ordinated and de-conflicted with friendly fire and troop movements. This presented a considerable Command and Control (C2) problem which necessitated extensive Army-Air co-ordination and co-operation. During the campaign in

France, Army requests for air support were passed along lengthy chains of command at separate headquarters. The system proved to be utterly inadequate to deal with rapid German operations and it broke down completely after the collapse of the Allied Front.[10] It proved impossible to carry out effective air support in a timely manner; indeed, there was no C2 process that successfully linked air power with the battlefront. Requests by Army commanders for air support would frequently take over 3 hours, often ensuring that all was lost as a consequence of disconnected and disjointed actions.[11] In contrast, German air support during the campaign proved to be sufficiently integrated to outmanoeuvre and outstrip the British model.[12] The *Luftwaffe* placed air signal liaison teams at headquarters and alongside advancing infantry and Panzer units. These controlled air strikes, whilst control teams acted as an important communications hub between requests and the *Luftwaffe*.[13] This resulted in effective air-ground liaison, enabling German forces to concentrate air power quickly in support of land forces.[14]

The British defeat in France in 1940 proved to be a pivotal moment in the exposure and recognition of weak air-land co-ordination doctrine.[15] Separate headquarters located miles apart hindered contact between RAF and Army planning staff – a problem magnified by unreliable communications and unwieldy C2 chains.[16] Certainly, early examples of air support were not successful and the two Services had no systems in place that could replicate the success demonstrated by the Germans.[17] Despite this, both agreed that 'air support was an essential prerequisite for success in a land campaign against a well-equipped and highly mobile enemy.'[18] The events in France had now created significant impetus to resolve the air support dilemma.

With the co-ordination of air support now firmly on the agenda, the Air Ministry and War Office sanctioned a series of joint Army-RAF signals experiments in order to develop tactics and procedures for close co-operation. Gp Capt A H Wann and Lt Col J D Woodall were appointed to progress the experiment as both had first-hand experience of the nature of the failures in France. Their aim was to devise an air support system that could be as effective as the one utilised by the Germans, and sufficiently robust to adjust to the rapid pace of modern military operations.[19] Prioritising flexibility, speed of response, target discrimination and communications, the output of these experiments

became one of the most significant developments in the war.[20] When the report was released in September 1940, Wann and Woodall identified a system of 'unified command' that drew on the expertise of each Service. This was a critical first stage in creating 'Close Support Bomber Controls' (CSBC), a sophisticated signals network providing rapid and effective communications between controllers at the combined headquarters and signals operators attached to forward Army units.[21] This enabled joint decisions to be taken in a timely manner, with requests for support passed directly to the nearest available airfield. Once airborne, the aircraft then received target information directly from the signals officer at the forward unit. Coningham later described it as:

> 'A plan that was far superior to anything possessed by the Germans then or thereafter, for co-ordinating the action of forward troops and supporting bombers. It was a signals network which sent out "tentacles". Army officers went forward to the leading troops and signalled back requests for support, by wireless links that avoided the normal channels, to a control centre where they were monitored by [Joint] Staff Officers sitting together. The Woodall plan, [or] what he called CSBC, was immediately adopted in principle, by both services [and was] one of the outstanding successes of the war.'[22]

An additional step, improving effective ALI, was made with the formation of Army Co-operation Command. This new RAF command centralised all Army co-operation squadrons and training establishments with a remit to develop all elements of air support to be used at home and abroad. Although the creation of this organisation originally proved promising, its inception created further mistrust as both Services developed different perceptions of its role. The Army considered it central to developing its air arm, whilst the RAF considered it as a training and tactics organisation equipped with understrength Lysander squadrons which had made significant progress with CSBC.[23] Certainly, the Army anticipated that the Command would be complemented with fighter aircraft and high performance bombers, with assets allocated to the Army as their primary function. These views were opposed by the Air Ministry, which maintained that the achievement of air superiority was central

to effective air support. These practical and conceptual differences of how to employ air power in air support operations remained largely unresolved as operational priorities overtook events.[24] Army Co-operation Command was largely successful in improving and developing tactics and techniques, but it failed to address broader policy issues and optimum aircraft usage.[25]

One step forward, two steps back.

Although it was still too early for the lessons identified between the Air Ministry and the War Office to be properly evaluated, some success was still achieved during early air support operations in the Western Desert. Ironically, this co-ordination was necessitated through paucity of resources, rather than the introduction of astute foresight. The 'combined plan' required the Army and RAF to co-ordinate joint effort in an attempt to overpower an Italian force of vastly superior numbers. Despite the absence of any standardised procedures, increased contact between the Services was encouraged. This resulted in the co-location of headquarters, an act that immediately increased the effectiveness, if not the sophistication, of the in-theatre C2 system.[26] Army intelligence officers began to attach themselves to squadrons, whilst a direct signals network was created that linked headquarters and airfields. Perhaps the most significant step forward was the perceived willingness of both air and ground commanders to co-operate and work together towards a common objective. Terraine relates this to the 'stress of war,' where the pressures of conflict drew them together.[27] Whatever the reason, the rewards of this willing co-operation and combined approach delivered immediate results. In the first limited offensive along the Libyan front, air operations focussed on bombing air bases (to secure local air superiority), reconnaissance and attacks on enemy ground forces.[28] Although this air activity was independent and involved prosecution of pre-planned static targets, the level of co-operation was high and the RAF was able to provide full support to the Army.[29] The numerically superior Italian forces were contained and air superiority enabled air support operations to be conducted relatively unopposed.

In December 1940, Operation COMPASS became the first fully co-ordinated and co-operative joint event of the campaign. From the commencement of planning operations, there appeared a determined

The mainstay of the tactical bomber force in 1940-41 was the Blenheim, represented here by a Mk 1 of No 45 Sqn.

willingness amongst both Services to plan and conduct operations together. Command headquarters were established on adjacent sites, whilst objectives were developed through joint planning teams. Certainly, Bickers argues that from 'this cordial and perceptive planning grew the concept of modern tactical warfare and tactical air forces so critical to allied success.'[30] Most importantly, COMPASS demonstrated the necessity of achieving control of the air to enable air support operations. The principal perception was that without establishing air superiority, one could not hope to influence decisively the outcome of land conflict and retain key territory.[31] Although the British had learnt the importance of air superiority in the Great War, inter-Service rivalry had ensured these principles were forgotten in the inter-war years. The Blitzkrieg clearly demonstrated how local air superiority led to overwhelming success in ground operations and RAF commanders had drawn this conclusion from German success in Europe.[32]

Initial RAF activity was focussed on seizing the initiative over a numerically superior Italian Air Force. By concentrating preliminary efforts on attacking airfields, the RAF was able to destroy large numbers of Italian aircraft, whilst forcing the remainder into a defensive posture. Within a week, Italian air operations all but ceased, providing the freedom of manoeuvre essential to conduct air support operations.[33] This was a critical development in effective support to land operations for two reasons. First, it enabled the ground commander to execute his offensive unimpeded by enemy air activity.

Secondly, the RAF was able to focus effort on the delivery of vital and often decisive air support operations, rather than providing fighters in an umbrella against enemy air attack. Such was the success of this action that it drew praise from Army HQ:

> 'Since the war began you [RAF] have attacked an air force between five and ten times your strength until finally it was driven out of the sky. You co-operated to the full in carrying out requests for [air support] and I would like to say how much this contributed to our success.'[34]

Although COMPASS was an undoubted air-land success, co-operation was still at an embryonic stage, understandably generating caution of the value of ALI lessons that could be drawn.[35, 36] Whilst the necessity of air superiority to air support operations was demonstrably clear, RAF success on this occasion was partly due to the lack of effective opposition, rather than sound tactical doctrine. Against a more co-ordinated and capable enemy such as the *Luftwaffe*, the degree to which 'control of the air' could be achieved would likely be reduced.[37] There were additional weaknesses identified that ensured air-ground co-operation remained imperfect. Several attacks were ordered on troop concentrations without co-ordination with Army headquarters, resulting in ineffective employment of air assets during the mobile phase of the ground battle.[38] Equally problematic was the difficulty in distinguishing friendly forces from the enemy. This was often caused by forward Army echelons hindering effective co-operation through poor behaviour and bad practice. Units frequently went for long periods without identifying their positions, making it almost impossible at times for the RAF to make positive identifications.[39] At this stage of the Desert War, Army and RAF Liaison Officers were only just starting to receive communications equipment for vectoring aircraft onto targets and these technical shortcomings made it almost impossible for the RAF to co-ordinate with forward troops. Furthermore, RAF headquarters frequently lost (or had no direct communications with) newly established Forward Operating Bases. Signals arrangements were poor and the telephone lines were frequently congested or unavailable.[40] Despite this, not all lessons were negative. Post-battle analysis reports declared the 'significance of airmen and soldiers working together in close co-

operation with arms of the service other than their own.'[41] It also advocated the value of intelligence liaison officers with squadrons, able to provide pilots with the latest details of operational objectives and targets; a scheme that was recognised and developed by both Services.[42]

The arrival of German forces under the command of, the then *Generalleutnant*, Rommel placed a new dimension on the Western Desert and provided the impetus for the development of a system of air support which would have decisive significance.[43] In May 1941, Operation BREVITY provided the first example of spectacular failure. There was little co-ordination between both Services and conflict over the correct utilisation of air power for close air support. Significantly, the problem of distinguishing friend from foe in close proximity remained a problem and the lack of working communications magnified this problem.[44] In response, Operation BATTLEAXE was carefully conceived and planned with a degree of equanimity between both Services; although it also ended in failure.

The failure of BREVITY contributed to the replacement of Air Chief Marshal Sir Arthur Longmore as Air Officer Commanding-in-Chief Middle East by his deputy, Air Marshal Arthur Tedder. It was at this point that personalities began to play an even more critical part in the inter-Service relationship. Progress was not without hurdles, and serious problems emerged as the early air-land co-ordination that had begun to develop during COMPASS was lost.[45] Thus, within less than a month of assuming command, the failure of BATTLEAXE led to Tedder facing recriminations over the recent disappointments. The Army and RAF preferred to blame the other party for the operational failure, an almost inevitable consequence given that one of the major problems was the fractious relationship caused by a profound disagreement over what constituted the best model for the effective use and ownership of air power. Although RAF attacks against enemy lines of communication and airfields had proven successful, the Army wanted fighters to be available overhead in a protective umbrella.[46] They also wanted bombers to be available at their call to provide close support at the forefront of the battle.[47]

Although Tedder was opposed to employing RAF assets in this manner, he had agreed to the proposal in an attempt to foster closer co-operation between the two Services. In retrospect, the use of an air

umbrella had a negative impact on the outcome of the operation. Previous success had been based on quickly achieving air superiority through the aggressive and flexible use of the RAF's meagre resources; however, the defensive posture adopted in this battle by the RAF only served to aid the British defeat.[48] Of note, German reporting identified that RAF attacks on rear communications and supply columns had been very successful, but the ramifications would have been much worse had the RAF fighter force been released for offensive action.[49]

In a report to London, General Wavell (Commander-in-Chief, Middle East) placed some blame on the RAF for the failure of the recent operation. Citing poor close support procedures and an inability to completely protect his forces from air attack, he contended that the RAF was not properly organised to provide the type of air support enjoyed by the Germans.[50] These comments brought an angry response from Tedder, who claimed that Wavell 'did not begin to understand the first principles of air warfare.' Indeed, Tedder went as far as claiming that although the model employed during BATTLEAXE was not a good example of air support, only one request had been made by the Army during the entire operation.[51] Interestingly, the Army put this down to the close proximity of enemy troops to friendly forces. This claim was refuted by Tedder who argued the fault was a consequence of poor communications procedure: in particular, the failure of the Army to respond to calls from the air to display recognition signals and the lack of friendly force positional data.[52] This made it difficult, if not impossible, for the RAF to assist the Army directly due to the risk of hitting friendly forces.[53] As a result, 'the air support the Army believed it desperately needed went unused.'[54] This disagreement clearly illustrated the gulf that existed between the two Services in their attempts to create an effective system of close support. The Army was adamant that success against a well-co-ordinated enemy required RAF assets to be under its direct command. This, they argued, should consist of a fighter aircraft for defence, and dive-bombers for intimate support.[55] Conversely, the RAF disagreed, citing the necessity of air superiority to enable effective air support operations. It was necessary, they argued, to enable an air situation where ground forces could operate freely, with air power capable of so much more than simply acting in intimate

The available fighters in 1941 were Hurricanes and Tomahawks, like this Mk I of No 112 Sqn.

support of the Army.[56]

From a broader perspective, Tedder was concerned that the 'Services were not really working together and that [ALI] demanded a degree of co-ordination that was sadly lacking in the desert.'[57] He was supported by General Beresford Pierce, ground forces commander during BATTLEAXE, who believed that the position of his headquarters (some 80 miles away from the RAF headquarters) had been 'a grave drawback'.[58] It was apparent that commanders had little appreciation of the importance of the need to work together and this, in turn, resulted in a lack of willingness to do so. Desperate to make improvements to the process, Tedder advocated the importance of developing mutual training, with Army co-operation instructors brought forward from the UK to institute training based upon common lines.[59] The importance of air superiority as a prerequisite for air support operations was central to this, not least since it seemed evident that the persistent use of umbrella tactics by Army commanders was proving costly and ineffective. Furthermore, significant improvements to embryonic wireless communication systems, tactics and doctrine for air support and closer battlefield liaison were also urgently required.

Striding ahead

The failure of BATTLEAXE brought about almost immediate change. Wavell was replaced as CinC Middle East by General Sir

Air Chf Mshl Sir Arthur Tedder and AVM 'Mary' Coninghham, 1943.

Claude Auchinleck. Tedder and Auchinleck quickly found common ground, and their first and most important initiative was the creation of an inter-Service committee to rationalise a joint system of co-operation.[60] In addition to this new committee, a series of trials was also initiated to improve communications, signalling and air support efforts. Supported by instructors who were familiar with the Wann-Woodall experiments, amendments to existing communications and signals processes led to the rapid evolution of procedures already utilised within the Western Desert. The results of these trials were reviewed at a joint air-land conference in Cairo on 4 September 1941, resulting in the production of an Air Support Directive that provided detailed doctrine on ALI concepts. In addition to defining air support operations as direct air support (close air support) and indirect air support (air interdiction) this directive also emphasised the

significance of air superiority toward achieving effective ALI. The doctrine was widely published and subsequently underpinned the development of co-operation for the rest of the campaign.[61] This conference was quickly followed by a damning edict from Churchill about the use of air power:

> 'Nevermore must ground troops expect, as a matter of course, to be protected against the air by aircraft the idea of keeping standing patrols of aircraft above moving columns should be abandoned. Upon announcing that a battle is in progress, the AOC-in-C will give him [the C-in-C] all possible aid irrespective of other targets, however attractive. The Army will specify the targets and tasks that he requires to be performed [and] it will be for the AOC-in-C to use his maximum force to these objectives the sole objective being the success of the military operation.'[62]

Additional tactics identified within the directive included the co-location of headquarters and requirement of closer working relationships between personnel at all levels.[63] This had already begun with the arrival of Air Vice-Marshal Arthur 'Mary' Coningham, whom Tedder had chosen to succeed Air Commodore Raymond Collishaw as the commander of 204 Group in the Western Desert. Collishaw had done well with his command, but, in Tedder's view, was a 'bull in a China shop', too willing to attempt to perform every task asked of him by the Army without appreciating the limitations of air power, and too enthusiastic in his attempts to run everything himself, causing 'frustration and misery' amongst his staff officers.[64]

In July 1941, shortly after his arrival, Coningham established a Joint Army-RAF Headquarters; an arrangement subsequently mirrored at Regional Command by Tedder and Auchinleck. Coningham later wrote that this decision 'was of fundamental importance and had a direct bearing on the combined fighting of the two services until the end of the war.'[65] The directive also provided a solution to one of the biggest problems that had faced effective air-land co-operation. Air Support Controls (ASC) closely mirrored the CSBC system developed in Ireland by Wann-Woodall to provide a communication system able to 'meet, modify or reject requests for air support in a timely fashion.'[66] An ASC was provided for each Army Corps and linked by

a two-way wireless tentacle to the brigades in the field. Each brigade had an RAF liaison team, a Forward Air Support Link (FASL) equipped with a two-way radio to control the supporting aircraft and receive tactical reports. In this way, the Army was able to make timely requests for support that could be rapidly evaluated at the ASC. The ASC then had direct communication with the forward airfields to request immediate air support.[67] Sometimes, aircraft were given the precise location of the air support requirement on take-off, but often they would require target indication by the FASL. A recognition system based on lights and ground signs was also developed that enabled aircraft to identify friendly forces.[68] 'Army Liaison Officers also began to arrive in theatre, specially trained by Army Co-operation Command to explain air methods to soldiers [and] to explain when things went wrong, how they could be put right.'[69] Figure 1 provides an overview of the C2 process for air support operations.[70]

Operation CRUSADER in November 1941 provided the ideal testing ground for the changes that had been implemented as part of the directive. From the combined headquarters, senior officers were ideally placed to make rapid adjustments in response to operational requirements. The RAF supported land operations in three ways: first, air superiority was established and maintained throughout the battle. Secondly, indirect support isolated the battlefield through the targeting of communications, convoys and supply networks. Thirdly, direct support was allocated, albeit with difficulty at times, in support of forward troops.[71] The introduction of the ASC was central to this improved procedure, although the newly created system was not without fault. Air support operations were often taking over two hours before the aircraft arrived over the target and the whole process required streamlining. Messages were frequently relayed in an untimely fashion, whilst aircraft transiting over 200 miles to the targets often became 'lost' trying to find their targets in the featureless desert.[72] Perhaps the most significant issue remained the difficulty in identifying targets in close proximity to friendly forces. Despite unchallenged air superiority, the failure of Army communication processes meant that opportunities to conduct direct support against key targets were not exploited, particularly as friendly force positions could not be assured. This led Coningham to report an intense 'sense of frustration at Army ineptitude' and that he planned to focus efforts

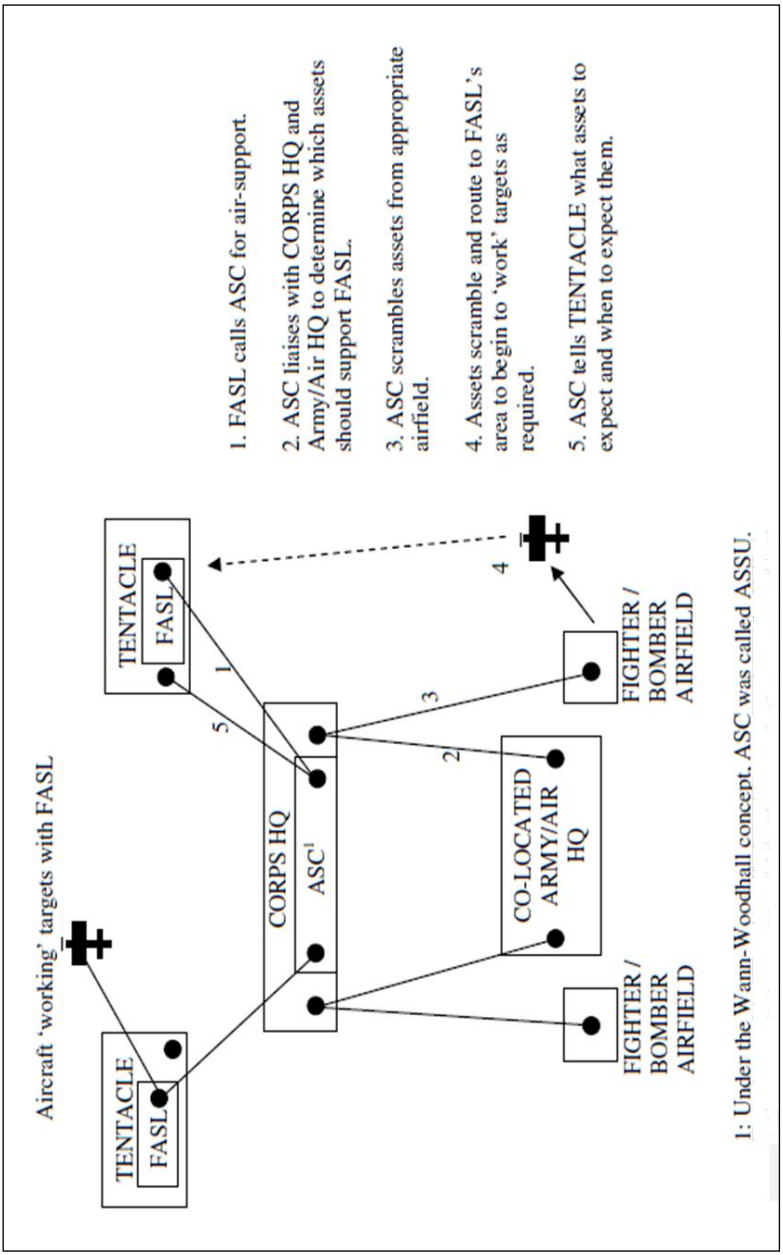

Fig 1. Schematic of C2 for air support operations.

on indirect support until they [the Army] could get their act together.[73] Despite initial failings, CRUSADER was a victory for the new system. Nearly 8,000 sorties had been flown in direct support operations and co-operation between the services was at last beginning to work well.[74] After analysing and considering ALI during CRUSADER, further lessons for improvement were incorporated into a combined Army-RAF Training Pamphlet No 3A, issued in March 1942. This focussed on centralising C2 by streamlining the ASC communications system to allow ASCs at the battlefront to communicate directly with a Joint Headquarters. It was hoped that this would help to simplify the process of calling for impromptu direct support and reduce aircraft response times. Further doctrinal improvements included target identification techniques and procedures to improve navigation.[75]

The Battles of Gazala and El Alamein between May and July 1942 provided the first opportunities to test the procedures within the training pamphlet. With the British Army in retreat, similar themes continued to emerge. Due to the fluid nature of the battlespace, confusion regarding the position of friendly forces and poor communications continued to inhibit progress. A fundamental disregard of the arranged processes was evident, with the RAF dependent on its own reconnaissance to determine friendly positions. The joint headquarters arrangement that had begun so well was severed with the Army relocating over 50 miles away from the nearest airfield, an action which Tedder stated defeated the most elementary principles of modern warfare.[76] Deep-rooted prejudices continued to emerge amongst the Army who naturally regarded themselves to be the senior parties on the battlefield. 'As Tedder and Coningham discovered, they were instinctively antagonistic to shared operational authority, especially with an airman […] and held bias about aircraft being auxiliary weapons for the Army.'[77] Despite this lack of co-ordination, air power was still able to isolate the battlefield through indirect support and provided a degree of air superiority that ensured total victory was beyond the enemy's capability. Auchinleck agreed, stating:

> 'The Air Force could not have done more than it did to help the 8th Army in its struggle. The effect on the enemy was

By the time of El Alamein No 6 Sqn was flying the 40mm cannon-armed Hurricane IID in the anti-tank role.

> tremendous, had it not been for their efforts we should not have been able to stop the enemy at El Alamein.'[78]

With fixed defensive positions finally established, the process slowly began to improve. Over 250 requests for direct support were made in July 1942 with 187 fed from the new tentacle system.[79] The time taken for aircraft to be over the target was also significantly reduced to around thirty minutes.[80] Indeed, ALI was beginning to see the benefits of doctrinal theory, co-operative training, experimentation and operational experience accrued in the desert.[81]

The arrival of Montgomery in August 1942 as Auchinleck's replacement set the conditions for ALI in the Western Desert to be perfected. With a philosophy of joint operations, integration and co-operation at every level, Montgomery understood the need for air superiority to enable effective air support.[82] Acknowledging the reliance placed on the RAF by the Army, Montgomery believed that 'any officer who aspires to hold high command in war must understand the use of air power'. He also stated that 'concentrated use of the air striking force is a battle winning factor.'[83]

By immediately locating his headquarters with Coningham's, Montgomery encouraged liaison at all levels of planning and execution between land and air with Tedder observing that air co-operation was [Montgomery's] first priority.[84] The Battle of Alam el

Halfa delivered a successful climax to ALI in the Western Desert. Providing a culmination to all the lessons learned, the battle 'exemplified the use of air power when used in direct support of the Army.'[85] It began with the RAF providing indirect support several days before a German assault, targeting airfields, communications and supply chains which culminated in direct support right at the heart of the German Army. At the pinnacle of the operation, British bombs were being dropped every 40 seconds. Indeed, Montgomery believed that it was 'the tremendous power of the RAF in co-operation with the land battle that made the success possible'; the effect of ALI was proven.[86] By 2 September 1942, Rommel gave orders to retreat, largely due to the air superiority held by the RAF who were 'masters of the air.'[87] This was the first time Rommel had tried to fight a battle with absolute inferiority in the air and it was decisive.[88] In short, the battle at Alam El Halfa vindicated the newly constructed air support doctrine.

A considered evolution

One of the stark realities of the conflict in the Western Desert was the necessity of effective air power in successful land warfare. After the defeat in France, the Army and the RAF were finally forced to develop and refine the principles and procedures to ensure ALI was a success. Despite the existence of deep-rooted prejudices within both Services and varying degrees of progress throughout the campaign, air and land activities became fully integrated. This resulted in the evolution of a coherent process that ultimately led to Germany's defeat in the desert. This paper has demonstrated that there are five significant tenets that must be achieved in order for the air and land battle to be truly synchronised. First and foremost is the requirement for air superiority, the essential pre-requisite for decisive air support operations.[89] Although the British experimented with the use of an air umbrella throughout the Desert Campaign, the great successes were only achieved after the RAF dominated the airspace by targeting airfields, enemy communications and directly engaging enemy fighters. Control of the air was necessary to enable ground forces to operate without interference and provided the conditions to develop air support operations. This is a sentiment that was echoed by Montgomery who claimed, 'if we lose the war in the air, we lose the

war and we lose it very quickly.'[90]

The second tenet is willingness to co-operate. Early setbacks in the desert were often followed with accusations and blame, and the culture ensured that both sides were often quick to attribute responsibility for failure upon the other. The Desert War consistently demonstrated that effective co-operation depends on how well the parties work together and the system, no matter how coherent, will fail if one party is unwilling. It is imperative that both air and land commanders work together to achieve common objectives, and only when this has been achieved can joint co-operation be properly achieved.

Third is the necessity for joint planning and headquarters. A combined land and air plan was a prerequisite for success. Commanders must work together at all levels of planning and executing operations to ensure a unity of purpose of the two Services' respective actions. By positioning headquarters together, plans are conceived jointly, whilst integration and co-operation is exponentially increased through combined awareness. Under these conditions, common goals are more frequently shared and decision makers are often connected, meaning that tactical decisions can be understood, ultimately providing greater knowledge at all levels.

The fourth tenet is the necessity for effective and reliable communications. Effective C2 is central to positioning assets effectively within the battlespace and this proved to be decisive in providing air support operations to the Army in a timely manner. Certainly, the introduction of ASC provided a mechanism that successfully linked tactical war fighters at the battlefront to operational decision makers at headquarters and rear airfields. Direct communications between aircraft and FASL also enabled pilots to distinguish between friendly and enemy forces on the front line. The development of these effective communication systems made a fundamental difference in enabling direct support operations.

The fifth and final tenet was the need for robust and recognised doctrine. Events leading to the conference in Cairo demonstrated that an absence of common understanding was inhibiting effective co-operation. The Air Support Directive provided a joint and coherent overview of how ALI should be achieved in theatre. Widely distributed amongst British forces, this framework successfully

captured previously identified lessons, whilst providing standardised procedures to be employed for greatest effect.

Conclusion

The importance of the Western Desert campaign to the establishment of effective principles of ALI is difficult to overstate. It also serves as a stark illustration of what can happen when key lessons are ignored or forgotten. In 1918, the RAF and British Army had developed what was possibly the best example of air-land co-operation seen during the First World War.[91] There were clear echoes of the experiences of 1914-1918 in the efforts of the various air and land commanders in the Middle East to establish a similarly effective system of ALI, and the key tenets adopted by Tedder and the various Army commanders have clear parallels with those seen in the British Expeditionary Force in 1918. During the inter-war period, the understanding of ALI which had developed was allowed to wither, culminating in the disasters in France in 1940. This disaster poisoned relationships as the Army felt that it had been let down, while the RAF contended that a lack of understanding of air power had been at the heart of the problems. Fortunately, a willingness to co-operate – in part imposed upon commanders by circumstance – developed on operations. Although the 'learning curve' was not smooth, by the time that Montgomery assumed command of the Eighth Army in August 1942, the foundations for an effective system of ALI had been created, and Montgomery and his airmen were to build upon them to telling effect. Montgomery observed:

> 'There used to be an accepted term of co-operation. We never talk about that now. The RAF and Army are one. We do not understand the meaning of co-operation. When you are one entity, you cannot co-operate.'[92]

Although the personal relationship between Tedder, Coningham and Montgomery collapsed in 1944 as the Allies liberated Europe, the enduring ALI principles laid down in the Western Desert remained strong, with the campaign marking the point at which the air and land components became one, demonstrating the validity of Montgomery's contention that knitting the two together created a structure against which the German army could, indeed, not stand.

Notes:

[1] Loader, Sir Clive; 'Is True Air-Land Integration Achievable' in *RUSI Defence Systems*, (Feb 2009) p50.

[2] Hall, David Ian; *Strategy for Victory – The development of British Tactical Air Power 1919-1943* (USA: Greenwood Publishing Group, 2008) pxi.

[3] Jordan, David and Sheffield, Gary; 'The British Army and Air Power' in P W Gray (ed) *British Air Power* (London: The Stationery Office, 2003) p67.

[4] Hall, *Strategy for Victory*, p15.

[5] Terraine, John; *The Right of the Line* (London: Hodder and Stoughton, 1985) p380.

[6] See, *inter alia*, Orange, Vincent; *Tedder: Quietly in Command* (Abingdon: Frank Cass, 2004) pp268-271 and the same author's *Coningham* (London: Methuen, 1990) pp180-181

[7] Hall, David Ian; 'Learning how to fight together – The British experience with Joint air-land warfare' (Air University Air Force Research Institute 2009-2) p11.

[8] Terraine, *The Right of the Li*ne, p383.

[9] Hall, *Strategy for Victory*, p56.

[10] Gooderson, Ian; Air *Power at the Battlefront – Allied Close Air Support in Europe 1943-45* (London: Frank Cass, 1998) pp22-23.

[11] Gooderson, Ian; 'Doctrine from the crucible – The British Air-Land experience from the Second World War' in *Air Power Review* 9, No 2 (2006) p4.

[12] *Ibid*.

[13] Hallion, Richard; *Strike from the Sky: The History of Battlefield Air Attack, 1910-1945*. (USA: Alabama University Press 2010) p146.

[14] Hall, *Strategy for Victory*, p61.

[15] *AP3235: Air Support* (London: Air Ministry,1955) p22.

[16] Gooderson, Air *Power at the Battlefront*, p23.

[17] Peach, Stuart W; 'A Neglected Turning Point in Air Power History: Air Power and the Fall of France' in Peter W Gray and Sebastian Cox (eds), *Air Power History: Turning Points from Kitty Hawk to Kosovo* (London: Frank Cass, 2002), p154.

[18] Hall, *Strategy for Victory*, p89.

[19] *Ibid*, p92.

[20] Terraine, *Right of the Line*, p351.

[21] Hall, *Strategy for Victory*, p92.

[22] Terraine, *Right of the Line*, p351.

[23] Hallion, *Strike from the sky*, p152.

[24] Hall, *Strategy for Victory*, pp99-102.

[25] *Air Support*, pp23-26.

[26] Bickers, Richard Townsend; *The Desert Air war 1939-45* (London: Pen and Sword, 1991) p16.

[27] Terraine, *Right of the Line*, p352.

[28] Gooderson, 'Doctrine from the Crucible', p7.

[29] Hall, *Strategy for Victory*, p72.

[30] Bickers, *The Desert Air War*, p45.

[31] Elhers, Robert. S; *The Mediterranean Air War – Air Power and the Allied victory in World War II* (USA: University Press of Kansas 2015) p57.
[32] Bickers, *The Desert Air War*, p46.
[33] *Ibid*, p53.
[34] Hall, *Strategy for victory*, p77.
[35] Gooderson, Doctrine from the Crucible, p8.
[36] Hall, *Strategy for victory*, p77.
[37] *Ibid*, p78.
[38] Ehlers, *The Mediterranean Air War*, p59.
[39] Ibid.
[40] Hall, *Strategy for victory*, p79.
[41] The National Archives (TNA), AIR 10/4004 War Office Report: Lessons of the Operations in the Western Desert, December 1940, p202.
[42] *Ibid*.
[43] Terraine, *Right of the Line*, p334.
[44] *Ibid*.
[45] Gooderson, 'Doctrine from the Crucible', p8.
[46] Hall, *Strategy for Victory*, p82.
[47] Betchthold, Mike; 'A stepping stone to success: Operation Battleaxe (June 1941) and the development of British Tactical Air Doctrine' in *Journal of Military and Strategic Studies* 14, no.1 (2011) p18.
[48] *Ibid*, p16.
[49] *Ibid*.
[50] Hall, Strategy for Victory, p83.
[51] *Air Support*, p52.
[52] Hall, *Strategy for victory*, p83
[53] Betchthold, 'A Stepping Stone To Success', p19.
[54] *Ibid*, p89.
[55] Hall, *Learning how to fight together*, p10.
[56] Betchthold, 'A Stepping Stone To Success', p17.
[57] Hall, *Strategy for Victory*, p84.
[58] Terraine, *Right of the Line*, p345.
[59] Hall, *Strategy for Victory*, p84.
[60] Terraine, *Right of the Line*, p345.
[61] *Air Support*, p56.
[62] *Ibid*, p347.
[63] This amendment was added to the original directive on 16 Nov 1941.
[64] Orange, *Coningham*, pp77-78
[65] *Ibid*, p79.
[66] Air Ministry, AP3235; *Air Support* (1955) p213.
[67] Gooderson, *Air Power at the Battlefront*, p26.
[68] Orange, *Coningham*, p82
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[70] Smyth, Wg Cdr Harv; 'From Coningham to project Coningham-Keyes: Did British Forces relearn historical Air-Land co-operation lessons during Op TELIC?' in *RAF Air Power Review*, Vol 10: 1 (2007), p8
[71] Hall, 'Learning How To Fight Together', p16.
[72] Hallion, *Strike from the sky*, p360.
[73] Bickers, *The Desert Air War*, p78.
[74] Hall, *Strategy for Victory*,p112
[75] *Ibid*, p115.
[76] Terraine, *Right of the Line*, pp364-366
[77] Hall, *Strategy for Victory*, p132
[78] *Ibid*, p133.
[79] Gooderson, *Air Power at the Battlefront*, p26.
[80] *Ibid*.
[81] Smyth, 'From Coningham to project Coningham-Keyes', p12.
[82] Terraine, *Right of the Line*, p380.
[83] *Air Support*, p72.
[84] Jordan, Sheffield, 'The British Army and Air Power', p81.
[85] *Air Support*, p69.
[86] *Air Support*, p72.
[87] Terraine, *Right of the Line*, p383.
[88] *Ibid*.
[89] Hall, *Strategy for Victory*, p112
[90] Terraine, *Right of the Line*,
[91] David Jordan and Gary Sheffield, 'Sir Douglas Haig and Air Power', In Peter W Gray and Sebastian Cox (eds) *Air Power Leadership: Theory and Practice*, p282
[92] Gooderson, Doctrine from the Crucible, p11.

THE HENRY PROBERT BURSARY

BOMBER COMMAND'S ELECTRONIC WARFARE POLICY AND SUPPRESSION OF ENEMY AIR DEFENCE POSTURE DURING THE SECOND WORLD WAR

Dr Thomas Withington

Introduction

In March 2018 the author was awarded a PhD in history by the University of Birmingham. His studies were supervised by Air Cdre (Retd) Dr Peter Gray, Senior Research Fellow in Air Power Studies in the university's School of History and Cultures and were made possible, in part, thanks to the award of a Henry Probert Bursary.

The thesis examined the Electronic Warfare (EW) policies and resulting Suppression of Enemy Air Defence (SEAD) postures of Bomber Command during the Second World War. It analysed how EW was applied to the *Luftwaffe's* Integrated Air Defence System (IADS) to reduce bomber losses and determined whether EW policies were drafted in a proactive and/or reactive fashion *vis-à-vis* the IADS, and how they were implemented. This was done through the application of air power theory regarding the levels and methods by which SEAD was brought to bear as a result of these policies.

EW, SEAD and Air Power Theory

EW refers to 'any military action that involves the use or control of the EM (Electromagnetic) spectrum to reduce or prevent hostile use or to attack the enemy.'[1] Air Mshl Sir Frederick Sowery presented a similar definition, stating that EW is 'the exploitation of the electromagnetic spectrum and the denial of its use to the enemy.'[2] In practical terms it employs Radio Frequency (RF) emissions to degrade, neutralise and/or destroy hostile radar, and radio communications and navigation systems. During the Second World War this saw the application of EW across the Medium Frequency, High Frequency (HF), Very High Frequency (VHF) and parts of the Ultra High Frequency (UHF) spectrum. These wavebands encompassed the frequencies used by the *Luftwaffe's* ground-based air surveillance, Fire-Control/Ground-Controlled Interception (FC/GCI) and Airborne Interception (AI) radars, along with its air-to-ground/ground-to-air fighter communications and navigation

systems.[3]

EW policy refers to Bomber Command's planning concerning its EW efforts, and the policies drafted by its leadership to this end. Proactive policy concerns the employment of EW in a pre-emptive fashion, ie expecting the enemy to use particular radar or radio communications/navigation systems or techniques and to devise and execute EW in such a way as to render these ineffective. Reactive policy employs EW in response to known radar or radio communications/navigation systems or techniques. Proactive and reactive policies take respective preventative and curative approaches. The Command's EW policies would be implemented via the use of Electronic Countermeasures (ECMs) as part of its overall SEAD effort.

EW forms a central part of the SEAD mission.[4] This is unsurprising as radar and radio communications/navigation systems are essential parts of an IADS. SEAD can be executed at the Campaign, Localised and Opportune levels:

a. Campaign suppression has a theatre-wide remit for the wholesale suppression of all elements comprising a hostile IADS as and when they are discovered prior to, and during, a specific operation. This is to cause the theatre-wide, long-term degradation of an IADS.

b. Localised suppression disrupts, degrades and/or destroys a hostile IADS in its entirety or in a piecemeal fashion over a geographically-defined area in a specific timeframe.

c. Opportune suppression focuses on self-defence against, and attacks on, elements of a hostile IADS as and when discovered, either as a primary or secondary target during a specific mission.[5]

Campaign, Localised and Opportune SEAD can be applied using the Manoeuvre, Stealth/Surprise, Mass and Balanced (combining Stealth/Surprise and Mass) approaches.

a. The Manoeuvre approach employs surprise, deception and acting faster than one's adversary; and exploiting an IADS' weak points to identify comparatively lower risk routes for ingress and egress.[6]

b. The Stealth/Surprise approach uses airframe design techniques

to reduce an aircraft's radar cross section and/or specific flight profiles to achieve the same effect. For the purpose of the thesis this approach included EW tactics or techniques developed to reduce an adversary's radar detection range.[7]

c. The Mass SEAD approach uses large numbers of aircraft and/or ECMs to overwhelm an IADS at a particular point.

d. The Balanced approach combines Stealth/Surprise and Mass to punch a hole in a hostile IADS, and then Mass to exploit the breach and perform further attacks against the IADS to overwhelm it.[8]

The Necessity for Examination

The Command's EW policies and resulting SEAD posture has remained under-explored by historians despite the significant body of work examining Bomber Command. This dearth of examination neglects a significant aspect of the Command's wartime experience. We know much about the feats of its squadrons, aircrew and aircraft, but comparatively little about how its leadership fought the *Luftwaffe's* IADS.

By answering the thesis' question one can determine whether the Command pioneered the practice of airborne EW and SEAD which has remained a vital component of air operations since the Second World War. Both have been employed in successive conflicts such as the Arab-Israeli Six Day War in 1967 and Yom Kippur War of 1973; throughout the United States' military involvement in Vietnam, and during the 1991 Gulf War and 2003 invasion of Iraq. EW and SEAD also supported the North Atlantic Treaty Organisation's interventions in the Balkans in 1995 and 1999, and in Libya in 2011.

A modest body of mainly non-academic works exists which has examined Bomber Command's EW efforts. Some of these are relatively detailed, though largely descriptive, providing a narrative account of the Command's efforts and largely focusing on the tactical execution of EW.[9] Taken together, these works do not examine how the intentions of the Command's leadership regarding EW policies and SEAD posture developed during the war. It is these subjects which were the focus of this thesis.

Bomber Command EW Policy and SEAD

Initially the Command's efforts to reduce the threat posed by the

IADS did not extend beyond gathering ELINT (Electronic Intelligence) concerning the *Luftwaffe's* ground-based air surveillance and FC/GCI radars. In October 1939 the Y Service, the RAF's ELINT-gathering organisation, began its hunt for *Luftwaffe* radars. This yielded little useful ELINT despite the *Luftwaffe* possessing at least eight FuMG 80 *Freya* ground-based air surveillance radars at this stage of the war.[10] The RAF received unexpected help in early November 1939 via the Oslo Report. Drafted by an anonymous author, later revealed to be the German mathematician and physicist Hans Ferdinand Mayer, it was posted to the British Embassy in Oslo. The report was examined by Dr Reginald Jones, the Air Ministry's Assistant Director of Intelligence (Science). It provided a treasure trove of information giving an overview of the strength of the IADS, planned future developments and a detailed technical description of the FuMG 80. Usefully, the report outlined the ECM techniques which could be employed against these radars, and a description of a second radar under development, later discovered to be the FuMG 62D *Wurzburg* FC/GCI apparatus.[11]

The Oslo Report formed the basis for much of Jones' thinking regarding the *Luftwaffe's* IADS in the years ahead. His actions represented an example of Campaign-level SEAD thinking. The report's information aided Jones' understanding of the IADS, enabling ECMs to be devised to ease the Command's pursuit of its strategic goals. This was the Command's first example of Campaign-level SEAD as ELINT collection aided the construction of the IADS' electronic order-of-battle, helping to ascertain how its electronic elements could be electronically attacked in the future.

Bomber Command's first use of ECM occurred in March 1941 with the deployment of the IFF Mk I identification friend or foe set by aircrew as an ECM. A theory developed amongst aircrew that switching on and off their IFF Mk I transponders would jam FuMG 62D radars used to direct searchlights. However, Bomber Command was never able to amass evidence that this practice was effective, and Jones even argued that it could allow the *Luftwaffe* to detect bombers via the IFF Mk I's transmissions.[12] This was the first illustration of the Command adopting a reactive EW policy as it was responding to the searchlight threat. This policy was enacted at the Localised level as the IFF Mk I sets were only to be used in this

FuMG80 Freya

fashion over hostile territory to protect bombers for the duration of their mission.

The Command's first major articulation of EW policy occurred in October 1942 following a meeting held to consider the use of countermeasures to enhance bomber protection. The meeting agreed that the *Mandrel* ECM should enter Command service in early December. *Mandrel* was developed in airborne and ground-based versions and reduced the range of the FuMG 80 radar. The airborne version could reduce radar ranges from 155 nautical miles/nm (287 kilometres/km) to 34·4nm (63.7km). When positioned 300 feet/ft (100 metres/m) above sea level, the ground-based version could reduce the range of an FuMG 80 from 34.4nm to seven nautical miles (13km).[13] The latter capability was particularly useful in protecting bombers from detection by coastal FuMG 80 stations. Once again, Bomber Command's policy was reactive as the ECM was devised as a riposte to the threat posed by the FuMG 80. Both *Mandrel* versions were employed at the Localised level as they protected aircraft during their mission but applied the Stealth/Surprise approach as the countermeasure reduced the FuMG 80's range.

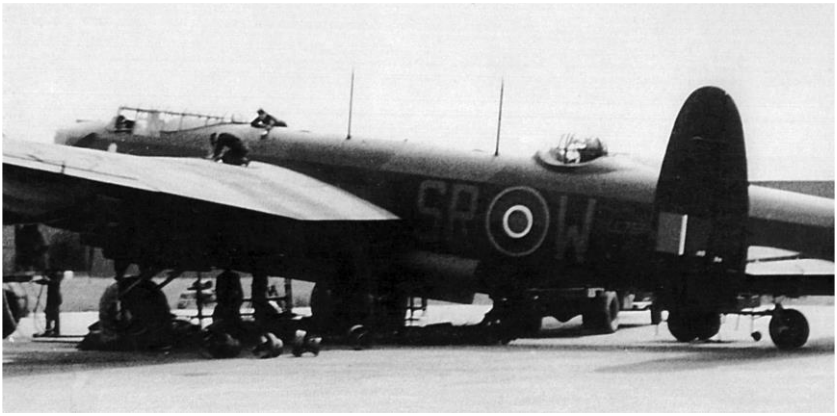
The October 1942 meeting also decided to deploy other ECMs including *Ground Grocer, Shiver, Tinsel* and *Window*. *Ground Grocer* (introduced April 1943) was a ground-based countermeasure which jammed *Luftwaffe* AI radar by providing a 'lane' of jamming through which bombers could fly.[14] *Shiver* (introduced October 1942) employed a standard IFF Mk II receiver modified to jam a waveband

FuMG62D Wurzburg

of 24 to 25MHz as used by the FuMG 62D. *Tinsel* (introduced in December 1942) jammed *Luftwaffe* HF fighter control radio traffic by transmitting noise from a bomber's engines.[15] *Window*, arguably the most famous countermeasure of the war, involved the dispersal into the atmosphere of millions of metal foil strips cut to half the wavelength of the radar they were intended to jam.[16] The Command's decision to introduce these countermeasures was reactive as it was intended to mitigate losses by degrading *Luftwaffe* radar. These ECMs would be used at the Localised level to protect bombers during their sorties. *Ground Grocer* used the Manoeuvrist and Stealth/Surprise approach to reduce the response time of *Luftwaffe* fighters by reducing their AI radars' range. *Shiver, Tinsel* and *Window* used the Mass approach as they were intended to entirely jam FuMG 62D radar coverage in the Main Force's locale.

Examples exist of the Command's proactive EW posture including the development of a VHF radio jammer in anticipation of *Luftwaffe* radio frequencies changing after *Tinsel*'s introduction. Having been OC 80 Wg since its formation in 1940, Gp Capt (later AVM) Edward Addison was appointed Chairman of the RCM Board in early 1942. The Board's functions were: to devise rules governing the use of countermeasures; reviewing proposals for new ECM devices and advising on their use; monitoring ECM research and development work and forecasting future requirements.

At an RCM Board meeting on 15 December 1942 Addison warned that *Tinsel* could prompt the *Luftwaffe* to move its radio frequencies into higher VHF wavebands of 30 to 300MHz urging that 'we must be ready to jam these,' noting that at this point in the conflict there were no suitable airborne ECMs to jam VHF communications. Addison



A Lancaster of No 101 Sqn with the mast aerials of Airborne Cigar *ahead of the dorsal turret.*

suggested that a ground-based countermeasure be developed for VHF jamming. The resulting *Ground Cigar* ECM comprised fifteen transmitters positioned around the UK.[17] By the spring of 1943, the TRE (Telecommunications Research Establishment) estimated that *Ground Cigar* would be sufficient to provide a lane of jamming at least 139nm (257·4km) in length.[18] Addison's idea embodied proactive EW policy because, while the *Luftwaffe* had yet to switch its radio frequencies to VHF (which would eventually occur in 1943), the RAF was already anticipating this change.[19] *Ground Cigar* employed the same Localised SEAD approach by jamming VHF radio traffic over a defined timeframe providing a corridor of jamming along Main Force ingress and egress routes. Using Mass and Manoeuvrist approaches it was intended to jam VHF wavelengths in their entirety which would hamper the *Luftwaffe's* ability to respond to Bomber Command actions and thus reduce its reaction times.

Ground Cigar's airborne equivalent, codenamed ABC (*Airborne Cigar*), was introduced in October 1943. This was also an example of proactive EW policy *vis-à-vis* VHF communications. The ECM was to disrupt hostile VHF radio traffic initially across the 38·3 to 42MHz waveband with jamming achievable over a range of 43·2nm (80km).[20] ABC would perform Localised SEAD, employing a Mass approach to jam VHF communications entirely in the locale of the Main Force. New ground-based ECMs deployed by 80 Wing (responsible for

ground-based countermeasures supporting Bomber Command) entered service in late 1943. These comprised *Dartboard*, first used on the night of 6/7 December 1943, which transmitted across frequencies of circa 300 KHz deployed as a reaction to the *Luftwaffe's* use of this waveband for radio (voice) and wireless (Morse) communications. Like other ECMs examined herein, it was used at the Localised level employing Mass in a similar fashion to ABC and *Ground Grocer*.

100 Group

Examples exist of the Command's EW policies being both proactive *and* reactive: This was illustrated by Bomber Command's decision in autumn 1943 to raise a dedicated force to direct its attention in a holistic fashion against all aspects of the *Luftwaffe* IADS. The decision to activate this force was taken at an Air Ministry meeting on 29 September 1943. The force would be tasked to 'undertake air offensive action against the enemy's [IADS using] 'all forms of radar and [ECM] operations both ground and air.' The rationale for its activation was because the size and complexity of the countermeasures carried by Main Force aircraft had increased exponentially since their introduction in October 1942 making it necessary to 'allot special aircraft and units for the [jamming] task.' Moreover, Air Mshl Arthur Harris, AOCinC Bomber Command since February 1942, had requested that a number of Fighter Command squadrons be placed under Bomber Command's control to protect the Main Force. The intention was for these squadrons to be formed into a group 'whose specific role would be to conduct co-ordinated offensive action in support [of] the bomber offensive against the German night defence system.'[21]

There was a consensus at the meeting that a single organisation should be formed for the employment of ECMs and 'other countermeasures' (ie fighters) against the IADS, and for collecting intelligence relevant to its mission. The meeting ultimately recommended that 'a centralised organisation for the operational employment of radio and other countermeasures both ground and air, to the enemy's defence organisation […] be set up to assist the air offensive.'[22] The meeting agreed that the new Group would assume all tasks for directing ECMs against the IADS, including the collection of relevant intelligence, and that it would receive fighters to defend the

Main Force. During the meeting, AVM Robert Saundby, the Command's deputy AOC, cited concerns regarding the size and complexity that the countermeasures needed to protect the bombers might assume in the future. He continued that this growth in complexity would result from changes adopted by the IADS in a bid to neutralise jamming efforts already underway. Saundby was advocating a proactive EW policy in urging the activation of the Group to pre-empt future changes in the IADS as the Command adopted new jamming tactics and techniques.[23]

On 8 November 1943 the Air Ministry ordered the activation of 100 Group which was placed under Addison's command.[24] Its missions were further clarified to include the 'direct support to night bombing or other operations by attacking the enemy night fighters in the air, or [at their] ground installations.' Beyond the kinetic mission the Group was to 'employ airborne and ground [ECM] apparatus to deceive or jam enemy radio navigation aids, enemy radar systems and certain enemy wireless signals.' The Group's ELINT collection role stressed the investigation of 'the offensive and defensive radar, radio navigation and signalling systems of the enemy,' to aid future kinetic and electronic attacks against the IADS. Finally, the Group was tasked to collect and examine information on the employment of *Luftwaffe* fighters 'so that the tactics of the bomber force may be immediately modified to meet any changes.'[25]

The activation of 100 Group exemplified both proactive and reactive EW policies: reactive in that it was responding to threats the Command had faced, and would continue to face, and proactive because dedicated EW aircraft would be needed for new countermeasures as and when new *Luftwaffe* radar and radio communications/navigation systems and tactics appeared. Harris' arguments regarding 100 Group's creation illustrated the Campaign-SEAD thinking he had shown since becoming the Command's AOCinC with the Group's activation inextricably linked to the overall success of the strategic air campaign. Addison's expectation that 100 Group would perform its operations to continually degrade the IADS also clearly exemplified Campaign level SEAD.

Following the formation of 100 Group, additional ground-based ECMs were activated in early 1944. These included *Fidget, Rayon* and *Drumstick*.[26] *Rayon* was deployed as a reaction to the *Luftwaffe's* use

of its *Knickebein* navigation system, which used a waveband of 41·1 to 47·9MHz for fighter control. *Drumstick*, meanwhile, jammed a waveband of 3 to 6MHz to disrupt *Luftwaffe* fighter wireless communications.[27] Three months later on the night of 27/28 April 1944, *Fidget* entered service. This was deployed as a response to the *Luftwaffe's* use of the 200 to 300MHz waveband for wireless fighter control. All of these ECMs were used at the Localised level. *Fidget* applied Manoeuvrist SEAD because it gave fighters a false indication of their bearing from a particular beacon.[28] *Rayon* and *Drumstick* applied Mass SEAD as both jammed the entirety of *Luftwaffe* radio communications in the Main Force's locale.

Much like the rationale for the creation of 100 Group, a request to the Air Ministry by Addison in August 1944 for additional heavy EW aircraft to equip the Group epitomised proactive EW policy. In a memorandum to Command headquarters he warned that: 'If strategic bombing on an extensive scale is to be continued during the coming winter without prohibitive losses, a considerable increase in bomber protective measures will be a *sine qua non*, since it must be assumed that the enemy night fighter organisation will be even stronger and more efficient than it was last year.'[29] Alongside Addison's concerns over the potential growth in *Luftwaffe* fighter strength, he expressed misgivings regarding the TRE's ability to remain abreast of technological developments which could be applied to the IADS: '. . . according to an opinion expressed by TRE at a recent meeting at Air Ministry, it would seem that our scientists can no longer keep pace with developments in the German defensive system, and so are unable to provide technical countermeasures capable of keeping our losses within reasonable limits.'[30]

Addison proposed two approaches to meet the prospect of growing fighter opposition. First, to increase the Group's fighter strength from five squadrons to nine and, secondly, to increase the quantity and capability of the Group's dedicated heavy EW aircraft.[31] As of August 1944 100 Group had three squadrons operating heavy jamming aircraft; No 214 Sqn (Fortress II/III), No 199 Sqn (Stirling III), and the United States Army Air Force's 803rd Bombardment Squadron (B-17F/G Flying Fortress).[32] Addison proposed raising two additional heavy squadrons to support EW tasks, and to expand Nos 199 and 214 Sqns.[33] This was addressed with the establishment of No 171 Sqn in

A Halifax of No 199 Sqn with a selection of (barely discernible) Mandrel *blade aerials on the lower fuselage.*

September 1944, initially with Stirling IIIs and, from January 1945, Halifax IIIs.[34] No 223 Sqn joined the Group in August 1944 equipped with Liberator VIs and Fortress II/IIIs. With new aircraft equipping 100 Group, Addison further defined its mission. Writing in early November he summarised the roles of the heavy aircraft: 'Depriving the enemy of early warning of the approach of our bomber formation, interfering with the enemy fighter control by jamming Radar and R/T and W/T control channels and supplying 'spoof' raids to divert the enemy's fighter forces, or to subject them to attrition by causing them to be altered unnecessarily.'[35] Addison's obtention of additional heavy aircraft in anticipation of enhancements to the IADS was a clear example of a proactive EW policy.

Proactive EW policy was also witnessed in December 1944 amid concerns that the *Luftwaffe* might deploy centimetric wave AI radar (see below) as a riposte to the *Mandrel* Screen and Special *Window* Force (SWF). The Screen was first used during Operation OVERLORD on 6 June 1944. When supporting Command operations, a *Mandrel* Screen could be around 86·8nm (160·9km) long.[36] Several 100 Group units supported the *Mandrel* Screen effort notably Nos 171 and 199 Sqns and the USAAF's 803rd Bombardment Squadron. Although Mandrel jammed the FuMG 80, it could be used against a

host of other *Luftwaffe* ground-based air surveillance radars.[37] Operation OVERLORD would represent the first opportunity for Addison to demonstrate the Group's Campaign SEAD approach to the German IADS. Honed during the support it provided to the allied invasion, which had created increasingly favourable conditions for friendly operations, this technique could now be applied against the IADS writ large in support of the Command's continuing offensive.

Following OVERLORD, Bomber Command organised its provision of *Window* into a dedicated force of aircraft (comprising Nos 171, 199, 214 and 223 Sqns) to disperse the countermeasure. The SWF would usually comprise up to 20 aircraft dispensing *Window* at a high rate. The intention was for the SWF to appear as the Main Force dispersing *Window* in its usual fashion.[38] While the *Mandrel* Screen was deployed at the Localised level to protect bombers during their specific operations, it was also an example of Campaign SEAD as the Screen was also deployed when the Main Force was *not* flying with the intention of wearing down the IADS. The Screen employed the Manoeuvrist approach as it relied on deception, and the Stealth/Surprise approach as it reduced radar detection range. Likewise, the SWF was employed at both Localised and Campaign levels as it too was used on nights when the Main Force was not operating and conformed to the Manoeuvrist approach as it was meant to deceive radar operators that the cloud of *Window* was being dispersed by the Main Force.

Bomber Command was concerned that, in light of the deployment of the *Mandrel* Screen and SWF, the *Luftwaffe* might develop radars outside the wavebands affected by both, possibly in the region of 2·9GHz – so-called centimetric wave radars.[39] Centimetric radar used higher frequency transmissions than previously employed by the *Luftwaffe*. Generally speaking, the shorter a radar's wavelength, the smaller the object it can detect. This means that a centimetric radar can discern a target in sharper detail than a radar transmitting at comparatively lower frequencies, allowing aircraft so equipped to see a target in greater detail and obtain a more accurate location. Fortunately for Bomber Command, such fears would not materialise, but the concerns raised clearly illustrated the proactive approach towards EW taken at this point in the war.

Additionally, reactive and proactive EW policy was illustrated by

80 Wing's deployment to the continent to apply ECMs against the IADS. The wing became part of 100 Group after the latter's formation in November 1943. Following the liberation of France in August 1944 proposals were made to move the wing's activities to the continent close to the Franco-German border to provide enhanced jamming against *Luftwaffe* radar and radio communications/navigation systems. No 80 Wing would deploy to the continent with a single mobile headquarters, six VHF communications ECMs and eight *Ground Mandrel* units.[40]

No 80 Wg's move to the continent was dictated by geography, because its operations were performed from ground level the range of its jamming was limited by line-of-sight, although this could be extended by using tower-mounted transmitters. For this reason, many of 80 Wing's *Ground Mandrel* jammers had been located on England's south coast to jam ground-based air surveillance radars on the French coast; the logic being to reduce the *Luftwaffe's* early warning time for bombers approaching France. With France liberated, its coast was bereft of radar coverage, thus the transfer of 80 Wing's operations to ensure that these ECMs remained within range of radar threats inland.[41] The redeployment of the wing would have another important effect. The lengthening of the autumnal and winter nights in late 1944 allowed Bomber Command to perform longer sorties into Germany and use the cloak of darkness for protection from fighters. Having the wing's ECMs positioned closer to Germany would provide Main Force jamming support during such endeavours.[42] The continental deployment of 80 Wing's ECMs was a clear reaction to the threat that the IADS continued to pose. Nonetheless, it was also proactive in anticipation of intensified Command efforts during the autumn/winter of 1944/1945 as reflected by a signal sent from the Air Ministry to SHAEF (Supreme Headquarters Allied Expeditionary Force) on 13 November stating that the move: '[will] help considerably in keeping our bomber losses down and [will] increase the scope of bomber approach tactics.'[43]

Away from 100 Group's ground-based ECMs, new airborne countermeasures debuted such as *Carpet* III in the early autumn of 1944. This jammed *Luftwaffe* FC/GCI radars, and was fitted throughout the Main Force, installed as a reaction to the continuing FC/GCI radar threat. Like the original *Carpet* deployed from April

A Fortress II of No 214 Sqn with Airborne Cigar *masts.*

1944, the new variant applied SEAD at the Localised level protecting individual aircraft during their missions in the vicinity of hostile radars, applying the Stealth/Surprise approach by reducing these radar's ranges.[44]

During the final year of the war, the deployment of the *Mandrel* Screen and the SWF remained the focus of the Command's SEAD efforts with Harris recognising the Campaign SEAD approach to which the Screen was integral. He made similar observations regarding the SWF which, by the final six months of the war, had paid dividends as noted in December 1944 by the Command's Operational Research Section.[45] Similarly an April 1945 paper written by Addison stressed the importance of the feint and diversionary tactics made possible by the *Mandrel* Screen and SWF in keeping casualties down following an increase in bomber losses experienced that March; a further example of his Campaign-level thinking. [46]

The final six months of the war saw the deployment of airborne countermeasures such as *Piperack* and *Jostle* IV. These were both used at the Localised level applying Mass. *Piperack* was fitted to several of 100 Group's heavy EW aircraft. It was designed to jam *Luftwaffe* AI radar across wavebands of 69 to 93MHz, and 95 to 210MHz to protect the Main Force.[47] *Piperack* provided Localised level suppression as it was meant to protect aircraft in its *locale* for the duration of their missions. The ECM applied Mass as it jammed *Luftwaffe* AI radar across all its wavebands.[48] *Jostle* IV was initially deployed by the Fortress II/IIIs of 214 Squadron accompanying the Main Force. A useful by-product of *Jostle* IV was that it caused

interference to the FuMG 220 *Lichtenstein SN2* AI radar.[49] The efficiency of this ECM led to Addison requesting its installation on the Liberator VIs of No 223 Sqn in September 1944.[50] As the countermeasure was designed to protect Main Force aircraft during their missions it exemplified Localised SEAD and applied the Mass approach to radio communications jamming across HF and VHF wavebands.

Conclusions

Bomber Command drafted both proactive and reactive EW policies enacted at the Campaign and Localised levels using the Manoeuvrist, Mass and Stealth/Surprise approaches. The first illustration of the Command's reactive EW policies was the use of the IFF Mk I as a response to the searchlight threat. This was enacted at the Localised level as was the deployment of *Mandrel* which was also the result of reactive EW policy, with the ECM deployed at the Localised level, but applying the Stealth/Surprise approach. Bomber Command's decision to introduce *Ground Grocer, Shiver, Tinsel* and *Window* was reactive with these countermeasures used at the Localised level applying the Manoeuvrist, Stealth/Surprise and Mass approaches.

An early example of proactive EW policy was shown by the decision to deploy the *Ground Cigar* to pre-empt the *Luftwaffe's* move towards VHF. This countermeasure was used at the Localised level employing Mass and Manoeuvrist approaches. The introduction of ABC was also an example of proactive EW policy with the ECM used at the Localised level to apply Mass as were ground-based ECMs such as *Dartboard*.

The watershed for Bomber Command's efforts against the *Luftwaffe* IADS came with the formation of 100 Group. This was an example of proactive and reactive EW policies. Its formation was an example of Campaign level SEAD thinking as the Group's activation was intrinsic to the success of the strategic air campaign. Meanwhile, additional ground-based ECMs including *Fidget, Rayon* and *Drumstick* were used at the Localised level to apply Manoeuvrist and Mass approaches. Furthermore, the allocation of additional heavy EW aircraft to the Group exemplified proactive EW policy in anticipation of Bomber Command's increased efforts from May 1944, as were concerns over the potential introduction of centimetric radar into

Luftwaffe service. The final two years of the war saw extensive use of the *Mandrel* Screen and SWF, both deployed at the Campaign and Localised levels using Manoeuvrist and Stealth/Surprise approaches. A trio of new airborne ECMs were introduced during this period including *Carpet* III deployed at the Localised level applying the Stealth/Surprise approach, along with *Piperack*, also used at the Localised level, but applying Mass, as did *Jostle* IV.

Bomber Command began its war devoid of EW policies and a SEAD posture. Six years of conflict profoundly changed this and saw the Command adopt EW policies which were enacted through SEAD in a comprehensive and holistic fashion. Its ground-breaking efforts have been replicated time and again in air campaigns witnessed since the end of the Second World War, and will continue to be for as long as aircraft must do battle with air defences.

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EYEBALLING RATKO

by Air Chf Mshl Sir William Wratten

Sir William's account of his encounter with General Ratko Mladic, originally written for his family in 2009, was first published, with his permission, as an Appendix to Air Chf Mshl Sir Richard Johns' autobiography, Bolts from the Blue – *see* Journal 70, *p156. In view of its interest and significance, it is reproduced here, again with Sir William's permission.*

In July 1995 over 8,000 Bosniak men and boys were massacred in Srebrenica. This was described by the outside world as genocide. Held responsible for this atrocity, amongst other war crimes, was General Ratko Mladic, the chief of staff of the Bosnian Serb Army. At the time our prime minister was John Major and he held a meeting of other heads of state to determine what should be done about this activity which all agreed was unacceptable. It was decided that General Mladic was to be given an ultimatum; desist immediately from all military activity or NATO forces, primarily the British and Americans, would embark on a bombing campaign that would severely damage his forces and with it his reputation.

Against this background I found myself driving to the RAF base at Northolt to take an aircraft to the annual International Air Tattoo at Fairford. It was a fine Sunday morning, I was in my second year as AOCinC Strike Command and I was looking forward to a good day out, a nice lunch and some entertaining flying displays not to mention a chat with many old pals and acquaintances. So it was with growing concern that I took the car phone from my driver who told me that the vice-chief of defence staff in the MoD wanted a word. VCDS at the time was Air Chief Marshal Sir John Willis, another Cranwellian whom I knew well. John gave me the background to the impending ultimatum to be delivered to Mladic, paused to let it all sink in, and then quietly informed me that from a cast of thousands I had been selected to deliver it personally to this perpetrator of such an atrocity. I was to report to the ministry immediately for briefing and would fly to Belgrade the following day to meet Mladic and give him the hard word. I was to be accompanied by a number of officials (civil servants), and collect the CinC United States Air Forces in Europe and

the deputy commander French Forces en route, as they would be representing the USA and France alongside me. But there was to be no doubt that I was in charge as the leader of the delegation.

In the MoD I was briefed comprehensively on the line to take with Mladic. There would be a C-130 Hercules on standby and I was to take off early on the Sunday for Frankfurt for the USAF general and then Paris for the Frenchman en route to Belgrade where we would be met by Mladic's representative. From then on no-one was quite sure how it would all evolve. That was to be my problem.

So the first thing I did after being briefed was to contact my staff at High Wycombe and instruct them to change the C-130 to a BAe 146, the four-engine jet the royal family used and that had a large Union Jack on the tail fin. It was also a modern aircraft. I wanted the right impression to be given on landing in Yugoslavia from the outset.

All went according to plan until we landed in Belgrade by which time it was dark. Our reception committee, all smiles, told us that General Mladic was waiting to entertain us to dinner and we could discuss whatever it was we wanted to talk to him about in comfort. So, I immediately informed our hosts that we did not come to break bread with this man. Mine was a mission of great importance and seriousness and I insisted we be taken to the general without delay. Dinner with him was out of the question. So a now morose party of Mladic's men ushered us in to waiting big, black cars and off we sped into the dark. About an hour later we arrived seemingly in the middle of nowhere and disembarked to be shown into an unpretentious, small shack-like building where, waiting in civilian clothes, was General Ratko Mladic. Those of my party in the military were all in uniform and I sensed immediately that Mladic regretted his mode of dress. We looked smart and he looked scruffy, and he knew it.

He invited us to sit at a table with me opposite him, my military colleagues on either side of me and our officials in the background. Beside him sat his interpreter (I had brought my own just to ensure their interpretation of what I had to say was accurate) and behind him a few `heavies' who looked as though they would not need much of an excuse to give us a good going over. So we began by introducing ourselves and our appointments ensuring that he realised the three of us were commanders of major military organisations. I then set out the ultimatum I had been charged to deliver.

General Ratko Mladic.

Mladic is a charismatic man and I found I had to occasionally remind myself that I was talking to a mass murderer. He has penetrating blue eyes and from the outset it became clear he was not about to give any indication of regret regarding Srebrenica. On the contrary he glared at me throughout and we each soon realised we were competing to see who was going to blink first, literally. I made it quite clear to him, in as calm and controlled a manner as I was able to muster, that if he did not order the cessation of hostilities without delay he and his forces would have the very daylights bombed out of them. This was my message from my prime minister, corroborated and fully supported by my representatives from the USA and France.

I was threatening a war criminal, in his own territory and in words that were not open to misinterpretation, that we would seek to kill him and all under his command if he did not do as he was told. Whilst mouthing these words I wondered to myself if we were going to be allowed to return home in one piece.

Once I had finished and had handed him a written summary of what I had said, Mladic embarked upon a long soliloquy about the history of his country, how the outside world had no understanding of his position, how impertinent it was of others to threaten him in this manner, and so on and so on. After about half an hour of him droning on it began to become rather boring, until he mentioned an area of operations in which a few French soldiers had been killed. At this our French general became extremely agitated and interrupted Mladic when he was in full flow, thumping the table with his fist and calling Mladic a liar. At this Mladic's neck muscles bulged, his already ruddy complexion darkened into a shade of purple as the red mist of his fury

descended upon him and then us. I realised instantly that we were in trouble. How do I get out of this?

So I immediately stood up and, smiling at the interpreter, thanked Mladic for his hospitality and said we must now return to our respective countries and report back to our political leaders. Well, not knowing what I was saying, and only seeing I was smiling, everyone waited for the interpreter to tell Mladic what I had said. As she started to do this, I began strolling as casually as I could for the exit hoping all the others in my party, the Frenchman especially, would follow. Thankfully, they did and we began the journey back to Belgrade, our aircraft and home, again via Paris and Frankfurt. Eventually I got to bed in Springfields around 3am, rising a few hours later to report to the MoD to brief the Secretary Of State For Defence on what had happened (Michael Portillo at the time).

The outcome was that Mladic did not cease operations so the bombing campaign against him began.

Author 's note: Ratko Mladic, who became known as the 'Butcher of Bosnia', was jailed for life on 22nd November 2011 at the International Court in The Hague for directing his troops to commit the worst atrocities in Europe since World War II.

FIGHTER COMMAND AAR EVALUATION TRIALS 1949-52

Brian Gardner

This is an extract from the author's draft Air-to-Air Refuelling in the Royal Air Force. *It was first published in the Autumn 2014 edition of Air Britain's* Militaria. **Ed**

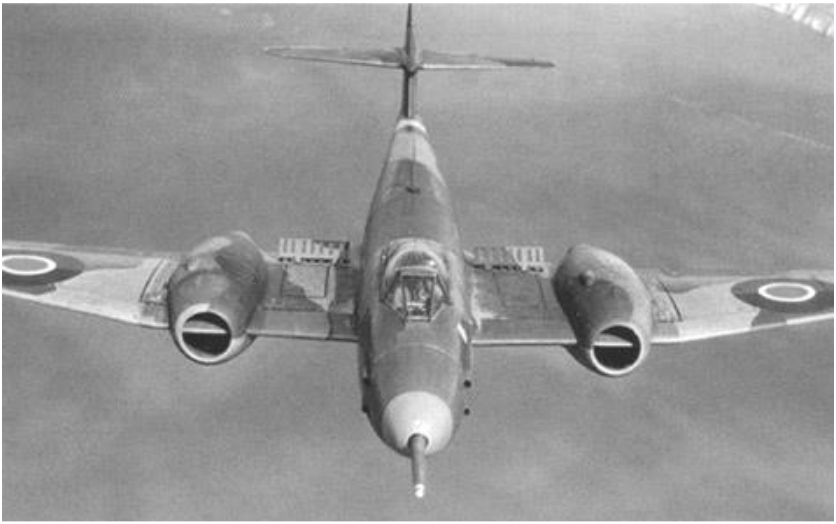
After many years of development, trials and false starts, air-to-air refuelling (AAR) was first introduced as a regular Service procedure in 1948 by the USAF's Strategic Air Command to enable its B-29 and B-50 bombers to conduct long-range operations. The initial equipment, produced by Flight Refuelling Ltd (FRL), was similar to that developed in the late 1930s and involved trailing lines, hauling-in and manual handling.

However, this method was clearly unsuitable for the increased speed and altitude of single-seat jet fighters and so, in response to an enquiry from the Air Ministry and interest shown by the USAF, FRL began investigating fighter refuelling schemes. After considering several schemes adapted from the looped hose method, the 'Probe and Drogue' appeared in March 1949. However, there was little official support at that time and FRL had to use company money for initial development.

The first probe and drogue contact was made on 24 April 1949 between a Lancaster tanker (PB972/G-33-2) and a Meteor III (EE397). Following a demonstration given to USAF officers a few days later, FRL received a contract for the modification of F-84 and B-29 aircraft for evaluation under Project OUTING.

Persistent lobbying by Sir Alan Cobham, together with numerous demonstrations of fighter refuelling and a 12-hour refuelled flight by the Meteor in August, persuaded the Air Ministry to support limited development and the Ministry of Supply agreed to the loan of a Lincoln (RA657) and a Meteor IV (VZ389) for further development.

During discussions with Fighter Command staff officers in May 1950, Cobham suggested that FRL participate in the autumn air defence exercises, using three additional Meteor receivers together with Lancaster and Lincoln tankers. This proposal was received favourably by the Command and was forwarded to the Air Ministry for approval. The Air Council agreed that development should be



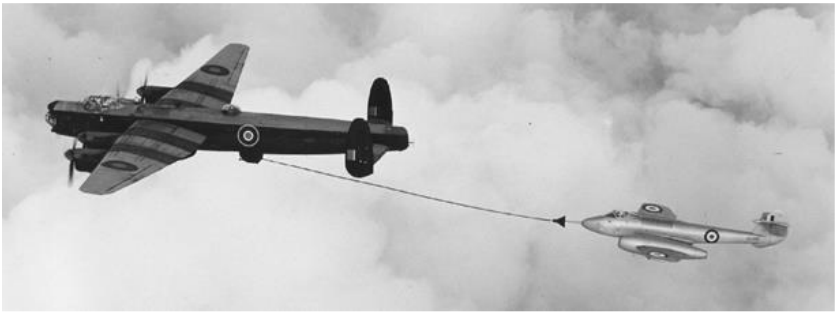
Meteor III EE397. (FRL)

sponsored by the RAF and Fighter Command should be asked to carry out trials under simulated war conditions with a squadron of Meteors.

Consequently, FRL was invited to submit estimates for the proposed modification work and the existing development contract would be extended to cover Service trials of flight refuelling by Fighter Command. The original proposal involved the Lincoln and Meteor IV participating in Exercise EMPEROR but this was replaced with contract 6/Aircraft/5925/CB.7B (awarded to Gloster and sub-contracted to FRL) for the conversion of sixteen Meteor F.8s as flight refuelling receivers. The sixteen aircraft, with squadron codes, were as follows:[1]

VZ465/C, VZ476/P, VZ477/Q, VZ507/V, VZ528/R, VZ543/W, WA823/M, WA826/F, WA827/N, WA829/A, WA830/X, WA832/B, WA834/H, WA836/E, WA837/J and WE934/G.

A further contract covered operation of an FRL Lancaster tanker and the loaned Lincoln. However, FRL pointed out that the Lancaster was a company-owned aircraft used for development trials and flown under 'B' conditions, which restricted its use. In view of the number of fighters to be refuelled, a better solution would be modification of another two Lincolns and in due course, contract 6/Aircraft/6285/CB.6(a) was awarded for the conversion of RE293



Lincoln RA657 refuelling Meteor IV VZ389. (RAF Museum)

and SX993. These were delivered to Tarrant Rushton in February 1951 and, although generally similar to RA657, were fitted with a Mk 12 hose drum unit in place of the Mk VII unit installed in the first Lincoln.

In June 1950, No 245 Sqn, based at Horsham St Faith, became the first RAF squadron to equip with the Meteor F.8 and it was selected to carry out the evaluation trials. During this period, the squadron was commanded by Sqn Ldr C F Counter.

By November, four of the squadron's Meteors had been delivered to FRL at Tarrant Rushton for receiver conversion and subsequent aircraft were delivered in batches. The first aircraft to be modified was WA830 and a conference to clear the installation was held at Tarrant Rushton on 26 January 1951.[2] Ground tests were made with the Meteor probe connected to the tanker drogue coupling for a complete top-up to check the fill valves for correct operation and flights with Lincoln RA657 began on 16 February.

Due to delays in the conversion programme, pilot training was also delayed, but this eventually began on 18 March, when seven pilots and two ground engineers began a course at Tarrant Rushton. Receiver training with Lincoln RA657 began on 29 March, but not without incident as the squadron operations record book recorded as follows. The CO made the first attempt to refuel, ‘and was unfortunate enough to have the hose bent, which resulted in a paraffin bath for his aircraft and great consternation in FRL. After a new hose had been fitted to the tanker, all the fighter pilots performed the refuelling operation with no difficulty, well inside the expected time. Approximately 150 contacts were made during one day’s flying.’[3]

Fighter Command concluded that an average pilot in full operational practice could make contact and take on fuel without any training at all, providing he was thoroughly briefed on the ground.[4]

Details of the trials were given in an Operations Instruction dated 5 May 1951: 'On instructions from HQ Fighter Command, a trial is to be carried out by Eastern Sector in conjunction with Flight Refuelling Limited, the object of which is to assess the value of refuelling fighter aircraft in flight while engaged on specific types of operational duties.'[5]

Phase 1 would investigate: rendezvous methods, with and without radio contact and assistance from Ground Controlled Interception (GCI); the most practical methods of refuelling formations of two to twelve aircraft with recommendations regarding refuelling speeds and approach procedures; height limits and weather conditions required; pilot fatigue on extended sorties and serviceability of refuelling equipment in tanker and receivers.

Phase 2 would cover: problems of refuelling fighters in unfavourable weather conditions; the use of flight refuelling when flying for range; refuelling at night and problems associated with convoy patrols and low-level standing patrols. Recommendations would be made for the maximum distance of the patrol line from base for the technique to be of advantage.

FRL would provide three Lincoln tankers: the first to be available immediately, the second by 1 June and the third by 1 July. These would be based at Tarrant Rushton and would use RAF Coltishall as an advanced base. On the evening prior to the day's operation, RAF Horsham St Faith would pass to FRL details of time and height for the tanker to be over Norwich, the anticipated duration of flight and the number and type of fighter sorties. The daily programme would involve the tanker arriving in the area about 0900 hrs each morning, Monday to Saturday, and after the exercise had been completed, would land at about mid-day at Coltishall. A second sortie would be carried out in the afternoon, after which the tanker would land at Horsham St Faith for crew debriefing. It would then return to Tarrant Rushton.[6]

The trials would continue until all tasked problems had been satisfactorily investigated but, although these were considered urgent, it would not be possible to relieve the squadron of other operational

A probe-equipped Meteor F8, WH834, of No 245 Sqn.
(Ray Sturtivant)

commitments.

The trials began on 8 May as scheduled, with nine modified Meteors available.[7] The Lincoln tanker took off from Tarrant Rushton at 0838 hrs and proceeded to Norwich, climbing to 12,000 feet en route and contacting the RAF GCI station which would co-ordinate the rendezvous with the fighters. The Meteors were scrambled and the first section made rendezvous with the tanker at 0940 hrs. Red Section approached and the leader made three good contacts, topping up on the second. However, the other two pilots were new to the technique and had some difficulty before making a successful contact. One aircraft, on breaking away, received a severe fuel splash and this was thought to be due to failure to close the nozzle valve prior to disconnecting.[8] After a further contact by Red 1, Yellow Section approached, but after some further contacts the tanker coupling became unserviceable. Because of this, and a damaged drogue caused by an aircraft striking it after overshooting an approach, further operations were cancelled and the tanker returned to Tarrant Rushton, dumping fuel to get down to landing weight.

During a temporary gap in the trials, caused by a combination of tanker unserviceability, poor weather, the Whitsun holiday break and a lapse in contract cover, investigation was carried out into instances of fuel splashes and premature breakaways and ground and flight trials were conducted in attempts to cure these problems. Although the defects were not completely cured, it was decided to continue the trials and these were resumed on 16 May.

During the afternoon sortie on 17 May, three Meteors returning from a flight over the London area successfully intercepted the tanker and topped-up. 'Squadron Leader Counter and the squadron pilots were most happy with this last exercise, since it was the first successful application of practical flight refuelling as these aircraft were extremely low on fuel after their prolonged exercise.' During the return flight to Tarrant Rushton, the tanker made a routine flight test with newly-modified Meteor F.8, WA836, as such flight tests were arranged as far as possible to coincide with trials flights to economise on flying hours.

On 20 May, WA827 crashed while carrying out aerobatics at low altitude, leaving fifteen aircraft to complete the trials. By 30 May, the training phase of the trials had been completed and a total of 26 pilots had been trained in the technique, including four from the Central Fighter Establishment. Contacts had been deliberately attempted in turbulence, with some success, and a few dents in drogues and aircraft. Fighter sorties had averaged about two hours and tanker sorties about four hours and the average time for refuelling four aircraft, with each taking on about 270 gallons, was about 16 minutes.

From early June, the squadron began to combine flight refuelling with other exercises and during rehearsals for the King's birthday flypast, the Meteors operated from Horsham St Faith and flew over the flypast route near the centre of London. Either before or after the flypast, the fighters rendezvoused with the Lincoln and on several occasions would have been unable to return to their home base without such a refuelling.

On 7 June 1951, 96 jet fighters – Vampires and Meteors of the RAF and Royal Canadian Air Force – performed a flypast over Buckingham Palace to commemorate the official birthday of King George VI. The participation of probe-equipped Meteors did not go unnoticed by the Press and *The Aeroplane* subsequently reported: '… many of our readers in London and Southern England will, no doubt, have drawn their own conclusions from the flypast of Fighter Command squadrons. [...] At least three Meteor 8s in one of the squadrons were fitted with a flight refuelling probe in the nose.'[9]

For the first month of the trials Lincoln RA657 had been the only tanker used and as the second Lincoln was not yet ready, the company Lancaster, G-33-2, was brought in to cover periods when the Lincoln

was undergoing maintenance and to act as a stand-by.

A radar homing device was fitted in the tanker for a trial flight on 14 June but, as none of the squadron aircraft had the complementary equipment, a specially-equipped aircraft was borrowed from the CFE to carry out tanker interceptions without GCI assistance. Apart from this exercise, the remainder of the interceptions were carried out under GCI control.

In preparation for a proposed long-distance flight, some experiments were carried out with refuelling at high altitude, but the maximum altitude attained was only 17,000 feet and refuelling at this altitude 'was not particularly successful.' A further attempt achieved a brief contact at 17,000 feet, but engine conditions necessitated reducing height and during the descent to 15,000 feet, several contacts were made.[10]

During much of June, flying was limited by poor weather conditions or tanker unserviceability, but the trials continued throughout July and the squadron carried out standing patrols, a round-Britain flight and demonstrations of simultaneous refuelling with the USAF's three-point tanker.

Although equipment serviceability was generally good, there was the odd incident. During a morning sortie on 5 July, one aircraft broke away with the drogue 'nestling coyly on his probe, having just come adrift from the pipeline.' The hose was wound in and the tanker dumped 900 gallons of kerosene from its cargo tank. Dumping was difficult, as the captain later reported, 'It is difficult to see why parts of the aircraft structure have to be dismantled on each occasion: for the operator, the present jettison methods are somewhat hazardous, and he also gets soaked with fuel. Huge amounts accumulate on the floor at the aft end of the fuselage.' A jettison system had been requested but was not included in the contract.

On 21 July, Sqn Ldr Counter made a round-Britain flight, with three in-flight top-ups planned from the Lincoln. These would be carried out at 15,000 feet, while the rest of the flight would be at 40,000 feet. However, after the second refuelling the probe nozzle could not be closed so the final refuelling could not take place but, as this had been planned over base to enable the Meteor to land with full tanks, it was not essential.

Recording the flight, the squadron Operations Record Book stated:

The three-point YKB-29T, modified by FRL for Project OUTING, refuelling two Meteor F8s of No 245 Sqn and FRL's Meteor IV VZ389. (FRL)

'The CO flew 1,300 miles in 3 hours 30 minutes, refuelling twice [...] he was very sore!'

Under Project OUTING, FRL modified two USAF F-84Es as receivers, two KB-29Ms as receivers and two KB-29Ms as hose/drogue tankers, one of these having three refuelling units. However, by the time the three-point tanker was ready for trials, the two F-84s had returned to the US.[11] FRL therefore requested permission to use their development Meteor IV (VZ389) and two probe-equipped Meteors from 245 Squadron for this purpose.

Approval was given and two squadron Meteors were detached to Tarrant Rushton for six days in late July to carry out demonstrations of simultaneous three-point refuelling with FRL's Meteor. The three-point YKB-29T was classified at the time but, when photos were later released, the demonstration of three-point refuelling received wide publicity, leading to erroneous reports that the B-29 had been used in the Fighter Command Evaluation trials.

Following a sortie on 1 August, no further refuelling exercises were planned until October and in the meantime, the second Lincoln tanker (SX993) had been completed and made its first handling flight on 23 August.

On 2 October, RA657 participated in Exercise PINNACLE,

Meteor F.8 WA829 about to make contact with the YKB-29T's starboard drogue. (Jet Age Museum/Russell Adams Collection)

refuelling Meteors off the Norfolk coast in conditions of poor visibility. After several contacts, the hose nearly separated, being held on by a reinforcing wire. The damaged hose was wound in and replaced at Tarrant Rushton before the next day's flying.

Two Lincoln tankers (RA657 and SX993) took part in the trials for the first time on 3 October, being kept at stand-by at Horsham St Faith until required by the fighters. Both tankers were scrambled at various times but due to some confusion by Horsham Control, there was an instance of a tanker not being fully fuelled and airborne at the required time and this resulted in some Meteors having to land and refuel.

During the exercise, in which there were 16 tanker sorties, the squadron maintained two standing patrols just off the Norfolk coast. The patrols were worked in three pairs, with one pair maintaining each patrol pattern and the third pair being refuelled. If one pair of fighters were sent off in pursuit of 'the enemy', its place was taken by another pair.

Night refuelling trials began on 9 October and lighting was fitted to the tanker and to the drogue. Meteor pilots found no difficulty in night probing but they did have problems in finding the tanker, even with GCI assistance. One Meteor was fitted with a 'lash-up' cockpit light attached to the probe by a Jubilee clip and this was very successful.

In preparation for a proposed non-stop flight to Malta, three squadron aircraft were flown on a second round-Britain flight on

11 October, equipped with drop tanks and using flight refuelling. Further night refuelling trials were carried out, but poor weather conditions resulted in several sorties being cancelled and the trials contract terminated on 31 October. The Lincoln tankers were flown back to Tarrant Rushton, where the third Lincoln (RE293) had made its first flight after modification on 29 October.[12]

During the trials, No 245 Sqn's Meteors had flown a total of 374 hours 37 minutes and made 672 contacts with the tankers. A total of 58,685 gallons of fuel had been transferred and 219 refuelling sorties had been flown.

Three tankers had been used: Lincolns RA657 and SX993 and Lancaster G-33-2. Tanker demand had been met on 82·2% of the days required. Of the total refuelling sorties tasked, 71·5% had been achieved; reasons for the shortfall had included poor weather, squadron cancellations for other tasks, maintenance and unserviceabilities.

It was planned to conclude the trials with a flight to Malta by four flight-refuelled Meteors. Three tankers would be used (Lincolns RA657, SX993 and either the third Lincoln RE293 or Lancaster G-33-2), with one based at Tangmere and two at Istres in southern France.

The flight was planned for 30 October, with the return flight scheduled on 1 November, but widespread civil unrest erupted in Egypt in mid-October following that country's abrogation of the 1936 Anglo-Egyptian Treaty under which British forces were stationed in Egypt. This had an immediate effect on RAF operations in the area[13] and a flight of Meteor fighters to Malta was considered unwise. Consequently, the flight was cancelled although it was hoped to mount it in the spring of 1952.

Fighter Command suggested that a converted Tudor might be used as a tanker if the Malta flight was made. Several Tudors were then stored at Tarrant Rushton and FRL considered the possibility of converting them to tankers for civil and military applications. With MOS agreement, FRL prepared Tudor 1 G-AGRI for flight to assess performance in the tanker role and this was carried out on 14 July 1951. During the flight, the Meteor IV was flown in a simulated refuelling position.

Before the trials finished, a conference was held at HQ 12 Group, to consider future Command policy on fighter refuelling.[14] Sqn Ldr

Counter reported on the progress of the trials and stated that there were no special fatigue problems and that refuelling could be carried out in any weather provided the fighter could maintain visual contact with the tanker. With the single-point tanker, it was found that four aircraft was the greatest number that could profitably be refuelled at any time and the overall time taken to refuel this number was about 18 minutes. On convoy escort or low-level patrols, it was found that flight refuelling became an economic advantage at distances of 50 miles or more from base.

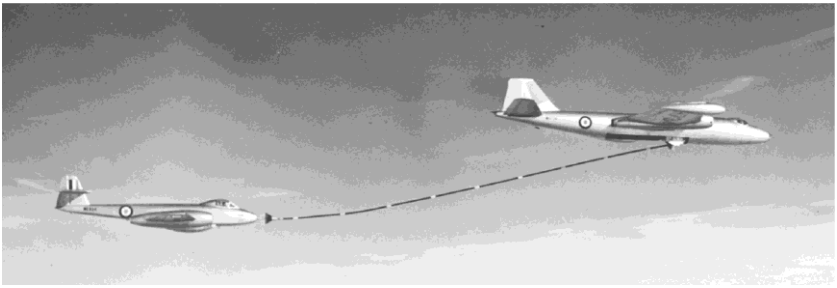
Asked his opinion of a suitable tanker, Sqn Ldr Counter expressed a preference for the three-point B-29, with which the squadron had just been demonstrating. A tanker would require a capacity of 5,000 gallons of transferable fuel and a performance enabling it to operate at 200 knots above 25,000 feet and the B-29 was the only current type that could meet these requirements.

AOCinC Fighter Command said it was obvious that considerable expense was involved, and that the provision of tankers would reduce the number of fighters available. Although the value of flight refuelling was indisputable, the benefits to be gained were unlikely to compensate for the cost of development and the reduction in fighter strength. He had, therefore, decided against the general introduction of the technique within Fighter Command for the present, but future fighters should include provision for flight refuelling.

With no early adoption of flight refuelling in sight and the possible use of Tudor tankers for the now-doubtful Malta flight, there was no further use for the Lincoln tankers. Accordingly, instructions were given to FRL to restore the aircraft to standard and return them to the Service. Although the Canberra was being introduced, the Lincoln was still in widespread use with Bomber Command and several Lincoln squadrons were operating in Malaya against communist guerrilla forces.

While RA657 had been used for more than a year with development flying, SX993 had participated only briefly in the trials and RE293 had only just completed its acceptance flights. The aircraft were disposed of during 1952, with RE293 going on 1 May, followed by SX993 on 15 May and RA657 on 14 July.[15]

FRL maintained its links with 245 Squadron and although Sqn Ldr Counter was keen to continue the trials, there was no further interest



Meteor WE934 made the first jet-to-jet refuelling with Canberra WH734 in January 1954. (Jet Age Museum/Russell Adams Collection)

from Fighter Command and the modified Meteors and trained pilots were gradually dispersed. Although the Meteors retained their probes, they were not used again, with the exception of brief trials with VZ543 and Lancaster tanker G-33-1 and WE934 with Canberra tanker WH734.

Although Fighter Command had postponed the introduction of AAR, Assistant Chief of Air Staff (Operational Requirements) asked in October 1952 that an investigation be made into the application of flight refuelling to the Javelin, Hunter and Swift.[16] There was no intention of modifying aircraft at that stage, only to determine what modifications would be necessary if AAR ever did become a requirement. Possible applications included reinforcement deployments and deep penetration operations.

In June 1952, FRL submitted a report to the Air Ministry dealing with the application of flight refuelling to the HP 80 (Victor), suggesting that, if a proportion of these bombers were to be equipped as tankers, they could refuel escorting fighters on long-range missions. One HP 80 tanker would be able to refuel ten fighters, such as the DH 110, for an effective radius of 1,300 miles.[17]

By late 1952, the Air Staff had agreed in principle to adopt AAR for the new bombers, using the Valiant as a tanker. The second generation of jet fighters was starting to appear and consideration was being given to fighter requirements for the late-1950s and beyond. However, by 1954 there was still no official requirement for AAR in Fighter Command, although the Air Staff had approved development of a Valiant tanker for Bomber Command.

In a 1952 article in *The Aeroplane*,[18] Air Mshl Sir Robert Saundby explained why flight refuelling had not been used during the war, looked at the current position of flight refuelling and acknowledged that recent developments, particularly the probe and drogue system, had radically changed the position: This had made it possible to rapidly refuel a fighter squadron to significantly increase range or endurance and would be of considerable value in both air defence and tactical operations.

Notes:

1 Cobham Archives files: Meteor Serviceability.

2 Shacklady, Edward; *Gloster Meteor* (Macdonald, 1962) p131.

3 TNA AIR 27/2481; No 245 Sqn ORB, Jan 46-Dec 50.

4 TNA AIR 16/1202; No 245 Sqn operations orders: flight refuelling minutes and trials programme, May-Dec 51.

5 *Ibid*.

6 Cobham Archives files: RAF Evaluation Trials.

7 Cobham Archives files: Mr Marks, Sundry Memos 1948-61; RAF Evaluation Trials Diary; Pat Hornidge, Sundry Memos, 1949-61.

8 Early probes had a pilot-controlled, pneumatically-operated nozzle valve.

9 *The Aeroplane*, 6 July 1951, p9.

10 Refuelling during descent – the 'toboggan' procedure – has been used with many tanker/receiver combinations where one or other aircraft was unable to make or maintain contact because of weight, altitude or engine power limitations.

11 The two probe-equipped F-84Es were flown across the Atlantic in ‘Fox Able 4’, refuelled by Lancaster, Lincoln and B-29 tankers. However, one aircraft was unable to complete a third refuelling and was abandoned over Newfoundland.

12 Cobham Archives files: Miscellaneous Flight Test Summaries.

13 Lee, Air Chief Marshal Sir David; *Wings in the Sun* (HMSO, 1989) pp45-46.

14 Cobham Archives files: C H Latimer-Needham, Memos 1950-54.

15 Cobham Archives files: Ward, Capt C, RAF Meteor Contract and Production Minutes up to 29 January 1953.

16 TNA AIR 2/11417; Flight refuelling of aircraft: policy, 1952-54; DGTD(A) to ACAS(OR), 27 October 1952.

17 Cobham Archives files: C H Latimer-Needham, Memos 1950-54.

18 Saundby, Air Mshl Sir Robert; ‘Flight Refuelling – The Position Today’ in *The Aeroplan*e, 28 November 1952, pp722-723.

‘MUTTON’, ‘ALBINO’ AND ‘TURBINLITE’: MISDIRECTION IN FIGHTER COMMAND NIGHT AIR DEFENCE POLICY, 1940-1942

by Stephen Moore

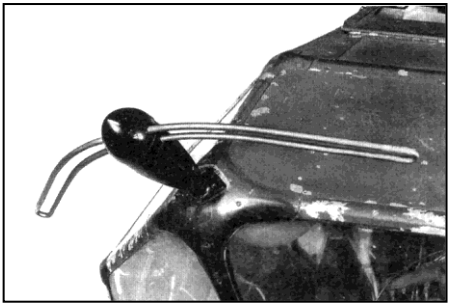
Introduction

RAF night defence policy from 1940 through to the end of 1942 demonstrated a sense of desperation, as a lack of confidence in AI radar prompted a series of what can only be most charitably described as hare-brained schemes. Compared to daylight operations, the technical complexities of night interception had been underestimated. Optimisation of aircraft and radars, both airborne and ground-based, into an integrated system was not possible until all three elements were in service so procedures were devised in an evolutionary fashion during operations carried out over the winter of 1940-41. The disappointing initial performance of AI, a lack of understanding by senior officers and political pressure prompted the RAF to consider less conventional means of air defence that reduced the overall effectiveness of Fighter Command.

Use of Radar by the RAF

The ability of radio pulses to detect approaching aircraft was first demonstrated in Britain in 1935.[1] The characteristics of British radar stations were unsuitable for direct control of interception, being designed for maximum early warning but requiring separate readings of range, bearing and height to be calculated in order to visualise a formation, which limited the precision.[2] The deficiencies of the daylight radar network were only rectified in the spring of 1940 shortly before the Battle of Britain began, but overland radar detection was still not available.[3] A prototype Air Interception (AI) radar was ready in the summer of 1939; it was limited in both minimum and maximum range, but an erroneous claim that range could be improved contributed to the severe disruption of the development programme.[4] The initial equipment demonstrated several major design faults, not least of which was an inability to determine the exact direction of the signal from a target, so by December 1939 it had been declared operationally useless.[5]

The technical complexities of night air defence greatly exceeded



The transmitter aerial of an early, metric, AI radar mounted on the nose of a Blenheim I.

those of daylight operations, with three additional components being required. A night fighter with a two-man crew, long endurance and heavy armament for momentary nocturnal interceptions was essential. To guide the fighter to within detection range it became clear that a completely new type of accurate Ground Control Interception (GCI) radar would be required to guide fighters into AI range. It was also imperative that the fighter was equipped with AI radar to enable it to close from 20,000 feet to within 500 feet from the target, where the pilot would be able to make visual contact and move into a firing position.[6]

The ineffectiveness of the night defences had been recognised, and in early 1940 the Fighter Interception Unit (FIU) was formed to test all new night fighting equipment. A re-engineering of AI Mk II eliminated back echo but both this, and the more powerful AI Mk III, still suffered from an unsatisfactory minimum range of 1,000 feet, which was insufficient to ensure visual contact.[7] The prototype of the first really effective AI set, the Mk IV, only began testing in July, which coincided with the availability of the first Bristol Beaufighters, and FIU trials demonstrated the tracking of targets from 19,000 down to 400 feet.[8] The unwise location of the unit at Kenley, in the middle of 11 Group, led to all of its aircraft being destroyed or damaged due to enemy action during the Battle of Britain.[9] The relocation of the FIU and replacement of its equipment undoubtedly delayed this evaluation, and would impair a viable defence once night bombing began in earnest with AI Mk IV-equipped Beaufighters only beginning to enter service in October 1940.

The Failure of Night Defence during the Blitz

At the time that the Blitz started, night defence rested on six squadrons of underpowered Blenheims equipped with experimental

Gp	Sector	Unit	Base
10	Middle Wallop	No 604 Sqn	Middle Wallop
11	Debden	No 25 Sqn (A Flt)	Martlesham Heath
	North Weald	No 25 Sqn (B Flt)	North Weald
	Hornchurch	No 600 Sqn	Hornchurch
12	Wittering	No 23 Sqn	Wittering
	Digby	No 29 Sqn	Digby
13	Catterick	No 219 Sqn	Catterick

Table 1: AI-equipped Blenheim ORBAT, 7 Sep 40.
(Adapted from TNA AIR41/17, Appendix 18)

and unreliable radar, as shown in Table 1.

By 1940 the Blenheim was obsolescent and barely faster than the enemy bombers it was attempting to intercept. Adding radar equipment, four Browning machine guns and ammunition did nothing to improve its performance margin over potential targets. There were also two squadrons of Defiant turret fighters available, relegated from the daylight battle due to their vulnerability, but these were of limited use as they lacked radar and the crews had uneven night flying experience.[10]

During the 17 October meeting that led to his sacking, Air Chf Mshl Sir Hugh Dowding objected to using single-engined, visually intercepting ('Cat's Eye') fighters at night on the grounds they would be useless.[11] This dissention, 'I am carrying out orders which I believe to be dangerous and unsound,' probably prompted his dismissal as much as the 'Big Wing' controversy.[12] Air Mshl Sholto Douglas, who succeeded Dowding at Fighter Command, assigned Hurricanes permanently to the night fighter role, and the desperation of Fighter Command can be demonstrated by the use of Hampden bombers at the end of 1940.[13] Douglas ordered such patrols to be initiated within twenty-four hours of assuming command of the fighter defences on 26 November.[14] As the Hampdens were too slow to catch German bombers, this approach was abandoned on 14 December in favour of increased use of single-engined fighters at night.[15] The protracted development of AI radar and the late introduction of the Beaufighter practically gave the *Luftwaffe* a free hand over the country during the winter of 1940. By December, Douglas was corresponding with Air Chf Mshl Portal, the CAS, to protest about the allocation of Beau-

Year	Month	Enemy Sorties	Dest (Total)	Dest (Single-Engine)	Single-Engine % Dest
1940	September	6,135	4	–	–
	October	5,845	3	–	–
	November	5,495	2	–	–
	December	3,585	4	–	–
1941	January	1,965	3	1	33%
	February	1,225	4	1	25%
	March	3,510	22	1	5%
	April	4,835	49	9	18%
	May	4,055	96	29	30%

Table 2: Results of combats during the night battle.
(Adapted from TNA AIR41/17, 116-117)

fighters to Coastal Command over the requirements of night air defence. Portal, however, had to consider the wider war and declined to alter the priorities.[16] The Beaufighter prototype had only flown for the first time in July 1939, and when the limitations of the AI-equipped Blenheims were highlighted it was clear that a better aircraft was required. The integration of the Beaufighter, AI and GCI into an integrated system was not possible immediately, but it was gradually achieved during the winter of 1940-41.[17]

Lack of experience in using AI inevitably limited interceptions, but serious faults with the equipment did not help. The initial slow supply of aircraft meant that daylight training was not possible, but by November at least one squadron had sufficient sets to begin such exercises. This revealed that the position of the target aircraft did not correlate with that shown on the equipment screens, a fault traced to dry-soldered and other poor connections in the AI equipment, with all squadrons being alerted to the problem.[18] By May 1941 AI was routinely checked before operational use, but dampness was still causing problems, aerials could break off due to ice formation and pilots stressed the need for careful selection and training of AI operators.[19]

Radar-equipped fighters only achieved success after the teething troubles of GCI and the Beaufighter/AI Mk IV combination had been overcome, as shown in Table 2. Although a Beaufighter using AI

Gp	Sector	Unit	Aircraft	Base
9	Ternhill	No 68 Sqn	Blenheim/ Beaufighter	High Ercall
10	Colerne	No 600 Sqn	Beaufighter	Colerne
	Middle Wallop	No 604 Sqn	Beaufighter	Middle Wallop
11	Tangmere	No 219 Sqn	Beaufighter	Tangmere
	Biggin Hill	No 29 Sqn	Beaufighter	West Malling
	Debden	No 85 Sqn	Havoc	Debden
12	Wittering	No 25 Sqn	Beaufighter	Wittering

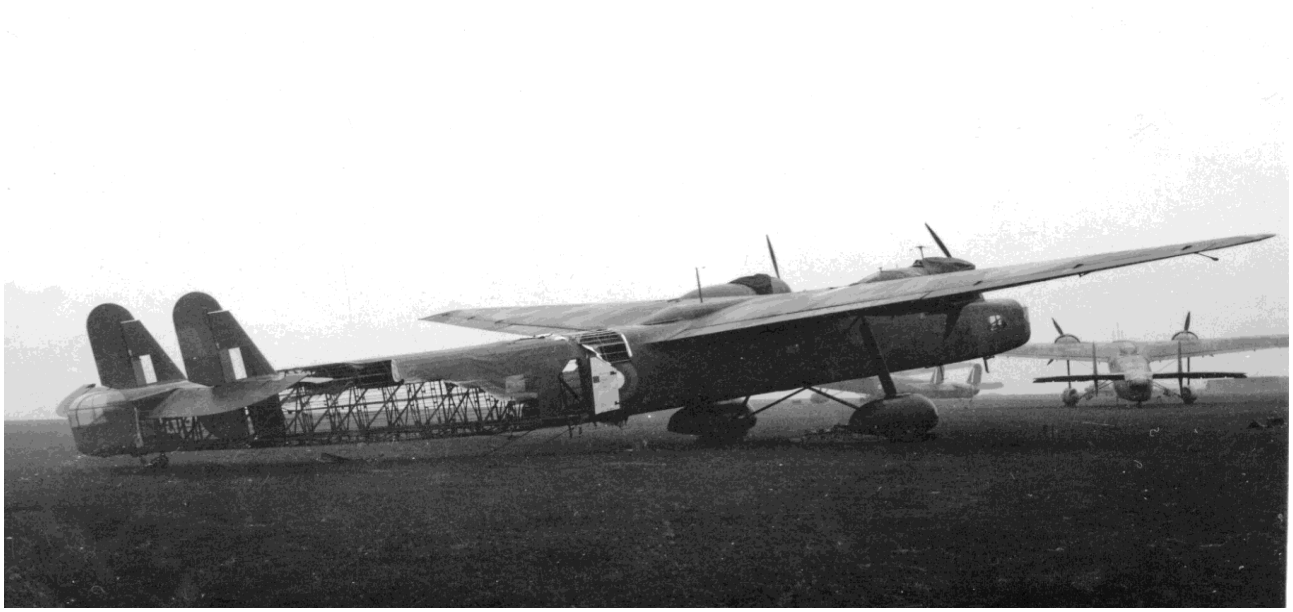
Table 3: AI-equipped night fighter ORBAT, 11 May 41.
(Adapted from TNA AIR41/17, p116 and AIR41/18, Appendix 1)

first destroyed an enemy aircraft on 19 November 1940, significant results were only achieved after GCI became available on 1 January 1941with eight stations becoming operational by the end of May 1941.[20] Although quantitatively the number of AI-equipped squadrons was just starting to increase in May 1941, the statistics conceal the qualitative improvement of the defences.[21] Compared to September 1940 only one extra squadron had been added to the order of battle, but all bar one were now operating Beaufighters or Havocs equipped with AI Mk IV as shown in Table 3.

Haphazard Alternatives to Night Air Defence

The disappointing initial performance of AI during the winter of 1940 prompted Fighter Command to consider less conventional means of air defence.[22] The long approach by the night fighter after AI acquisition into a firing position below the target was perceived as being slow and inefficient when compared to day fighter tactics.[23] While radar-controlled night fighting did exactly what it said on the tin, too many senior Air Officers and politicians did not understand the contents or could not read the product information correctly. In early 1941 this was then conflated into a crisis, leading to a loss of confidence in AI fighters and a great deal of time and resources being wasted on what can only be most charitably described as hare-brained schemes that would not be ready for operations until after combat results had improved (see Table 2), and equipment and personnel shortages had been resolved.

The ‘Long Aerial Mine’ (LAM), codenamed ‘Mutton’, consisted of 2,000 feet of piano wire with a parachute at the top and a small bomb



The 'Mutton' concept was tested and deployed by No 420 Flt, later No 93 Sqn. The work was not without its hazards. This is the result of the premature detonation of a mine in a Harrow, K6994, while airborne, on 26 October 1941. (A Thomas)

at the bottom.[24] The theory was that these would be dropped from patrolling aircraft in front of the attacking bombers; the wire would strike a wing and pull the bomb up to explode on the aircraft.[25] Trials using obsolete Harrows were discouraging, as well as preventing AI-equipped aircraft from using the first (and at the time only) GCI station for extended periods.[26] Instead of abandoning the experiment at this stage, the squadron was re-equipped with much faster Havocs, still reducing the effectiveness of GCI stations and diverting aircraft and crews trained for night interception.[27] This method of defence was intended to take advantage of concentrated streams of enemy bombers travelling to a target using a radio beam, a technique which the *Luftwaffe* had abandoned by the end of the Blitz.

Even more perplexing were the 'free balloon barrages', again equipped with wires attached to small bombs. The intention was to deploy such barrages, codenamed 'Albino', when conditions were unsuitable for the operation of night fighters.[28] To avoid civilian casualties, deployment of this method was also limited to occasions when the wind direction would prevent bombs from being deposited overland. Despite claims to the contrary, there is no evidence that this scheme ever destroyed a single enemy aircraft.[29] At no point did the scale of attacks justify a release, and during the intervening year improvements in training and equipment of night fighter squadrons meant they could operate in much poorer weather conditions than when 'Albino' had been introduced, so on 24 December 1942 'Albino' was abolished. The possibility of damage to RAF aircraft operating over Europe was considered greater than to *Luftwaffe* bombers and the, 'scheme was using too much manpower'.[30]

Development and Response of the Defences to Continuing Night Attacks

Following the end of the Blitz in July 1941 Fighter Command only achieved double figures of aircraft destroyed during one month (October), as shown in Table 4, and anti-aircraft figures were similarly low.[31]

Although the optimisation of fighters, ground and aerial radar had been achieved by May 1941, further progress during the rest of the year appeared slower than expected. This perception was reinforced by the *Luftwaffe* adopting a low-level approach over the sea, to pre-

Month	Sorties		Combats		Dest		Enemy Sorties	Total Fighter Sorties*
	T/E	S/E	T/E	S/E	T/E	S/E		
Jan	84	402	2	9	0	3	2,295	486 (25%)
Feb	147	421	4	9	2	2	1,820	568 (46%)
Mar	270	735	31	25	15	7	4,125	1,005 (29%)
Apr	542	842	55	39	28	20	5,125	1,384 (29%)
May	643	1345	80	116	37	59	4,625	1,988 (49%)
Jun	536	942	37	15	20	7	1,980	1,478 (75%)
Jul	557	338	23	18	20	6	1,352	895 (66%)
Aug	549	592	4	1	3	0	935	1,141 (122%)
Sep	361	344	10	3	7	1	838	705 (84%)
Oct	621	496	36	3	9	2	849	1,117 (132%)
Nov	417	345	15	0	7	0	695	762 (110%)
Dec	440	211	6	0	3	0	695	651 (94%)

Table 4: Combat results for RAF fighters in 1941.
(Adapted from TNA AIR41/17, Appendix 8)
*% of sorties per enemy sorties; S/E & T/E = single & twin-engined.

vent GCI from acquiring targets, and confining its operations to the east coast, further limiting opportunities for interception. Although single-engined 'Cat's Eye' fighters destroyed more aircraft in May than any other month of 1941, this was against highly concentrated raids with good visibility, operating under the most favourable conditions. Compared to AI-equipped fighters, 'Cat's Eye' aircraft were unable to sight and intercept raiders if the moon was below the horizon. An AHB analysis calculated that AI fighters were seven times more likely to shoot down an enemy bomber compared to the 'Cat's Eye' alternative. 'Cat's Eye' fighters achieved less than ten combats during the last five months of the year. Despite the enthusiasm of the AOC for the diversion of single-engined fighters to the night battle, their results were probably not worth the effort expended (see Table 2).

On 12 May 1941 Douglas was quoted as saying, 'AI with GCI was the most profitable means of night interception,' which was a similar statement to the one which had cost Dowding his job six months earlier.[32] As the original 'Intermediate' GCI installations were only able to control one fighter at a time, the capabilities of the forty-one

Group	15 April 1941	25 December 1941
9	1½	1½
10	2	3
11	3½*	4*
12	1	3
13	0	2

Table 5: Expansion of AI squadrons during 1941.
(Adapted from TNA AIR41/17, Appendix 14
and AIR41/18, Appendix 1)
* Including FIU

stations operating at the end of 1941 would still be limited in the event of heavy attacks.[33] From May 1941 the number of AI squadrons in Fighter Command began to increase. The majority of additional squadrons were formed in groups away from the south and west coasts, as shown in Table 5.

Relocation of squadrons to the north-east and east coasts, where significant activity continued, did not happen as the resumption of heavy attacks in the south-east was anticipated, so many squadrons were underemployed. Although the night fighter force was planned to expand to sixteen Beaufighter squadrons by the end of 1941, only twelve squadrons had formed in Fighter Command by November.[34]

Ministry of Aircraft Production (MAP) statistics show that 911 Beaufighters had been supplied to the RAF by the end of 1941.[35] While 270 of these aircraft were Mk ICs, without radar, the availability of so many aircraft makes the expansion of the AI squadrons seem unnecessarily slow.[36] Given the early entry into service by the Beaufighter the aircraft became effective very rapidly compared to other first-generation monoplane fighters in the RAF. Table 6 shows that, despite flying for the first time ten months after the Whirlwind, the Beaufighter entered service in the same month. The Beaufighter was also in extended service, with five squadrons, before the other fighters began operating with the RAF, and it would have been unrealistic to expect the aircraft to become established more quickly.

Initially there was a perception of an unnecessary time lag between delivery of Beaufighters from the manufacturer and supply of aircraft from the Maintenance Units (MU), where military equipment had been installed. One report complained that on 1 November 1940 there

Aircraft	First flight	Entered service	Extensive service
Hurricane	Nov 35	Dec 37 (25 months)	Dec 38 (37 months)
Spitfire	Mar 36	Aug 38 (29 months)	Sep 39 (42 months)
Defiant	Aug 37	Dec 39 (28 months)	May 41 (45 months)
Whirlwind	Oct 38	Sep 40 (23 months)	Oct 41 (36 months)
Beaufighter	Jul 39	Sep 40 (14 months)	May 41 (22 months)

Table 6: Introduction of monoplane fighters into RAF service.
(Compiled from Mason, *The British Fighter*, pp254, 258-259, 268-269, 274-275 & 280-281)

were twenty-four Beaufighters at MUs, many already fitted with AI and other equipment and air tested, some of which had been there since 25 October.[37] MAP statistics show that 111 Beaufighters had been delivered to the RAF by the end of 1940.[38]

During the winter of 1940-41, airfield lighting was mediocre, with no flying control and poor radios.[39] Night flying accidents were commonplace, with thirty-six Beaufighters being destroyed or badly damaged in accidents during the first three months of 1941 – almost half of the seventy-seven in squadron service.[40] 'At that stage of the war,' a night fighter pilot recalled, 'the chief task confronting anybody who took off at night was to try and get himself and his aircraft back safely on the ground. The accident rate was extremely high.'[41] In May 1941, Air Mshl Douglas noted that his six squadrons had a total strength of eighty-one Mk I and five Mk II aircraft.[42] Using the Air Ministry Aircraft Record Cards, which summarise the movements and service of each aircraft, the expansion of the night fighter force up to the end of 1941 may be assessed (see Table 7).

Beaufighter numbers increased very slowly during 1940 and early 1941, due to high losses over the winter months. The delivery of ninety-four aircraft in the first five months of 1941 only increased the first-line strength by twenty-seven. These winter losses meant that it was June 1941 before Fighter Command could field more than 100 Beaufighters. But the number of aircraft on charge to squadrons increased rapidly thereafter, doubling over the next four months. Once the weather deteriorated as winter approached, the number of aircraft fell again as the accident rate increased. Although the number of aircraft in squadrons decreased, there was no shortage of Beaufighters with 121 aircraft available for issue in MUs at the end of 1941.[43]

Date		Cumulative deliveries	Total IE	Beaufighter Squadrons	
				Total	Fully Equipped
1940	Sep	22	18	5	0
	Oct	45	29	5	0
	Nov	76	47	5	2
	Dec	96	57	5	3
1941	Jan	101	55	5	3
	Feb	123	65	5	4
	Mar	141	70	5	4
	Apr	159	79	7	5
	May	190	84	7	5
	Jun	228	107	9	6
	Jul	275	136	11	7
	Aug	331	177	13	10
	Sep	375	204	14	11
	Oct	410	212	15	12
	Nov	424	199	15	12
	Dec	461	189	15	12

Table 7: Beaufighter squadrons in Fighter Command 1940-41.
(Compiled from AHB, *AM Form 78, Drawers: Battle P (Cont.) to Beaufighter T* and *Beaufighter V to Beaufighter JL)*

Training

By September 1940 the quality of pilots provided to Fighter Command from OTUs fell to an unacceptable level with these units merely providing conversion to type.[44] There was no capacity for night flying instruction to be carried out under these circumstances, and such training did not restart until November.[45] The night fighter squadrons were unable to maintain their numbers using pre-war personnel so they were supplemented by night bomber pilots and gunners converted into AI operators after a short radio course.[46] Guy Gibson, for example, was seconded to a night fighter squadron in November 1940 and, due to his previous night flying experience, he was operational by late December.[47]

Additional OTUs were formed to ensure that pilot supply never fell to critical levels again, including the establishment of the first dedicated night fighter OTU in December 1940, which was when night training resumed.[48] By the middle of 1941 the numbers emerg-

Date	Aircraft 's'	Night fighter crews		Op day pilots	OTU output	
		Total	Op		Night	Day
2 May 41	72	91	85	1185	51[1]	229
30 May 41	69	97	81	1176	23[1]	411
14 Jul 41	89	116	92	1321	27	387
8 Aug 41	97	137	91	1273	56	400
5 Sep 41	125	181	122	1376	48	475
3 Oct 41	147	304	130	1447	23	459
7 Nov 41	138	220	130	1445	27 (+13)[2]	340
2 Jan 42	167	259	178	1466	22 (+21)[2]	326

Table 8: Supply of aircrew to operational Beaufighter squadrons.
(Adapted from TNA PREM3/29/4 and AIR16/1144)
[1] Single-engine and twin-engine totals quoted as combined figure
[2] Number in brackets from No 51 OTU

ing from day OTUs were acceptable, but night OTUs generated only 152 aircrews in the first six months, a mere 10% of the output from day fighter OTUs.[49] Although a second night fighter OTU had been formed in April 1941 it was not until June that it started training crews. By that date, all seven day OTUs were producing pilots but night fighter output was still solely from No 54 OTU.[50] The expansion of the night fighter force during the Blitz and until the end of 1941 shows the availability of operational aircrew rarely exceeded the number of serviceable aircraft. As shown in Table 8, the supply of crews to AI-equipped fighter squadrons remained a fraction of those from day OTUs.

All output from No 60 OTU after June went to Defiant squadrons, while the third night OTU, No 51, only began producing crews in November 1941.[51] Before 1941 all fighter training had been *ad hoc* and unregulated, the operation of the first night OTU being described as, 'somewhat of an experiment'.[52] A day fighter syllabus was drawn up and adopted by OTUs in March 1941, but it took until August before night fighter training was standardised.[53] A shortage of dual control Blenheims limited the amount of flying at OTUs, together with poor reliability of aircraft.[54] Pilots spent a month at OTU before their operators joined them, flying a total of thirty hours together including eighteen at night. Fifteen hours training was then needed on a squadron before flying at night to complete their training as no

An AI Mk IV-equipped Blenheim IF of No 54 OTU.

Beaufighters were available for OTUs.[55] Since GCI interceptions were not practised at OTU this presumably formed an important part of squadron training.[56] Therefore the output of night fighter OTUs needs to be considered with caution, one source commenting, 'it was a long time before squadrons called us "operational"'.[57] It was not uncommon for crews to spend two months at squadrons before they became operationally effective.[58]

The other aircraft used for AI interception was the American-built Havoc, which also experienced shortages of aircrew throughout the year. One squadron had been equipped with Havocs in May 1941, but it was still the only such unit by the end of the year.[59] The Havoc had been identified as suitable for many different roles, and this 'multiplicity' delayed its operational deployment.[60] Another squadron was also using the aircraft in the intruder role over enemy airfields, but additional aircraft had been squandered operating the LAM ('Mutton'). While the intruder squadron was successful in disrupting *Luftwaffe* activity, 'Mutton' achieved nothing except wasting AI-trained crews and GCI resources. Despite claims to the contrary, there is no evidence that aerial mines ever destroyed an enemy aircraft and the weapon was declared obsolete in November1941.[61] As the OTU supplying replacement personnel for Havocs only began producing aircrew in that month, maintaining operational resources on the two

Month	Sorties		Destroyed	Enemy Sorties	Total Fighter Sorties
Jan	T/E S/E	357 194	4 (1.1%) 0 (n/a)	573	551 (96%)*
Feb	T/E S/E	218 149	2 (0.9%) 0 (n/a)	318	367 (115%)*
Mar	T/E S/E	224 168	2 (0.9%) 0 (n/a)	519	392 (76%)*
Apr	T/E S/E	738 397	17 (2.3%) 3 (0.8%)	975	1135 (116%)
May	T/E S/E	584 187	14 (2.4%) 0 (n/a)	791	771 (97%)*
Jun	T/E S/E	976 286	21 (2.2%) 3 (1.0%)	760	1262 (166%)*
Jul	T/E S/E	1348 655	27½ (2.0%) 5½ (0.08%)	681	2003 (294%)*
Aug	T/E S/E	1462 424	21½ (1.5%) 0 (n/a)	626	1886 (301%)*
Sep	T/E S/E	1128 252	10 (0.9%) 0 (n/a)	319	1380 (433%)*
Oct	T/E S/E	122 2	6 (4.9%) 0 (n/a)	202	124 (62%)*
Nov	n/r	n/r	n/r	58	n/r
Dec	T/E S/E	} 647 }	1 (0.2%) 0 (n/a)	124	647 (192%)*

Table 9: Combat results for RAF night fighters in 1942.
(Adapted from TNA AIR16/525 & AIR16/889)
* % of sorties per enemy sorties
n/r = not recorded; S/E & T/E = single & twin-engined.

squadrons had been a challenge throughout 1941.

Response to Escalation of Attacks in 1942

At the start of the *Baedeker* phase in April 1942 Fighter Command destroyed only eight German bombers in the first four attacks, all of which took place on targets in 10 Group. In contrast, the next set of raids was against cities along the east coast, within 12 and 13 Groups'

Date	AI-equipped	Single-engine	Turbinlite
2 Jan	12½	7½	5
26 Feb	17	6	5
4 Jun	19	–	5
7 Oct	20	–	10
3 Dec	19	–	10

Table 10: Expansion of AI squadrons during 1942.
(Adapted from TNA AIR16/584 and AIR41/49)

areas which had suffered the attacks of autumn 1941, when aircrew and controllers had both gained experience of countering enemy operations. Their increased expertise was reflected in the fifteen aircraft shot down during the next four attacks on the east coast.

Up to this point the long wavelengths used by AI sets had limited the minimum operating height and detection range due to ground clutter.[62] At the end of 1941 the RAF introduced AI Mk VII, fitted with the cavity magnetron which permitted the use of wavelengths as short as 10 cms (centimetric).[63] At the same time, techniques to reduce ground returns allowed aircraft equipped with the old AI Mk IV to perform interceptions down to 3,000 feet and improvements in radar operator training improved the ratio of successful combats.[64]

The number of sorties flown by the *Luftwaffe* during the first quarter of 1942 remained high (see Table 9), but losses were few making this a relatively low risk campaign at this stage. Sortie numbers peaked in April during the *Baedeker* raids, and then remained high until August 1942. High levels of fighter sorties were flown against these raids, which increased progressively throughout the year. Throughout 1941, the use of 'Cat's Eye' fighters had been effective only during highly concentrated raids, but unfavourable conditions in 1942 meant that few enemy aircraft were destroyed.[65] The superiority of the AI/GCI weapon system was finally proven, and the use of single-engine night fighters was phased out during the first half of the year, as shown in Table 10.

While the Defiant units were transitioning to AI-equipped Beaufighters or Mosquitos, a large number of squadrons became non-operational, albeit briefly; by April 1942 five of them had been re-quipped for only three months, so night defence did not become more

The Helmore Turbinlite.

effective until after the *Baedeker* period.[66] By the time of the July attacks on Birmingham, however, these additional squadrons were suitably trained and experienced and the *Luftwaffe* suffered unacceptable losses. Late in 1942, Fighter Command was finally able to field the twenty AI-equipped night fighter squadrons which Air Chf Mshl Douglas had insisted was required while the Blitz was still in progress.[67] The decline in single-engined night fighter squadrons continued throughout 1942, with the last of the Defiants gone by the middle of the year, and Hurricane numbers falling as squadrons were posted overseas, leaving few single-engine fighters for night use.[68]

Aerial Searchlights – the 'Turbinlite'

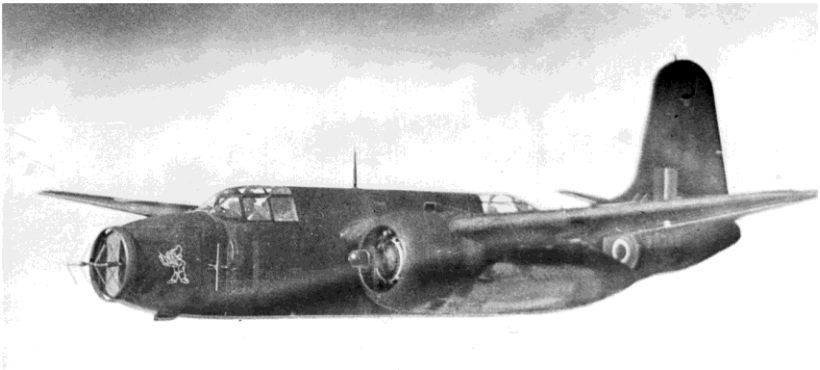
From July 1941 Fighter Command began to receive experimental 'Turbinlite' Havocs fitted with a Helmore searchlight in place of armament. Frederick Lindemann, Churchill's scientific advisor, was convinced that it was, 'self-evident that the easiest way to intercept at night is to turn night into day by the use of artificial light,' and he persuaded Churchill to coerce the RAF into trials with 'chemical searchlights' in September 1940.[69] Air Chf Mshl Portal had reservations about atmospheric conditions negating searchlight beams, but Lindemann brushed these off.[70] As an intruder the Havoc was faster and more robust than the previously used Blenheims, while as an AI-equipped fighter its performance was comparable to early Beaufighters. The only way to accommodate both the radar and a searchlight in a Havoc was for the aircraft to be unarmed, so the decision to equip ten flights with Turbinlite aircraft denied Fighter Command additional AI squadrons when Beaufighters had been scarce. The impact of this policy can be illustrated by the previously used Aircraft Record Cards methodology. The delivery of Havocs was

Date		Cumulative Deliveries	Total IE	Havoc formations	
				Total	Fully equipped
1940	Dec	5	5	2	0
1941	Jan	8	7	2	0
	Feb	22	21	5	0
	Mar	50	42	5	2
	Apr	72	55	5	3
	May	87	51	5	3
	Jun	109	63	6	3·5
	Jul	140	73	10	3
	Aug	174	84	11	4
	Sep	225	97	13	5
	Oct	265	111	12	6
	Nov	295	117	13	7
	Dec	322	100	13	5*

Table 11: Havoc formations in Fighter Command 1940-41.
(AHB: AM Form 78, Drawer: Havoc AE to Hind K)
* Long Aerial Mine squadron disbanded

initially slow, due to LAM conversions being prioritised over those being prepared for intruder operations or fitted with radar, so Turbinlite versions did not begin to arrive until March 1941. The number of aircraft available increased only slowly thereafter and still did not reflect actual aircraft availability (see Table 11). The only AI-equipped Havoc fighter squadron was operational by April 1941, but the priority given to LAM had delayed its availability by two months while the Blitz had been at its height.[71] Without the distraction of questionable weapon systems, aircraft and crews could have been found to equip two more Havoc squadrons before the end of the Blitz thus compensating for the shortfall in Beaufighters.

The fact that LAM, and then Turbinlite, were sponsored by Lindemann, with his bias against AI is almost certainly the reason for this, and many Havocs remained unused at MUs during the first half of 1941.[72] The large number of civilians used to convert Turbinlite aircraft and to supply associated equipment was considered a major security concern, so diagrams and other information were, ‘not dis-



A Turbinlite Boston III, W8346 of No 537 Sqn.

played where they could be seen by anyone other than those directly concerned'.[73] Such exceptional precautions would have been more impressive if the formation of units had been as inspiring; only thirty pilots were available to Turbinlite units at the end of November 1941.[74] At the beginning of April 1942, there were only seventy Turbinlite Havocs on strength compared to the ninety required, with no further aircraft available for conversion.[75] The supply of Havocs, which could have increased AI fighter numbers while Beaufighter availability was low, was therefore squandered without being used.

The demand to validate the aerial searchlight concept was apparent in the orders issued to Fighter Groups in April 1942 during the *Baedeker* raids, 'I am particularly anxious to use the Turbinlites and these also should be put into the air early.'[76] Controllers and crews were less convinced than Douglas of the effectiveness of the Turbinlite system, and HQ Fighter Command's ORB notes that Douglas, 'sent a personal message to operational Groups,' noting, 'a curious reluctance on the part of all concerned to employ Turbinlites operationally.' This led to the almost plaintive request, 'that all Groups should try out Turbinlites at the first reasonable opportunity.'[77] The expectations of Turbinlite capabilities by RAF commanders and the government – 'we should depend on dark nights upon our turbinlite flights for our defence'[78] – were clearly not shared by operational units and crews.

As previously noted, because the only way to fit both an AI radar and a searchlight in a Havoc was to take the guns out, it was necessary

Initially, each of the Turbinlite units, Nos 1451-1457 Flts, was paired with a Hurricane squadron but in September 1942 the flights, were raised to squadron status, as Nos 530-539 Sqns, and allotted Hurricanes of their own. This one is BD936 of No 247 Sqn which flew patrols in co-operation with No 1457 Flt.

to use another aircraft to shoot down anything illuminated by the Turbinlite. This was achieved by using two Hurricanes as 'satellite' or 'parasite' fighters, and Lindemann never considered the co-ordination and tactics required for this. Using GCI/AI, the formation was supposed to close to within 1,000 feet. The Hurricanes then moved forward to intercept and after twenty seconds the Havoc switched on its searchlight to illuminate the target. In practice, the German bomber instinctively banked to escape the searchlight beam, whereupon, 'the Hurricanes got in each other's way, and the Havoc's way, or they obstructed the beam'. This meant that, 'the target got away, while a Havoc and two rather hapless Hurricanes floundered about completely lost, and with their pilots' night-adapted vision destroyed.'[79] Another weakness of the system was that the endurance of the Hurricanes was much less than the Havoc's and, 'having got to a position from which the Havoc could illuminate the target, it seems almost beyond belief that anybody could imagine that it wouldn't be better to aim cannon shells rather than a searchlight.'[80]

With hindsight, it is difficult to argue how taking the guns out of a fighter and replacing them with a searchlight could ever be a good idea, or understand why it was ever considered in the first place. Night interception was a complex process consisting of multiple steps; the

failure of any one of which would prevent an interception. The Turbinlite system complicated and extended the process, further reducing the likelihood of a successful combat. After finally being cleared for operations during the *Baedeker* attacks, early results of the tactic were hardly encouraging, with only two enemy contacts being made during the period. In the first contact the Havoc succeeded in holding the enemy aircraft in its searchlight beam for over ten seconds, but for, 'various reasons the satellite fighter was unable to get into a position suitable for combat.' Although the second contact, on 30 April/1 May, resulted in a He 111 being claimed as destroyed, the Hurricane was in visual range before the searchlight was deployed, and attacked without the German bomber being illuminated.[81]

On 4 May, however, one Turbinlite did achieve a successful combat but, due to its nature, the details were heavily supressed.[82] A Havoc illuminated a bomber which was shot down by the accompanying Hurricane near Norwich.[83] Any enthusiasm for this success was quickly overshadowed by the realisation that the aircraft had been a Stirling returning from a bombing operation.[84] Fortunately the crew were able to parachute to safety but, less fortunately, they were, 'stupidly brought to the same airfield as the errant Turbinlite flight; there was nearly a riot.'[85]

Douglas was clearly underwhelmed by the lack of success, and cautioned that *Luftwaffe* tactics, 'of flying fast and low whilst taking constant avoiding action are not easily dealt with by the Turbinlite,' and that there was not, 'any immediate likelihood of proving the worth of the Turbinlite system.'[86] Operational crews complained that, 'many useful trained night fighter crews were tied up in this operation for over a year,' and were convinced that, 'the powers-that-be certainly persisted far too long with Turbinlites.'[87] Although Groups were being urged to prioritise the use of Turbinlite over AI-equipped fighters well into September 1942, Douglas eventually conceded that, 'the results of such opportunities as have occurred have proved disappointing.'[88]

In his memoirs, Douglas concedes that the Long Aerial Mine was a, 'complete waste of time,' taking, 'a whole year of frustrating experiments,' before he convinced Churchill that the idea, 'was worthless and he agreed to abandon it.' For Turbinlite, however, he insists that it was, 'a more promising idea,' although he admitted that it had cost, 'a great deal of money and time and effort,'

and

Month	Sorties	Contacts		Combats		Results	
		AI	Visual	AI	Visual	Dest	Dam
Apr	3	1	1	–	2	1[1]	–
May	37	4	1	–	–	–[2]	–
Jun	68	2	–	–	–	–	–
Jul	117	–	–	–	–	1[3]	1
Aug	88	–	–	–	–	–	–
Sep	42	–	–	–	–	–	–

Table 12: Summary of Turbinlite operations during 1942.

1 Hurricane attacked before Havoc searchlight was illuminated.

2 Not including Stirling W9313 of 218 Squadron on 4 May 1942.

3 Claimed in British records as one of 6 Do 217s destroyed and 2 damaged (German records show 1 destroyed and 1 damaged, so validity of claim is unlikely).

that the, 'weight of all its equipment and the obstruction in its nose slowed up the Havoc too much when it came to chasing the enemy bombers.' He conceded that, in operation, Turbinlite was, 'surpassed in effectiveness by the straightforward radar-equipped night fighter.'[89] The operational record of Turbinlite throughout these six months was underwhelming; only a single bomber had been destroyed (see Table 12), with the other results being inconclusive.

The future of airborne searchlights was reconsidered in an extraordinarily defensive memorandum by Douglas, which complained that, since it had become operational, *Luftwaffe* activity had, 'been on a small scale,' using, 'shallow penetration combined with the taking of routine evasive action,' which was, 'difficult to counter with Turbinlites,' and that, 'the system has never yet been tried against large scale raids penetrating deep over this country' – which ignored the periods of heavy raiding around the end of April and July.[90] These attacks took place in conditions of bright moonlight, which Douglas does not mention, although separately he accepted that, 'during the moon period each month the light is not effective and is not required.'

Referring back to the large-scale attacks of 1940, when the *Luftwaffe* had used radio aids for bombing on dark nights, he argues, 'at that time AI was still in a very experimental form, and the standard

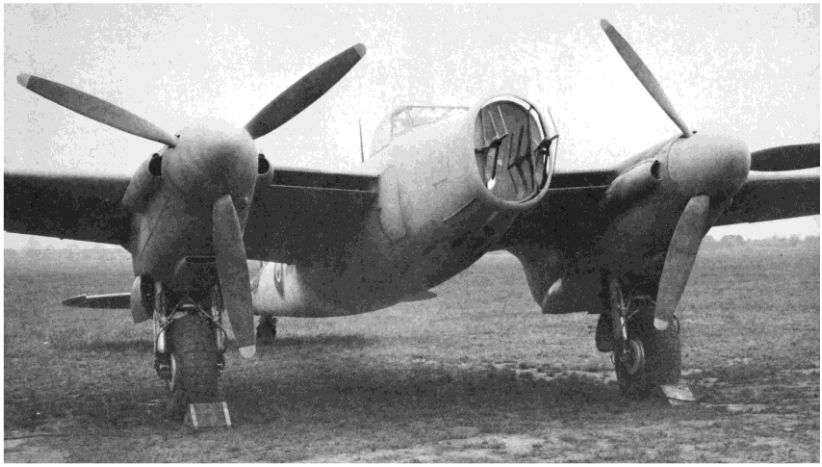
of training required to operate it was very low. Consequently,

System	Sorties	Dete-cted	Vis-ual	Com-bat	Dest	Prob	Dam
Turbinlite	355	38	11	5	1	1	2
AI VII	8082	215	95	59	28	11	14
AI IV &V		–	–	–	95	24	77

Table 13: Combat Results for Night Air Defence Systems in 1942.
(Adapted from TNA AIR41/49, *ADGB*, Vol V, p62)

although AI contacts were achieved,' he contended that, 'few were converted into visuals,' completely ignoring the fact that the Blenheims used at the time were too slow to chase the bombers they were trying to intercept.[91] By the time of the first installation of the 160Kw light, however, the Germans had significantly curtailed the use of radio navigation, and the five radar-equipped fighter squadrons had shot down double figures of *Luftwaffe* bombers for the third month running, demonstrating that training and experience of night interception was achieving success.[92] Due to the uncompromising support of Lindemann and his hostility towards AI radar, there was never any likelihood of Turbinlite being abandoned at that stage, thus denying additional AI-equipped fighters to Fighter Command. Douglas concluded his account of Turbinlite operations (or lack of them) with a table (see Table 13) which completely invalidated the whole concept.[93]

Douglas noted that the AI Mk VII results were achieved by thirty-seven aircraft distributed between four squadrons which, together, claimed 25% of all aircraft destroyed by AI-equipped fighters while forming around only 10% of the AI fighter force.[94] If the, 'great deal of money and time and effort,' spent on ninety Turbinlite aircraft had been used to increase the quantity of AI Mk VII radar sets, the number of aircraft shot down by Fighter Command during 1942 could have been significantly increased.[95] Conceding that the continued use of Turbinlite had been, 'extremely difficult to justify,' Douglas recommended that, 'squadrons should be retained for a further period,' so that an opportunity, 'for assessing the true worth of this weapon,' could occur, although the worth (or lack of it) is clearly illustrated by Table 13. He suggested that if, 'such an opportunity does not occur before 1 January 1943, then I am of the opinion that the Turbinlite



The last gasp of the Turbinlite concept was a trial installation in this Mosquito II, W4087.

squadrons should be abolished,' which was a significant date.[96] Douglas left Fighter Command at the end of November 1942, and thus would not have the responsibility of abandoning a scheme that he had supported for over two years.[97] In the final analysis, there were very few nights when it was, 'so dark that the average trained night fighter pilot,' could not, 'obtain a visual of his target once within firing range.' On 17 December 1942, the Turbinlite squadrons were finally abolished, due to, 'the stringency of the manpower situation,' and because, 'the development of more effective means of night defence did not justify the continued locking up of considerable resources.'

Conclusions

A question remains as to why Douglas persisted with LAM and Turbinlite, despite the clear inadequacies of both systems. The AHB narrative (politely) describes the system, 'as something of a 'white elephant',' while a former pilot is more scathing, saying that it amounted to the, 'flogging of dead horses.'[98] Perhaps, as Douglas saw his predecessor (Dowding) being sacked for refusing to endanger pilots by using single-engined fighters at night, and because of the aggressive support of Lindemann (and a powerful ally in Churchill), he decided to go along with such methods in order to keep his job. When Douglas knew his time at Fighter Command was coming to an

end he was able to campaign for the discontinuation of Turbinlite without risking his career. Describing both Turbinlite and LAM as, 'the useless aberrations that they had always appeared to be,' one (ex-RAF pilot) historian explored why they were persisted with for so long but, 'the only answer I ever got is that it was correct policy to investigate any method that offered some hope of beating the night raider. This was certainly true in 1940, but to go on messing about with demonstrably impractical schemes until late-1943 takes some explanation.'[99] It should also be noted that mistakes (and political interference) in defence procurement have a long history, rivalling that of the armed services unfortunate enough to be issued with such equipment, and this shows no sign of ending.

Notes:

1 Overy, R; 'Introduction', in *Air Power History: Turning Points from Kitty Hawk to Kosovo*, eds. S. Cox and P. Gray (London: Frank Cass, 2002), p xiii.

2 The National Archives (subsequently TNA) AIR41/88, Air Historical Branch (subsequently AHB) Narratives and Monographs, Signals, Vol V, Fighter Control and Interception (1952), p175.

3 Zimmerman, D; *Britain's Shield: Radar and the Defeat of the Luftwaffe* (Stroud: Sutton, 2001), pp184-186.

4 Zimmerman, *Britain's Shield*, p216.

5 Zimmerman, D; 'British Radar Organisation and the Failure to Stop the Night-time Blitz', *Journal of Strategic Studies*, 21, No 3 (1998), p100.

6 Zimmerman, *Journal of Strategic Studies*, 21, No 3 (1998), p86.

7 White, I; *The History of Air Intercept Radar and the British Nightfighter 1935-1959* (Barnsley: Pen & Sword, 2007), p38.

8 Zimmerman, *Journal of Strategic Studies*, 21, No 3 (1998), p103.

9 TNA AIR29/27, Air Ministry: Operations Record Books, Miscellaneous Units, Fighter Interception Unit Operations Record Book (subsequently ORB), 16 August 1940.

10 Price, A; *Blitz on Britain 1939-1945* (London: Ian Allan, 1977), p95.

11 Orange, V; *Dowding of Fighter Command* (London: Grub Street, 2008), p205. Official sources also describe these aircraft variously as 'cats-eye' and 'Catseye', but this has been standardised in the text.

12 Ray, R; *Battle of Britain – New Perspectives* (London: Arms & Armour, 1994), p143 and 149.

13 Richards, S; 'Hampden Patrol', *Aeroplane*, 43, No 12 (2015), p41.

14 TNA AIR24/507, Fighter Command ORB; 1936-1940, 26 November 1940.

15 Richards, S; *The Luftwaffe Over Brum – Birmingham's Blitz From A Military Perspective* (Solihull: Richards, 2015), p75.

[16] TNA AIR16/622, Air Ministry: Fighter Command, Registered Files, Sir W Sholto Douglas, CinC Fighter Command: correspondence with Sir C F A Portal, Chief of Air Staff, 6 and 8 December 1940.
[17] Bingham, V; *Bristol Beaufighter* (London: Airlife, 1994), p74.
[18] TNA PREM3/22/2, Prime Minister's Office: Operational Correspondence and Papers, AIR: Night Bombing – Measures to Counteract, Night Interception – Memoranda by Air Mshl Dowding, Night Interception, 17 November 1940, p2. The first German bomber was shot down by an AI equipped Beaufighter on 19 November. It is not inconceivable that the two events were related.
[19] TNA AIR20/4316. Sir Henry Tizard, Night Defence and Interception: Reports and Analyses, Report of Conference on Technical Aids to Night Fighting, 8 May 1941, p4.
[20] TNA AIR41/88, Signals, Vol V, p192 & 195.
[21] Richards, D; *Royal Air Force 1939-1945*, Vol I, (London: HMSO, 1953), p214.
[22] TNA PREM3/22/5, AIR: Night Bombing – Measures to Counteract, AI (Airborne Interception Equipment), Lindemann correspondence with Churchill, 24 October 1940, p1.
[23] TNA AIR19/308, Air Ministry: Private Office Papers, Turbinlite Squadrons, Turbinlites, 18 October 1942, p1.
[24] The use of the 'Mutton' code name is anecdotally rumoured (sadly unsubstantiated) to have been chosen because it could not be dressed as LAM(b). The code name generators at the Air Ministry were clearly working overtime, as the actual aircraft were designated as carrying 'Pandora' equipment.
[25] Richards, *Royal Air Force 1939 – 1945*, Vol I, p207.
[26] TNA AIR41/17, ADGB, Vol III, p92.
[27] Gunston, B; *Night Fighters: A Development and Combat History* (Stroud: Sutton, 2003), p69.
[28] TNA AIR41/17, ADGB, Vol III, p93.
[29] TNA PREM3/314/4, MINES: Long Aerial Mines, Including Daily and Weekly Returns, Mar-Nov 1941, Portal correspondence with Churchill, 11 May 1941, p1.
[30] TNA AIR41/49, ADGB, Vol V, pp63-64.
[31] TNA AIR41/17, ADGB, Vol III, Appendix 8.
[32] TNA AIR41/17, ADGB, Vol III, p112.
[33] TNA AIR41/88, Signals, Vol V, p202.
[34] TNA AIR16/524, Night Air Defence Committee, Minutes of Meetings and Reports, September 1940 - April 1942, Progress Report by Air Officer Commanding-In-Chief on the Developments and Results Obtained in Night Interception for the Period 1 August to 10 November 1941, p10.
[35] AHB (RAF), *Ministry of Aircraft Production Statistical Review 1939-1945* (1946), *United Kingdom New Aircraft Deliveries by Type*, p6.
[36] AHB, Aircraft Record Cards (Air Ministry (subsequently AM) Form 78), Drawer: Battle P (Cont.) to Beaufighter T.
[37] TNA PREM3/22/2, Night Interception, 3 November 1940, p2.
[38] AHB, *MAP Statistical Review*, *United Kingdom New Aircraft Deliveries by Type*, p6.

[39] Brandon, L; *Night Flyer* (London: Goodall, 1992 [1961]), p45.
[40] Warner, G; *The Bristol Blenheim: A Complete History* (Manchester: Crécy, 2002), p299.
[41] Brandon, *Night Flyer*, p48.
[42] Bingham, *Bristol Beaufighter*, p75.
[43] AHB, AM Form 78, Drawers: Battle P (Cont.) to Beaufighter T & Beaufighter V to Beaufighter JL.
[44] TNA AIR41/71, Operational Training, p824.
[45] TNA AIR41/4, Flying Training, p503.
[46] TNA AIR41/71, Operational Training, p837.
[47] Gibson, G; *Enemy Coast Ahead* (London: Goodall, 1986 [1946]), p118 & 124.
[48] TNA AIR41/17, ADGB, Vol III, p90.
[49] TNA AIR16/1143, Record and History of Operational Training Units under Nos 81 and 9 Groups and No 12 Group: 1910-30 June 1941, Vo. I, 1941 Summary of Events, pp105-106.
[50] TNA AIR16/491, Training at Operational Training Units 1940-1942, AOC Fighter Command from AOC No 81 Group, 25 July 1941, p2 and AIR16/1144, Air Ministry: Fighter Command, Registered Files, Record and History of Operational Training Units under Nos 81 and 9 Groups and No 12 Group: 1 July-31 December 1941, Vol II, Input and Output of Pupils in 1941, pp488-493.
[51] TNA AIR41/71, Operational Training, p830.
[52] TNA AIR16/491, AOC Fighter Command from AOC No 81 Group, 25 July 1941, p2.
[53] TNA AIR41/4, Flying Training, pp506-507.
[54] TNA AIR16/491, Minutes of a Meeting held at Headquarters Fighter Command on 5 August 1941 to Decide on the Establishment of Aircraft in Twin Night Fighter OTUs, p1.
[55] TNA AIR41/71, Operational Training, p830 and AIR16/1147, Air Ministry: Fighter Command, Registered Files, Record and History of Operational Training Units under Nos 81 & 9 Groups & No 12 Group: 15 April-31 October 1943, Vol V, A Comparison of the Training at a Night OTU - November 1941 & September 1943, pp1695-1697
[56] TNA AIR16/491, Air Cdre C E S Goodwin from Air Mshl W S Douglas, 17 March 1942, p2.
[57] TNA AIR16/1147, Comparison of the Training at a Night OTU, p1697.
[58] Howard-Williams, J; *Night Intruder* (Abingdon: Purnell, 1972), p27 & 38.
[59] TNA AIR41/18, ADGB, Vol IV, Appendix 1.
[60] TNA PREM3/314/4, Prime Minister from Lord Beaverbrook, 14 March 1941, p1.
[61] TNA AIR16/524, Progress Report by AOCinC on Night Interception, 1 August to 10 November 1941, p6.
[62] TNA AIR10/2288, Air Ministry: Air Publications (subsequently AP) and Reports, AP1093D, Vol I, Introductory Survey of Radar, Part II, Chapter 1, Paragraph 16.
[63] Johnson, B; *The Secret War* (Barnsley: Pen & Sword, 2004 [1978]), pp94-97.
[64] TNA AIR16/525, Night Air Defence Committee, Minutes of Meetings and Reports, November 1941-August 1943, Progress Report by Air Officer Commanding-

in-Chief on the Developments and Results Obtained in Night Interception for the Period 10 November 1941 to 31 March 1942, p5.

[65] Described officially as 'moderate results', with five aircraft destroyed during six 'Fighter Nights', TNA AIR16/525, Progress Report by AOCinC on Night Interception, 1 April to 15 June 1942, p3.

[66] TNA AIR41/49, ADGB, Vol V, Appendix 1

[67] TNA AIR41/18, ADGB, Vol IV, Part 1, para 71.

[68] TNA PREM3/29/4.

[69] TNA PREM3/22/6, AIR: Night Bombing – Measures to Counteract, Chemical Searchlights, Lindemann correspondence, September 1940 to February 1941. This was achieved by the use of flares, released in pairs from under the wings and towed three feet behind the trailing edge, in close proximity to the fuel tanks, a fire hazard that must have impressed the crew almost as much as being illuminated as a perfect target for every *Luftwaffe* aircraft in the vicinity.

[70] TNA PREM3/22/6, Correspondence between Portal and Lindemann, March 1941.

[71] Townsend, *Duel in the Dark*, p184.

[72] AHB: AM Form 78, Drawer: Havoc AE to Hind K.

[73] TNA AIR16/585, Turbinlite Squadrons, Turbinlite Flights, 6 September 1941.

[74] TNA AIR19/308, Air Member for Personnel from Air Member for Training, 27 November 1941, p1.

[75] TNA AIR19/308, Air Ministry Supply Organisation to Secretary of State for Air, 1 April 1942.

[76] TNA AIR24/509, HQ Fighter Command ORB; 1942, AOCinC Message No 384, 27 April 1942.

[77] TNA AIR24/509, Fighter Command ORB, AOCinC Message No 385, 28 April 1942.

[78] TNA AIR19/308, Secretary of State for Air to Air Ministry Supply Organisation, 16 March 1942.

[79] Gunston, *Night Fighters*, p70.

[80] Howard-Williams, *Night Intruder*, p59.

[81] TNA AIR16/525, Progress Report by AOCinC on Night Interception, 1 April to 15 June 1942, 5 and Appendix A. The scepticism of Controllers and crews is evident as only three Turbinlite sorties were flown in April 1942, with full moon conditions negating any possible advantage of searchlight illumination, AIR 16/607, Description of Enemy Activity, April and May 1942.

[82] None of the Fighter Command HQ or Group ORBs contains any information, and the incident was never mentioned in any Night Air Defence Committee Minutes or Reports.

[83] TNA AIR27/2004, Air Ministry: Operations Record Books, Squadrons, 534 Squadron (ex 1455 Flight) ORB, 4 May 1942.

[84] TNA AIR27/1350, 218 Squadron ORB, 4 May 1942.

[85] Howard-Williams, *Night Intruder*, p59.

[86] TNA AIR16/525, Progress Report by AOCinC on Night Interception, 1 April to 15 June 1942, p5.

[87] Brandon, *Night Flyer*, p53.

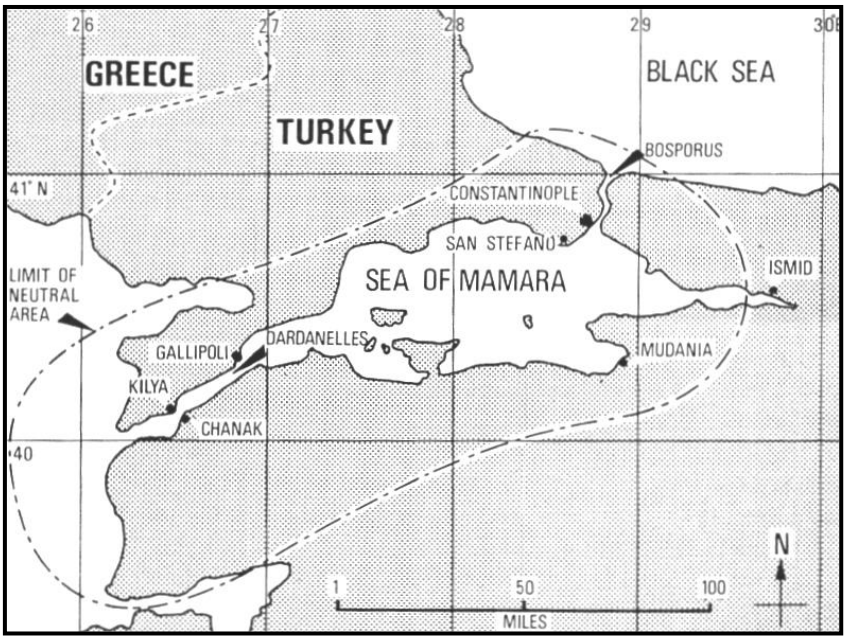
[88] TNA AIR16/525, Progress Report by AOC-in-C on Night Interception, 1 July to 30 September 1942, p4.
[89] Douglas, W S; *Years of Command* (London: Collins, 1966), pp107-108. It should be noted that armed AI Havocs had no difficulty in chasing enemy bombers.
[90] TNA AIR16/525, Turbinlite Squadrons, 14 December 1942, 2 and AIR16/607, Description of Enemy Activity, April and July 1942.
[91] TNA AIR16/525, Turbinlite Squadrons, 14 December 1942, pp2-3.
[92] TNA AIR41/17, ADGB, Vol III, p116.
[93] TNA AIR 16/525, Turbinlite Squadrons, 14 December 1942, 2-4.
[94] TNA: AIR19/308, NAD (42) 11th Meeting: Turbinlite Squadrons, 17 December 1942, p2.
[95] Only 150 AI Mk VII sets were built, all by hand, Gunston, *Night Fighters*, p76.
[96] TNA AIR16/525, Turbinlite Squadrons, 14 December 1942, pp4-5.
[97] Richards and Saunders, *RAF 1939-1945*, Vol II, p368.
[98] TNA AIR41/49, ADGB, Vol V, p61 and Howard-Williams, *Night Intruder*, p127.
[99] Gunston, *Night Fighters*, p71. This inquiry was carried out before the end of the war in 1945.

THE RAF AND THE CHANAK CRISIS OF 1922-23[1]

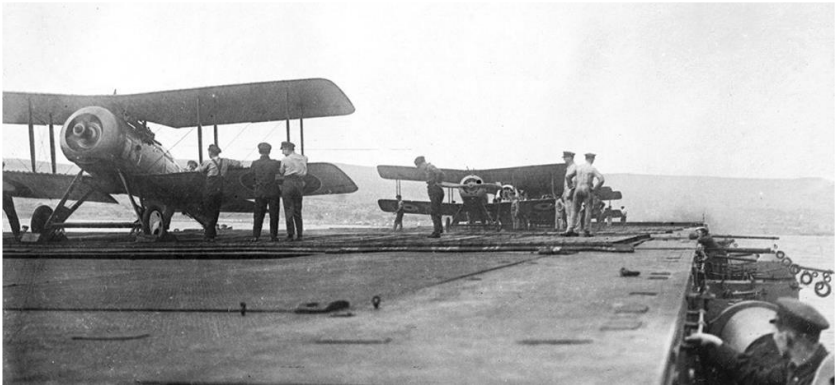
by Tim Mason

Turkey was defeated in World War I, but Turkish Nationalists, under Mustafa Kemal, refused to accept the terms of the 1920 peace treaty, particularly as part of Turkey was occupied by Greece, an age-old enemy. As a result, Kemal seized effective power in Turkey. By September 1922 the Greeks were defeated and the victorious Kemal threatened the Straits (see map) where Britain alone of the Allies had small forces in Constantinople and Chanak to maintain the neutrality of the area.

The British Commander, General Harrington, had warned of the impending invasion by the Turks, and in mid-September the British Cabinet decided to reinforce the area with naval, army and air force units. At the same time, Kemal was to be warned of the threat to European peace if he invaded the Straits area. Nevertheless, Kemalist forces lurked just south of Chanak, and at one time were well inside the neutral zone.



The Neutral Zone.



Nightjars of No 203 Sqn about to be launched from HMS Argus.

Before the British reinforcements arrived, there were numerous ships in the area, including the seaplane-carrier HMS *Pegasus* (3,000 tons) with its RAF unit of five Fairey IIID seaplanes (Eagle VIII engines) on board. The ship's first job was to evacuate an army outpost to the main garrison at Chanak on 9 September. Thereafter the RAF unit maintained daily patrols in the IIIDs over the neutral zone around Chanak. General Harrington was thus kept informed of the Turkish movements on this front.

The first reinforcements in the area were ships of the Royal Navy, including the aircraft carrier HMS *Argus* with No 203 Sqn on board. On 11 September No 203 Sqn at Leuchars had been re-equipping one flight with Nieuport Nightjars (deck-landing versions of the Nighthawk) and had received five aircraft with a sixth being prepared by the Aircraft Repair Section. Bad weather prevented their being flown to Gosport, but by 13 September the aircraft had been crated and sent by rail to Portsmouth. *Argus* sailed on 18 September with one flight of No 203 Sqn and eleven Fairey IIIDs. On arrival at Malta on 23 September, six more Fairey IIIDs (of No 267 Sqn) were taken aboard. Two days later the ship entered the Dardanelles, and four of the IIIDs made their first patrols the following day. The Nightjars were transferred to the airfield at Kilya, while most of the IIIDs were beached on the shore of Kilya Bay.

Meanwhile mobilisation orders had been issued on 16 September to squadrons in Egypt and England. The selection of

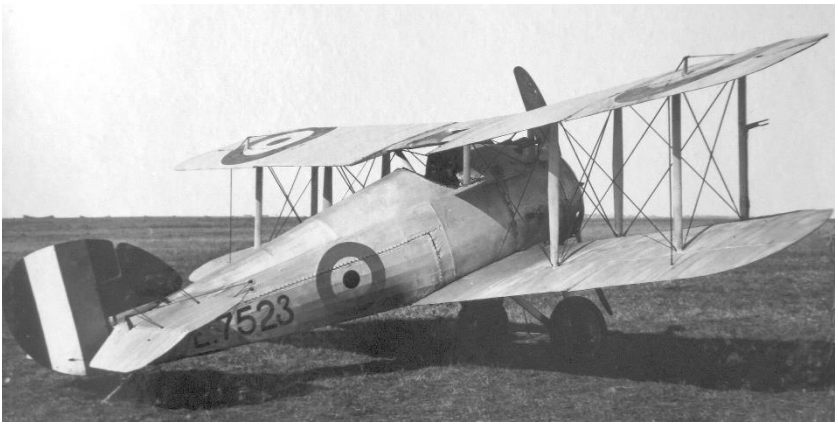
the units had posed something of a problem. It was essential to send enough air power to meet the expected demands of the situation (ie co-operation with army and naval guns and troops, fighter cover and offensive bombing) and the force had to arrive in time. The aircraft on *Argus* were regarded as an interim solution and therefore it was decided to rush No 208 Sqn and what remained of No 56 Sqn (one flight) from Egypt. The remaining units had to be selected from the operational squadrons in England. No 4 Sqn (Bristol Fighters), No 25 Sqn (Snipes) – the only fighter squadron in the country – and No 207 Sqn (DH 9As) were selected. Thus, the first peacetime crisis faced by the RAF left the country with no fighter defences; this situation lasted until No 56 Sqn, consisting of two flights, re-formed in November 1922.

Worked round the clock

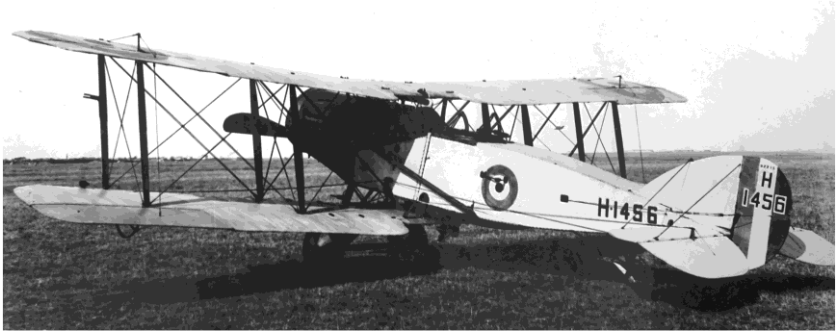
All squadrons worked round the clock to crate the aircraft, pack stores and prepare themselves with 'jabs' and kit. Over half the airmen on No 4 Sqn had to be replaced for overseas service. Aircraft nearly due for inspections were changed and crates were sent from the Depot at Ascot. Such was the enthusiasm in packing that stores were put into boxes without regard for the order in which they would be required. There was no indication of the contents on any box. All squadrons had similar experiences – indeed No 25 Sqn packed exactly the correct number of split pins, with the result that aircraft could not be assembled in Turkey when some pins were dropped in the mud.

Shipping was arranged in Egypt and England to transport the squadrons to the Straits area. Many ships were unsuitable, notably the SS *Podesta* which was used to transport No 208 Sqn from Egypt. This ship had lain at the bottom of Alexandria harbour from 1915 until she was raised in 1920. She had not been completely refitted by the time she was required by the RAF and had insufficient hold space for the crated aircraft. These were left on deck, with very little to restrain them. Fortunately, the crossing was calm; the ship's compass was swung on leaving harbour.

The SS *Podesta* arrived in the Bosporus on 30 September and docked at Constantinople. The ship's derricks were used to unload,



Above, the first Snipe to fly in theatre, E7523 of No 56 Sqn and, below, the first Bristol Fighter, No 208 Sqn's H1456.



but shortage of cranes on shore meant that the bulky crates had to be manhandled on to the railway trucks. The airfield of San Stefano had been selected to house Nos 208 and 56 Sqns, since the French had recently vacated the area. A narrow-gauge railway joined Constantinople and San Stefano – a distance of seven miles. Unfortunately, there were no locomotives, but there were a number of trucks which were pushed by hand along the length of the track. Eventually all the equipment of the squadrons was assembled at the airfield which had been cleared by airmen who had been diverted for the task from their journey to Iraq.

A No 56 Sqn Snipe (E7523) was the first to fly, on 2 October, followed the next day by one of No 208 Sqn's 'Brisfits' (H1456). The remaining aircraft were flown over the next few days. No

Mechanics resolving a problem with the Bentley BR2 engine of one of No 203 Sqn's Nightjars.

208 Sqn made its first patrols over the Ismid peninsula on 5 October; on 7 October they were escorted by No 56 Sqn for the first time. These patrols over the northern end of the Neutral Zone supplemented those made by the IIIDs of *Pegasus* which had anchored in the Bosporus on 27 September. Thus, by the end of the first week of October, RAF aircraft were patrolling the whole of the southern perimeter of the Allied Zone.

During the period mid-September to mid-October the political and military situations were very obscure. A Turkish attack was expected daily, even after meetings with their leaders had started at Mudania on 3 October. During these meetings, reconnaissance was of prime importance over both areas considered to be the most likely to be attacked. The RAF headquarters at Constantinople was kept informed of developments in the southern sector (150 miles away) by a W/T link. Such was the efficiency of the reporting, that the Turkish representative at the peace talks remarked that General Harrington was better informed about Turkish dispositions than he was.

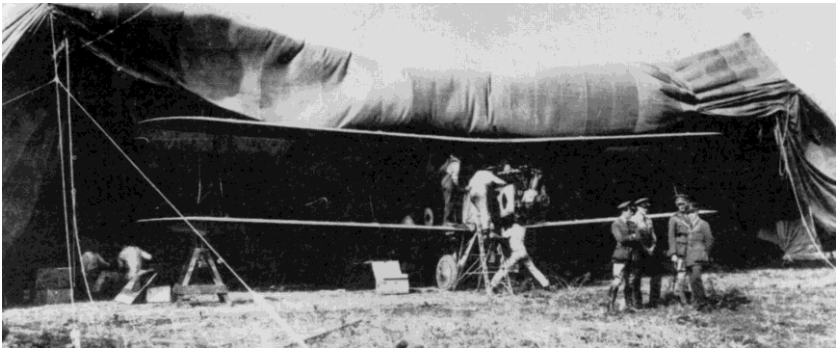
In addition, the RAF made demonstration flights over

Constantinople to quell any pro-Nationalist uprisings. The first demonstration was made on 5 October by No 208 Sqn (five aircraft) and No 56 Sqn (one aircraft). In the Southern Sector, No 203 Sqn and the IIIDs had, by 14 October, completed 145 hours of patrols over very inhospitable territory without an engine failure. On 11 October the Turks acceded to the British demand to respect the Neutral Zone, and an agreement was signed.

By this time the seaplane carrier HMS *Ark Royal* had arrived in the Dardanelles with No 4 Sqn on board.[2] This ship, which had no flight deck, tied up alongside the aircraft-carrier *Argus* and the partially erected 'Brisfits' were transferred. Final assembly was completed on the deck of *Argus* by floodlight during the night of 10/11 October. During the following afternoon *Argus* steamed into wind and all twelve 'Brisfits' were successfully flown off and landed at Kilya aerodrome. This raised the total number of serviceable aircraft in the area from twenty-six to thirty-eight. No 4 Sqn flew four patrols on the day after they arrived. Meanwhile Nos 25 and 207 Sqns were left aboard their ships off Constantinople until the situation became clearer.

In spite of the agreement, Turkish soldiers were seen inside the Neutral Zone on 12 October. The following day eight 'Brisfits' of No 208 Sqn flew over the soldiers and dropped leaflets; the Neutral Zone was clear by 15 October. No Turkish aircraft were seen, although they were estimated to have up to sixty machines available. In view of doubts about Turkish intentions, Gp Capt Fellowes decided to disembark Nos 25 and 207 Sqns at Constantinople for duty at San Stefano.

These two squadrons started disembarking on 16 October. There were many difficulties, including an absence of derricks on both the ships and quayside and limited rolling stock. Eventually some lighters were found, and the aircraft cases and other stores were manhandled ashore. With further manual effort the crates were loaded onto the narrow-gauge railway and after a week's strenuous effort both squadrons were established at San Stefano whence they flew their first aircraft on 22 October, the day the weather broke. There was a fierce storm on the night of 23/24 October, which damaged aircraft and hangars; one hangar collapsed on the aircraft. No aircraft were written off, however, and eventually all the aircraft were made airworthy. By



The weather broke in the autumn. Above, one of No 207 Sqn's DH 9As in a partially collapsed Bessoneau hangar at San Stefano and, below, snow-covered Bristol Fighters of No 4 Sqn at Khilid Bhar.

this time the airfield was a quagmire, and aircraft, particularly the heavy DH 9As of No 207 Sqn, could not take off. Fortunately, drier and frostier weather soon made the soil firm again.

With the arrival of Nos 25 and 207 Sqns the Constantinople Wing, as it was called, was complete (see table). It is noteworthy that the force of about seventy operational aircraft was commanded by a group captain with two wing commanders under him. The squadrons were self-sufficient, even having their own cooks and batmen. There was an aircraft park to deal with major repairs and overhauls, but most squadrons had brought aircraft that had been recently overhauled, so the work of the park was mostly restricted to repair. The other unit, the aerodrome party, was responsible for security, cleanliness, etc of the aerodromes at San Stefano, Kilya and, later, Khilid Bahr.

The latter part of October and November 1922 was an anti-climax. It was necessary to see that the Turks honoured the agreement, and at

Snipes of No 25 Sqn. (RAFM P4053)

the same time to avoid antagonising them. British air supremacy enabled the squadrons to patrol at will. It was usual for No 207 or No 208 Sqn to carry out daily patrols over the Ismid peninsula, escorted by No 25 or No 56 Sqn. The southern area was covered by No 4 Sqn, with the remainder of No 203 Sqn in attendance (No 203 Sqn was down to their last four Nightjars by mid-November). The British commander still feared a Turkish uprising and decided that a massed formation over Constantinople was necessary. He ordered the Fairey IIIDs up from Kilya Bay, and two flights of No 4 Sqn together with two Nightjars of No 203 Sqn. The demonstration was planned for 10 November, but not until the 21st was the weather good enough. In all, fifty-one aircraft took part, led by Gp Capt Fellowes in a IIID piloted by Flt Lt J A Sadler. This show of force comprised three Fairey IIIDs, twelve 'Brisfits' of No 208, seven 'Brisfits' of No 4, eleven DH 9As of No 207, six Snipes of No 56, eleven Snipes of No 25 and one Nightjar of No 203 Sqns. There was no Turkish riot.

The peaceful atmosphere around the Straits area was still liable to deteriorate as the local peace treaty, made at Mudania in October 1922, was only an interim settlement pending a full peace conference. It was felt that, until the successful conclusion of the conference, trouble could be expected from the Turks at any time if negotiations were not going their way. As a result, the British forces, including the RAF squadrons, remained in the area until after the signing of the Peace Treaty in September 1923.

HMS *Argus* left the Dardanelles for the UK on 20 December 1922, taking the remnants of No 203 Sqn and some IIIDs. The other

The 'At Home' day at San Stefano on 11 August 1923. (RAFM P693)

two seaplane carriers continued duties in both the Dardanelles and the Bosporus; both ships returned briefly to Malta for refitting in 1923. HMS *Ark Royal* returned to the Dardanelles in April 1923, having re-equipped its flight with the first Lion-engined IIIDs while at Malta. (This unit was redesignated No 481 Flight on 1 August 1923.)

Back to normal

The first few weeks in the area had been hectic for all squadrons, but by the beginning of 1923 a more leisurely routine was maintained. Normal training was resumed. Among the more interesting activities were a low-level bombing competition between the land-based squadrons (the IIIDs did not have light bomb carriers). Each squadron was represented by one pilot/crew, and Fg Off H O Long of No 25 Sqn won with an average error of 6 ft from eight bombs. Bombing a running torpedo was attempted by No 208 Sqn, but after one successful sortie no further trials were made.

In August an 'At Home' was held at San Stefano, attended by the Embassy staffs in Constantinople. No 208 Sqn started to use a squa-

Unit (Peace Station)	Commanding Officer	Dates		Station	Aircraft (Initial Equipment)
		Arrival in Area	Departure		
HQ	Gp Capt R M Fellowes (+14 officers)	28 Sep 22	1 Oct 22	Constantinople	—
No 4 Sqn (Farnborough)	Sqn Ldr C H B Blount (+22 officers)	11 Oct 22	5 Sep 23	Kilya (Khilid Bahr after 11 Dec 22)	12 × Bristol Fighter
No 25 Sqn (Hawkinge)	Sqn Ldr Sir Norman Leslie (+19 officers)	12 Oct 22	22 Sep 23	San Stefano	12 × Snipe
No 56 Sqn (1 Flight)	Flt Lt G H D Gossip (+4 officers)	30 Sep 22	Disbanded 22 Sep 23	San Stefano	6 × Snipe
No 203 Sqn (A Flight)	Flt Lt L H Slatter (+5 officers)	27 Sep 22	20 Dec 22	Kilya	6 × Nightjar
No 207 Sqn (Bircham Newton)	Sqn Ldr A W Tedder (+22 officers)	12 Oct 22	22 Sep 23	San Stefano	12 × DH 9A
No 208 Sqn (Ismailia)	Sqn Ldr A ap Ellis- (+27 officers)	30 Sep 22	23 Sep 23	San Stefano	12 × Bristol Fighter
No 267 Sqn (Kalafrana) (No 481 Flt after 1 Aug 23)	Flt Lt J A Sadler (+11 officers)	26 Sep 22	—	Kilya Bay and HMS *Ark Royal*	16 × Fairey IIID
HMS *Ark Royal*	—			Dardanelles and Bosporus	6 × Fairey IIID
HMS *Pegasus*	—				5 × Fairey IIID
No 1 Aerodrome Party	—	Oct 22	Disbanded 22 Sep 23	San Stefano and Kilya	Nil
Aircraft Park	Flt Lt P J Murphy (+3 officers)	28 Sep 22	Disbanded 1 Oct 23	San Stefano	Various

Fig 1. Constantinople Wing, 1922-23

dron badge on the fins of their aircraft at this time and half the squadron aircraft were so adorned for the 'At Home'.

The most significant development during 1923 was the standardisation of the methods employed by the Army and Navy in artillery co-operation with the RAF. Previously the Navy's guns had been controlled by the IIIDs using one system, and the Army's guns had been controlled by the 'Brisfits' using another. The shortage of aircraft to co-operate with the Navy led to the decision to devise a common system, and many meetings between the interested parties were held. The first successful exercise was held in June when No 4 Sqn directed naval guns on to a shore target. Apart from these diversions, a leisurely training programme was followed before HQ Constantinople Wing was disbanded and the squadrons returned to England (see table).

The Air Ministry had learned many lessons from the operation in Turkey, the RAF's first peacetime overseas reinforcement. Among the policy changes adopted was the designation of a number of squadrons for immediate despatch overseas to overcome the problems encountered in preparation. Another change was the adoption of a standard procedure for artillery co-operation with the Navy and the Army. In view of No 4 Sqn's success in flying off a carrier without previous experience, and the fact that the squadron was ready for operations immediately on landing, it is surprising that more trials were not undertaken to establish the value of operating RAF land squadrons from carriers.

Perhaps what most influenced future reinforcements (eg China in 1926-27) was the fact that naval air power was the first to reach the trouble spot.

Notes:

1 This article was first published in *Air Pictorial* for July 1973.

2 The *Ark Royal* mentioned here was the second ship of that name to serve in the Royal Navy. A collier converted to a seaplane-carrier in 1914, she served in WW II as well as WW I, but was renamed *Pegasus* in 1934 when the famous WW II aircraft carrier *Ark* Royal (third of the name) was ordered. The fourth, and probably last, *Ark Royal* was completed in 1955.

The *Pegasus* at Chanak was laid down as the passenger vessel *Stockholm* for the Great Eastern Railway but converted to a seaplane-carrier; she was sold in 1931.

No 350 SQN AND No 6350 SERVICING ECHELON, 1944-45

In late 1941 Fighter Command withdrew most of the groundcrew from its squadrons and organised them into autonomous units known as Servicing Echelons (SE) which were individually numbered within the 3000-series. In the spring of 1944, in preparation for the mobile warfare that was expected to follow the invasion of France, ADGB revised the system which was also adopted by 2nd TAF whose SEs were numbered in a new 6000-series. The designations of 2nd TAF's SEs reflected the identity of the squadron which they supported, preceded by '600', '60' or '6' as appropriate for squadrons with one-, two- or three-digit numbers. Thus No 6003 SE supported No 3 Sqn while the groundcrew looking after No 247 Sqn's Typhoons formed No 6247 SE. Where practicable, an SE continued to support the unit with which it identified but, when circumstances dictated, an SE might be required to work on the aeroplanes of any squadron.

Fg Off D L Rowell, OC 6350 SE 1944-46

Two days before D-Day, Fg Off Donald Leslie 'Slim' Rowell was appointed OC 6350 SE which was then stationed at Friston maintaining the Spitfires of the Belgian-manned No 350 Sqn. He remained in post until October 1946 when the Belgian element of the RAF was reconstituted as *La Force Aérienne Belge*, its core being represented by the Spitfires of Nos 349 and 350 Sqns. Fg Off Rowell (later to become, by then a squadron leader, the Editor's, now late, father-in-law), remained in Germany until 1948, maintaining the Tempests of No 26 Sqn. The account that follows was found among his papers. Unfortunately, it is unsigned, but it is handwritten and clearly the work of a member of No 6350 SE, not all of whom were Belgians. Although the prose is a little stilted, it has been only lightly edited in order to retain something of its immediacy. **Ed**

No 350 SQN AND No 6350 SERVICING ECHELON

AN ACCOUNT OF CONDITIONS WHEN MOBILE AND THE EVENTUAL CHANGE TO BEING STATIC

Derived from the papers of Sqn Ldr D L Rowell

On June 6th 1944 350 Sqn and 6350 Echelon were stationed at Friston, near Beachy Head in Sussex, serving ADGB. At dawn the squadron was over the beachhead in Normandy doing support work. The squadron was equipped with Spit VBs which had clipped wings and cropped blowers. The youngest aircraft was nearly 400 flying hours old. The eldest well over 700 flying hours. Consequently, the aircraft were known as clipped, cropped and clapped.

Ground crews were working over 100 hours per week, there being many glycol leaks, block changes and 14 engine changes in the short time we were there. Aircrews were doing three and sometimes four sorties daily, commencing before dawn and finishing after dark.

After a fortnight at Friston the order to move came through. Although having only a few hours in which to have all aircraft serviceable, all ground equipment packed in lorries, all men's kit to be packed, tents to be taken down and packed, we were ready to move at the appointed hour – in teeming rain. We were thankful for one thing; there were plenty of trucks. More trucks than we'd had on previous

Spitfire Vs of No 350 Sqn.

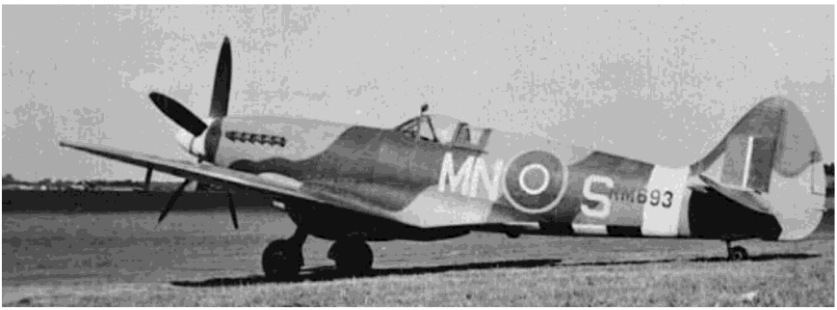
No 6350 SE at Lympne shortly before it left for the Continent.

moves and, as it turned out, many more than we received and accompanied further moves.

Our move was to Westhampnett where support and escort work were carried out by the squadron. We did not stay at Westhampnett long, but we changed our aircraft for Spit IXs. This was shortly before we moved. Our next move was to Hawkinge where we changed aircraft again. This time we were equipped with Spit XIVBs. Hardly had they been brought up to operational standard when we were equipped with Spit XIVEs. This latter change was due to the fact that the squadron were chasing flying bombs and the firepower of the XIVE was stronger and better suited than the XIVB. We did not keep the new XIVEs long for 130 Sqn took them away, over to the continent. This transference brought another move, this time to Lympne, where we were equipped with old worn out XIVBs and XIVEs.

At Lympne we were brought to the scale of 2nd TAF and entered 2nd TAF for we were due for a change of climate. Our departure was held up for six weeks. During the six weeks the squadron were on escort work, everything was packed ready to move at two hours' notice, but the aircraft had to be serviced and kept flying, which they successfully were.

The day came however when we had to proceed to Tilbury and there some of us saw our first German soldiers. These were a dirty, bedraggled, smelly and mostly dejected looking bunch of Prisoners of War. It was a grand sight for the Belgians, for they knew that the enemy had been kicked out of their country – and were not they on



Spitfire XIV of No 350 Sqn at Lympne, September 1944.

their way to knock them further back still? And what a morale builder, if this was all there was to contend with, none of the fanatical Nazi about these, and super men? – never!

From Tilbury to Ostend we went by LCT having to stand off-shore for a few hours awaiting permission to enter the harbour. We entered in darkness and left Ostend for Brussels. On arrival there we went to Evere (B56) and eventually laid down to sleep at 0400 hrs. Our beds were one groundsheet, three blankets and a hangar floor.

6350 Echelon were attached to 127 Canadian Wing, whilst 350 Sqn, still in England, did long range escort work, flying to Evere for inspections. Eventually the whole squadron moved over and were there in time to spend Xmas in Brussels. A good time was had by all at Xmas, despite the German boast, that they would be in Brussels on Xmas Day. Although a good time was had, there was still work to do, even though it was Xmas Day. The squadron at that time were providing air cover for our ground forces in the Ardennes push. The allied forces had much confidence in their armies and laughed at the thought of the Germans breaking through. The Belgian civilians did not display this same confidence; they fully expected to be under German domination once again. Maybe these thoughts were brought about by parachute scares and Germans being picked up in Brussels in American officer's uniform. After five or six weeks of Brussels we were moved again, from a land of plenty to a barren, open, bitter moorland.

We made the move in two parties and joined our parent unit, 125 Wing. A Party went to Y32, an American airstrip, on the borders of Belgium and Holland and not far from the German border. At that

time we were only eight miles behind the front line, and were practically due west of Aachen. The first party, ie A Party, arrived two days before the New Year. On Dec 31st bombs were dropped in the vicinity, killing two soldiers. No one else was hurt, and only one house was damaged. The bombs had no effect on the New Year's Eve festivities of either service personnel or civilians.

New Year's Day dawned, a bright, clear and sunny morning. The atmosphere was exhilarating, and it felt good to be alive. Most of the men were trench-digging, thoughts of the proximity of the front line causing this activity. Although the Americans laughed at us, we went on digging. Our digging was not in vain – we laughed last. At approximately 0900 hrs, out of the peaceful skies, and unnoticed until on top of us, appeared between twenty and thirty German aircraft. We jumped, not up, but down. One unfortunate F/Sgt had to jump into a trench that he had previously used as a lavatory; he received some of his own back.

We had eight aircraft on the ground. When 'Jerry' went away we had one serviceable and two which could be made serviceable after much hard work. I have never seen trenches made so quickly as were made by the Americans when Jerry kindly left us. Other damage was slight and there were three men wounded on the whole strip. We had no casualties. Our B Party at Evere were not so fortunate; they had two men wounded, both receiving leg wounds. They were drawn up on the tarmac in convoy, being briefed, just prior to moving off. They were held up by a few burst tyres but pushed on immediately the wheels were changed. They went to Diest but joined A Party on the strip a few days later.

The conditions at Y32 were pretty grim. The winter seemed to strike in January in full fury. Frosts were as thick as snow and for a fourteen-day period the highest temperature recorded was 16ºF, the lowest -1ºF. These conditions made it pretty hard for the ground crews. They had to work out in the open, changing engines, repairing damaged aircraft and carrying out inspections. Pre-heater vans were used to warm men, machines and tools. The guards had to sleep in tents on the strip and do their rounds in the bitter cold. They had a lot of rum to keep them warm; small comfort, but better than none at all.

Tents were erected and used as offices where, even with heating lamps installed, ink froze on the pen as one attempted to write.

Eventually a canvas hangar was erected. Advantages being, the keeping off of the wind and extension of working hours for R&I until 2100 hrs.

The roads, due to falls of snow and hard frosts, were like glass. It was a nightmare to drivers and several minor crashes occurred. Due to obliteration of tracks on the strip, and the glassiness of the surfaces a petrol bowser overturned and landed in a ditch; fortunately no one was hurt.

Living conditions were also grim. The men slept in a camp, complete with barbed wire encirclement, that had been used to house slave workers employed in a nearby coalmine. Beds were wooden frames with wooden battens, two-tier type. These beds housed the hardest biting bugs in Christendom and any amount of bug killer seemed to make them thrive, but not writhe. The SNCOs and officers were billeted in a nearby school and were in a much more comfortable position than the men, even though the officers were paid 4 shillings per diem for sleeping in camp beds.

It was here that initiative was shown, so much so that American officers commented on it thus; 'You guys amaze us. If you haven't a thing, you just get organised and make-do. Our boys, if they haven't a thing just sit on their fannies and bitch until they get it. They show no initiative like you fellers.' This was apparent from the number of trucks used by the Americans, in comparison to the number used by the British, to move units of equal size. When the Yanks came in they brought a bed for every man, many had mattresses, huts and many other comforts. They even laid on a hot water system. To move an R&I consisting of 44 men, the British supplied three trucks to move the men, their kit and the aircraft servicing equipment. It was managed, but how I don't know.

Apart from the hardships there were two little things to amuse us, such as snipers having a crack at the boys returning from bathing in the pit-head baths, about one mile from the camp. There was the odd spy around, two being caught dressed as Russian officers. Three German soldiers were caught near the airfield attempting to steal an army truck.

The squadron during the four of five weeks we were at Y32 covered the northern British front in Holland.

Again we were on the road, this time to Eindhoven. Arriving there

Refuelling a Spitfire XIV of No 350 Sqn.

we found a rather badly battered ‘drome, with bad roads. Due to severe frosts they had broken up. The SNCOs had to move from their mess, a nunnery (there was much conjecture as to the amount of Holy Water that would be needed to cleanse the air in and around the nunnery for the officers used a part of it) due to bad roads.

At Eindhoven there was quite a lot of flying, in consequence quite a lot of work. There was nearly as much sand there as there was in the Western Desert; that did not improve engines. The work was not in vain for the squadron was at last mixing it with ‘Jerry’ and were proving themselves and their machines superior to the enemy. Conditions were far better than those of Y32. We found the Dutch quite amiable and they made us welcome.

The Dutch were very short of food and there was a bad black market. There was tension in the atmosphere of Eindhoven. Was it war strain, or the odd V1? Or was it the number of convoys on their way south (building up for the offensive) which passed through Eindhoven that produced this tension? Was it due to the hate of the Dutch for the German, or was it the state in which the populace had been left? Whatever it was, maybe a little of each, the tension charged

atmosphere could be felt. This was more noticeable and emphasised when, after three weeks at Eindhoven, we went to England. This time we went by air and it was the quickest move we had yet done.

We went to Warmwell, primarily for air-firing, but unofficially for a rest. It was good to be in England with spring in the air and the freedom which could be felt. The heavy, oppressive war-charged atmosphere was not to be found here. On the contrary, there was a gaiety, a freedom, and a 'war is over' atmosphere. The complacent manner in which the Rhine crossing was greeted seemed to prove that those at home were quite content to let the lads over there keep on keeping on, so long as they were not brought in. The lads were putting up a magnificent show. Whilst in England we all had a 48-hour pass and the squadron managed to put in 70 hours flying more than any previous squadron. Trust them! On April 2nd we returned to Eindhoven by air.

Back at Eindhoven we found an A Party from the wing had crossed the Rhine in the wake of the Army, passing through burning Wesel to Rheine. Our aircraft helped to cover further Rhine crossings and to keep the Hun away from the Rhine. As there were only skeleton crews left to service other squadron's aircraft (for A Party were on their own for 10 days) we helped to service these squadrons. After ten days we were again on the move, this time to Enschede, north of Arnhem and just inside Holland. We were the first RAF personnel in this area and we were heartily cheered by large crowds in several villages and towns.

To get to Twente (the name of the airfield) we had to cross the Rhine, enter Germany and then proceed into Holland. Some of the parties accomplished the Rhine crossing at night, thereby passing through bomb and shell battered Rees, Kalkar, Goch, Isselburg in darkness. Rather a weird experience according to some; it was their first trip into enemy territory and they knew not what to expect. They reached Twente quite safely, all their fears allayed. The first RAF boys to go into Enschede were taken for Germans, due to a similarity of uniform and had quite a hard job explaining that they were British. They were unmolested but only just. We were always looked upon suspiciously and were only there a week before further moving. This time we were going into enemy territory, to the most advanced airfield at that time, Celle.

We left Twente in the early hours of the morning, arriving at Celle in the evening. The armoured cars which were supposed to accompany us on moves in enemy territory were conspicuous by their absence. The trip through Germany was quite pleasant, the day being warm and sunny. There were white flags all over the place and evidence of skirmishes denoted by graves at the wayside. Evidence of tank movements shown by tracks in fields and an old tank or car bunt out or wrecked beyond repair. SS troops were being burnt out of the woods as we passed through.

Our first day at Celle was greeted by five air raid alarms, plenty of ack-ack, the odd Hun, but no bombs. There was evidence, by the number of aircraft found intact, and others wilfully damaged, of the shortage of oil and petrol and of hurried evacuation of the German forces. Most of the aircraft were camouflaged in the woods around the aerodrome. Belsen was not far away and it was whilst we were at Celle that it was discovered.

The wing – now reduced to three squadrons – put up 133 sorties in one day. They shot down many German aircraft, forty-two in three days and brought the April total to 93 enemy aircraft destroyed in the air and 19 on the ground. All this was apart from damaged trucks, railway engines, trains and tanks whilst on armed recces. The last enemy aircraft of the war was shot down from Celle, 130 Sqn being the squadron; this was at 0750 hrs on the day of cessation of hostilities in our area.[1] The squadron brought their total of enemy aircraft destroyed to 54, not bad considering they did not have many chances – until the last fortnight – of encountering the enemy. When they did meet they always proved themselves good fighter pilots and were always on top.

From Celle we moved to this beloved camp, Fassberg, on May 6th 1945. 125 Wing proceeded to Copenhagen and we joined 122 Wing. We celebrated the end of the war here and a reversion to peacetime activity was introduced immediately. However, we were not destined to remain here for long. 122 Wing went to Copenhagen and we rejoined 125 Wing at Husum. Our billets there were good; Germans were put out of their houses to make room for the victorious air force.

[1] This was a Si 204 shot down on 5 May (reportedly at 0630 hrs) by a pair of No 130 Sqn's Spitfires patrolling over Hamburg. **Ed**

A Spitfire XIV of No 350 Sqn, circa April 1945.

Not long was spent in Husum where 125 Wing was disbanded, and once again we were on the road. This time to Wunstorf to join 123 Wing and to meet up with our younger sister squadron – 349. The rumours were as thick as flies in Fassberg, the outstanding one being that the Belgians were to form their own wing. Early in Dec we moved to Fassberg, where we have remained, forming our own wing in the style of the RAF and forming on static lines.

Being static is, in many ways, far better than being mobile, at least from our point of view of comfort and work. There is a decent room to sleep in, a decent bed – no Sommerfeld tracking converted into something resembling a bed. Working hours are better, weekends off and Weds afternoons for sport. There may be parades, which were absent in days of mobility, but a parade is better.

When a squadron moves there is plenty of time and transport allowed, in order to carry out the move. No early morning moves; no middle of the might moves; no moves if a fair distance to be done in a day to be ready to receive aircraft the next day, carrying out operational duties with skeleton crews employed.

Due to being static, amusements and sport are organised, liberty runs to nearby towns. Not so in the days of mobility; there wasn't time. Now there are gift shops, clubs and officer's shops, etc nearby. One had to be lucky, when mobile, to be near these places and we were not near them for long.

The piping days of peace with their static airfields are far better than the broiling, toiling days of war, with mobility as the slogan.

WHO WAS THE YOUNGEST PILOT IN THE BATTLE?

by Geoff Simpson[1]

Who was the youngest Allied pilot in the Battle of Britain? Does it matter? Unfortunately, if the response to the last question is 'Yes', the response to the first has to be, 'We don't know.'

Media outlets have to have 'pegs' for news stories. Two that seem to have been pursued with some obsession over the last year or so are an intention to laud the last living holder of the Battle of Britain Clasp and the search for the latest birth date (at least of a pilot) among those who qualified for the Clasp.

As journalists have been finding out, neither matter is straightforward. Despite precise figures published from time to time, we still do not know how many aircrew earned the Clasp for one authorised operational sortie, with one of 71 accredited squadrons and other units, between 10 July and 31 October 1940. The number is around 2,940 but at least two further pilots have been identified in this century and more non-pilots in the Blenheim squadrons have come to light. At the same time, it has become clear that the credentials of a few of those included on the official list of Clasp holders are questionable.

Gp Capt Patrick Tootal OBE DL, Secretary of the Battle of Britain Fighter Association (BBFA) and the Battle of Britain Memorial Trust (BBMT) commented, 'Anyone seeking to mark "the last of The Few" is overlooking the problems of achieving accuracy. At the beginning of 2019 the number of known living holders of the Battle of Britain Clasp was in single figures. However, so many have deliberately disappeared from view over the years that we cannot be certain that there are not others alive. In one case a few years ago, for example, a Hurricane pilot from the Battle died in the West Country, leaving his family instructions that the RAF and associated organisations should not be informed of his passing. The matter came to light because an alert historian spotted a familiar looking name in *The Daily Telegraph* death announcements.'

What of the youngest? The birth certificate of Plt Off Martyn Aurel

[1] Geoff Simpson is a journalist who has studied aspects of the Battle of Britain for 35 years, including the Allied aircrew who took part. He is a member of the RAF Historical Society and the Royal Historical Society.

Aurel King.

King shows that he came into the world at West Mersea, Essex on 15 October 1921, making him the youngest Hurricane pilot in the Battle of Britain for which I (and the BBFA and the BBMT) have a proven date of birth.

Aurel King, as he was known, at least at school in China, where his father was a medical missionary, served with No 249 Sqn and was killed by parachute failure on 16 August 1940 in the action for which Flt Lt James Nicolson was awarded the Victoria Cross. King was, therefore, 18 when he died. In September 2018 the Commonwealth War Graves Commission agreed to correct the longstanding error in its records showing him as 19 years of age at death. The Commission also agreed to provide a new headstone on Plt Off King's grave at Fawley, Hampshire, showing the correct age.

The youngest Spitfire pilot in the Battle of Britain for whom there is a proven date of birth is Flt Lt (Plt Off in 1940) Alexander Nelson

Robin Appleford.

Robin Langley Appleford, known as Robin. He was the son of an RAF officer who had previously served in the Royal Flying Corps. Robin Appleford was born on 16 September 1921 near Murree, then in India, now in Pakistan.

Like Aurel King, Appleford joined the RAF on a short service commission. He flew in the Battle of Britain with No 66 Sqn and No 421 Flt. On 4 September 1940 he was shot down over the Thames Estuary and slightly wounded, in a 66 Squadron Spitfire. He baled out and received seven days of sick leave.

Released from the RAF in August 1946, Appleford later worked in sales and died on 17 April 2012 in Shiplake, near Henley-on-Thames, Oxfordshire.

One reason for putting on record the current state of the research is the inaccurate media coverage which accompanied the death, on 18 July 2018, of Sqn Ldr Geoffrey Wellum DFC who had been a Spitfire pilot with 92 Squadron in the Battle of Britain. Geoffrey richly deserved the respectful obituaries he received. What was unfortunate was the casual inaccuracy of some of the reporting, in which he was described as either the youngest pilot in the Battle of Britain (by BBC TV News for example) or the youngest Spitfire pilot in the Battle.

Geoffrey Wellum was born at Walthamstow, then in Essex, on 4 August 1921, several weeks before Appleford and more than two months before King.

The research goes on. A project on which I am working with Richard Hunting CBE, Chairman of the BBMT and Gladys Armstrong, a genealogist, is, we feel, contributing not only to the study of RAF history but to social history, as we uncover the backgrounds of more and more of ‘The Few’.

THE FAKE 28 SQUADRON STANDARD

by Wg Cdr Colin Cummings

The end of Confrontation, in August 1966, prompted some reorganisation of the Far East Air Force. This saw, not only a rapid withdrawal of forces from Borneo, but possibly unrelated changes involving the closure of Air Headquarters Hong Kong and the disbandment of No 28 Sqn, which had been resident in the colony since 1949, and the redeployment of most of its assets to No 20 Sqn in Singapore. The resulting contraction of RAF Kai Tak led to reductions in staff and the 'down ranking' of many of the remaining posts.

A vacancy for a flying officer in my branch, led to an invitation to move from Borneo (where I was finishing a year's tour) to Kai Tak; an opportunity which I had no intention of letting slip from my grasp. I naively assumed that the offer was just reward for time spent at an airstrip in Malaya, a cancelled 3-year posting to Cyprus and 12 months confined to an island in Brunei Bay. I was quickly disabused of this idea when one of my more cynical and worldly-wise colleagues pointed out that my move saved the 'P' staff having to bring somebody from UK and probably pay them the tropical uniform allowance, that I had already received.

I quickly settled into life in the colony, although a junior officer's pay and local overseas allowance – the latter being 11 shillings per day – did not offer much opportunity for the high life and compared badly with my expat colleagues in the Hong Kong Auxiliary Air Force.

Having a tailor on the station, whose work was well known throughout the RAF, allowed me to refresh my careworn uniform and to purchase a No 6 – the tropical equivalent of the best blue and something my previous service in the Far East had not required. A short while after acquiring this garment I was at a mess meeting, when the Station Commander asked for a show of hands from those with a No 6. I was somewhat surprised to note that relatively few others raised their hands but learned another lesson – 'Why spend your

clothing allowance on a uniform you might never need?'

Having returned to work, I received a phone call from the Station Commander's PA summoning me to see 'the Boss'. I scuttled across the adjoining space, searching my mind for the transgression that I was presumably being called to the inner sanctum to explain. I knew that it was nothing too awful when I was invited to sit down before being told that, after much careful thought, the CO had decided to appoint me to be officer in charge of the guard of honour, as one of my (increasing number of) secondary duties. Having confirmed that I did indeed have a No 6, I was told to see the station's RAF Regiment NCO, who would 'brush up' my sword drill.

My little gang of two dozen airmen, Sgt Louden and myself, passed a pleasant summer and autumn 'strutting our stuff' at various events. I had noticed that when I came on parade and went through the preliminaries my happy band always seemed to be smiling, which I considered a little odd for a group of men who might reasonably have thought that marching up and down and having to keep their kit immaculate was an occasional thing rather than an almost weekly event. I asked Louden why this was so and he looked down at me from his ramrod straight 6 feet or more to my own not much over 5' 5" and with a broad grin said, 'They're waiting for you to trip over the scabbard, Sir.'

Late 1967 brought with it such an increase in civil unrest and problems with a porous border that, to assist with internal security, a detachment of Whirlwind helicopters was deployed from Singapore to the colony by the heavy repair ship HMS *Triumph*. The problems didn't go away, however, and the early spring of 1968 brought news that the detachment would be made permanent and raised to squadron status. My suggestion that this should be No 194 Sqn, the RAF's first helicopter squadron, fell on deaf ears – or rather was completely ignored, because whoever takes notice of a flying officer, and certainly not one who isn't aircrew? Perhaps it was too obvious, but 28 was the chosen number plate.

At this stage also, planning began for the annual Queen's Birthday Parade (QBP) and, inevitably, the RAF would participate. My gallant band was doubled in size and I was supplanted by a flight lieutenant, who, because he was also an honorary ADC to the Governor, didn't just have a No 6 uniform but also possessed a No 6A – that rather

splendid all-white uniform with shoulder boards taken from the tropical mess kit. Being the RAF, this rig was worn with black shoes, whereas the Navy went the whole hog with white.

Early 1968 had brought with it a new group captain Station Commander (for whom a proper house – not a flat – had to be found). The new incumbent was a sea change from his predecessor: tall, with a craggy jaw, ready smile and charm, flecked greying hair cut unfashionably long and an easy, approachable manner; he soon acquired the nickname 'Sexy Rexy'. He was determined to make his mark and the QBP was the vehicle he chose to do this.

I was summoned and told that I was to be sent to the UK to collect the 28 Squadron standard and a signal to that effect was already on its way across the globe. I could take a week's leave in the UK if I wished, but that didn't really appeal and I made no arrangements – which was just as well. A few days later, I was summoned again to be told that there was a considerable bureaucracy associated with recovering a laid-up squadron standard and it was all too difficult to do this in the time available. In response to my query to 'Sexy Rexy' as to what we should do, I was advised that he had already sent a signal to HQ Far East Air Force for the loan of a standard and its party to come from one of the ten operational squadrons in Singapore and I was stood down, other than in my capacity as 2i/c the RAF contribution to the parade.

A further summons found me in the Station Commander's office yet again with most of the station Execs present and 'Sexy Rexy' in a significant state of ill humour. The reason for this became readily apparent when he announced that HQ FEAF could not spare any of the standards. With the possibility of being on the receiving end of the Station Commander's wrath, I kept quiet, but a less cautious squadron leader ventured to ask what was intended now. Rexy had already decided what was intended and indeed he had prepared his solution in a level of detail which suggested that dissent was ill-advised. 'We're going to make our own,' he said, which immediately brought several comments about misuse of public funds (Station Accounts Officer), shortage of materials and skills (OC Engineering), shortage of time (OC Admin) and a few others in a similar vein.

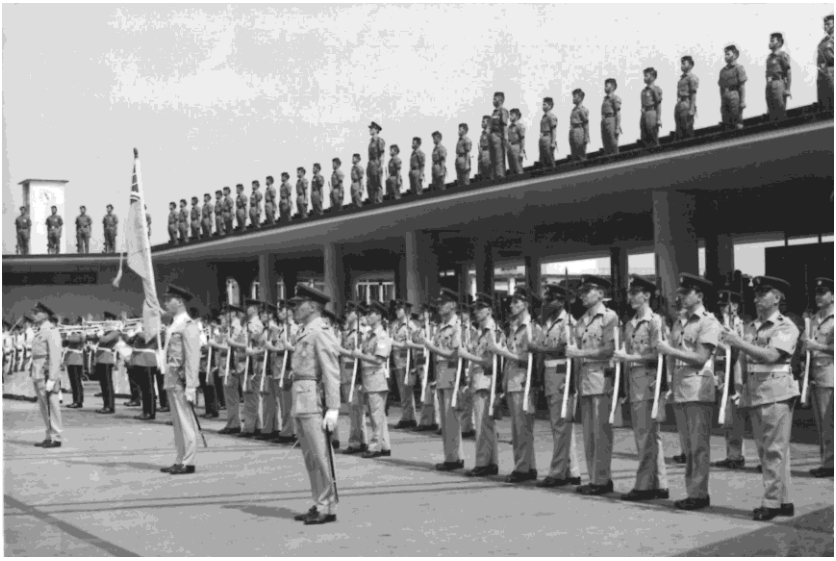
The plan was straightforward and simple and the Station Commander had mapped out, in considerable detail, how: the 'home

made' standard would be produced; its staff machined and varnished in workshops; its finial machined and polished; two RAF ensigns were to be stitched together and suitably weighted (station tailor); a cross belt would be obtained (from the same source); tassels acquired (Mrs CO sent downtown and told not to comeback without the fringing as well) – and so it went on, leaving most of us surprised and mightily impressed at the thought that had already been invested in the idea. The Station Commander even had an answer for the doom merchants, who saw their involvement in the project spelling a rapid end to any career ambitions previously harboured; 'The RAF would expect us to hold up our end and it will be others and their failure to support us who will attract any opprobrium which might be levelled, and anyway it's my station and I take the flak!'

The production of the standard went so smoothly as to be an anti-climax and so did the 'practice standard' made from a pair of GS blankets, which rapidly earned the name: 'blanket on a broomstick'. Perhaps inevitably it fell to the station's RAF Regiment officer to become the standard bearer and he and his small group quickly perfected the finer points of standard drill as the general rehearsals continued.

At about this time – although I feel certain they were always pretty obtuse – the Army, who ran the garrison HQ and hence were organising the parade, began to make life needlessly difficult by their inappropriate use of the signals system. For instance, one might receive a 'priority' signal, announcing the agenda for a meeting two weeks' hence, which would invariably arrive after hours which involved getting the Duty Officer out of his bed because he was supposed to respond to such messages within a matter of hours. Conversely, a 'routine' signal might relate to something quite important. A classic example occurred when a late decision was made by the HQ to hold a full-dress rehearsal for the QBP and the notification of this change was not received until the RAF contingent was already en route in working dress. I took some mild pleasure from my place at the back of the parade as we marched on to see the confusion as the organisers were uncertain as to whether they ought to pay 'compliments' to our blanket on a broomstick.

The Drill Sergeant Major, an Irish Guards Warrant Officer, who, whilst vastly experienced with drill and ceremonial, found it rather



The Queen's Birthday Parade, Hong Kong. 1968.

difficult to appreciate that skilled tradesmen in the RN and RAF were rather different from the usual run of 'squaddie' and he soon found them to be more than a match for his screeching and screaming. One late 'adjustment' to the parade was a decision to place a company of Gurkhas on the flat roof of a shelter at the rear of the parade ground, where they would fire a volley at the end of the parade. The question as to how these soldiers would get onto the roof was resolved when a set of giraffe ladders were sent across the harbour from Kai Tak.

So the scene was set and the big day arrived but there was one final 'gotcha'. The space within the shelter had been allocated to local civilians and the din and constant chatter was heard above the music of the band as we marched onto the parade ground. This noise continued throughout the parade and, as I was at the back, I did not hear a single word of command during the entire parade. Fortunately, a combination of a well-rehearsed event and a Parade Commander who jerked his head slightly when emphasising the executive words of command, meant that I didn't go wrong nor miss my timing (unlike Lance Corporal Jones). There was one sweet moment of revenge as the parade neared its conclusion: the soldiers on the roof of the shelter

fired their volley and for a moment there was a stunned silence from the crowd, as gunfire echoed around the parade area.

With a feeling of considerable relief, I marched from the parade – last man on and last man off. Having changed into casual clothes and with the prospect of an afternoon by the sea at Repulse Bay, I prepared to join my girlfriend and her brother. An acquaintance from the army contingent, who had witnessed the blanket-on-a-broomstick episodes, asked what standard we were parading, as it had not, unlike the other banners, been identified in the official programme. 'Why, 28 Squadron's, of course,' was my reply!

***

There is a (very) loosely connected sequel to this tale.

The first involved the RAF's celebration of its 50th anniversary, held a little later in 1968. The success of the QBP episode had allowed 'Sexy Rexy' to give full scope to his creative ideas as to how to do things. So, in order to mount a suitably impressive parade, the Station Commander arranged for an entire RAF Regiment field squadron to be detached from Seletar under the pretext of a training exercise so that it could spend a couple of weeks in Hong Kong.

With a slow start to the parade rehearsals, there was a sharp intake of breath when Warrant Officer Gibbons of No 15 (Field) Sqn announced to the Station Commander that he would take over the parade organisation and the meek acquiescence from the CO was something that no one had expected.

The day went extremely well until a Whirlwind of the recently reformed No 28 Sqn took a bow and turned about to fly off. Nobody had factored-in the rotor turbulence when erecting the awning beneath which the great and good were accommodated and said structure lifted off the ground. The Hon ADC to the Governor, resplendent in his No 6A, decided to play the hero and attempted to hold onto one of the guy ropes. He was lifted off his feet and deposited onto the grass with his formerly pristine white uniform now sporting green stains, his hat somewhere else and his sword beneath him having suffered significant damage – made worse by somebody attempting to straighten the bent weapon which promptly broke at the hilt.

It fell to me, as the Equipment Officer, to return the sword whence

it came, and it was sent to Singapore with a request for a replacement loan. As it was classed as ‘valuable and attractive’ (V&A), an explanation of the damage was required and I simply recorded that, ‘His excellency the Governor’s ADC, fell on his sword at the end of the parade.’

I forgot about the event until several weeks later when I was sent for by the Senior Administrative Officer. He showed me a letter from some ‘big cheese’ at HQ FEAF in which I was rebuked in fairly forceful terms: ‘Flying Officer Cummings is to be reminded that there is no place for frivolity in the conduct of official correspondence on so important a matter as serious damage to service property. Furthermore, Cummings is to be counselled as to his future conduct.’ Result: Officialdom 1, Cummings 0!

THE VICTORY FLYPAST OF THE DESERT AIR FORCE

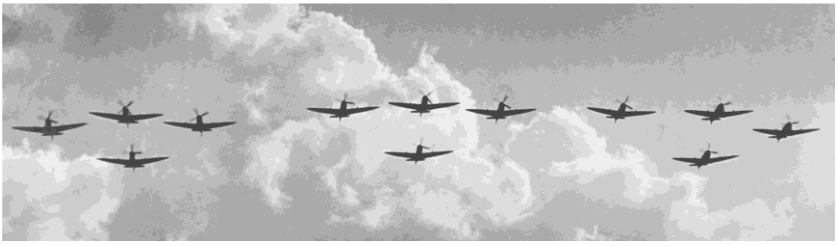
by Wg Cdr Jeff Jefford

The Form 540 for No 239 Wg records the ending of the war in Europe on 8 May 1945 followed, two days later, by the news that there was to be a victory flypast on the 26th. It notes that 'squadrons are to be allowed to select their own formation' and that, 'as is only right and proper, the Wing is to lead the whole show.' In the event, the weather caused a 48-hour postponement, but the flypast went ahead on the 28th with the salute being taken at Campoformido by the DCinC MAAF, Air Mshl Sir Guy Garrod.

The F540 goes on to record that No 250 Sqn was in the vanguard, led by OC 239 Wg (Gp Capt Brian Eaton DSO DFC RAAF) followed by Nos 450 Sqn RAAF, 3 and 5 Sqns SAAF and 112 and 260 Sqns RAF, in that order. The pride felt by the wing's scribe is self-evident from his report which reads:

> '. . . our formation flying was, to all intents and purposes, perfect. The only other unit that approached our standard was 79th Fighter Group USAAF, who also put up a very good performance. […] There is no question that the wing gave the finest exhibition of formation flying that was seen that day and completely overshadowed the Spitfires, who showed no originality in any of their formations. All six squadrons were excellent, but mention must be made of 112 Squadron who chose the most difficult formation of all – 12 aircraft in line abreast, and put up an impeccable display.'

According to the ORB, 'in all 756 aircraft flew past, 12 aircraft



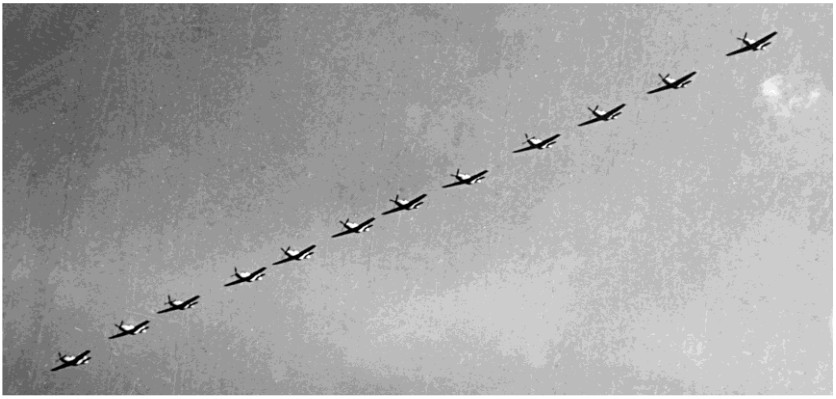
While No 239 Wg's understandably partisan scribe was unimpressed by the efforts of the Spitfire brigade, this was quite a tidy group.

Wing	Squadrons	Aircraft
No 239 Wg RAF	Nos 250 Sqn RAF and No 450 Sqn RAAF	Kittyhawk IV
	Nos 112 and 260 Sqns RAF, 3 Sqn RAAF and 5 Sqn SAAF	Mustang III/IV
No 285 Wg RAF	Nos 208, 225 and 318 (Polish) Sqns RAF and No 40 Sqn SAAF	Spitfire IX
No 244 Wg RAF	Nos 92, 145, 241 and 601 Sqns RAF and No 417 Sqn RCAF	Spitfire VIII/IX
No 7 Wg SAAF	Nos 1, 2, 4 and 7 Sqns SAAF	Spitfire VIII/IX
No 324 Wg RAF	Nos 43, 72, 93 and 111 Sqns RAF	Spitfire IX
No 8 Wg SAAF	Nos 3 Sqn SAAF and Nos 87 and 185 Sqns RAF	Spitfire VIII/IX
	No 11 Sqn SAAF	Kittyhawk IV
No 3 Wg SAAF	Nos 12, 21, 24 and 30 Sqns SAAF	Marauder II/III
No 232 Wg RAF	Nos 13, 18, 55, and 114 Sqns RAF	Boston IV/V
	No 256 Sqn RAF	Mosquito VI/XII/XIII
No 253 Wg RAF	No 500 Sqn RAF, No 15 Sqn SAAF and No 454 Sqn RAAF	Baltimore IV/V
—	No 600 Sqn	Mosquito XIX
79th FG USAAF	85th, 86th and 87th FS	P-47D Thunderbolt

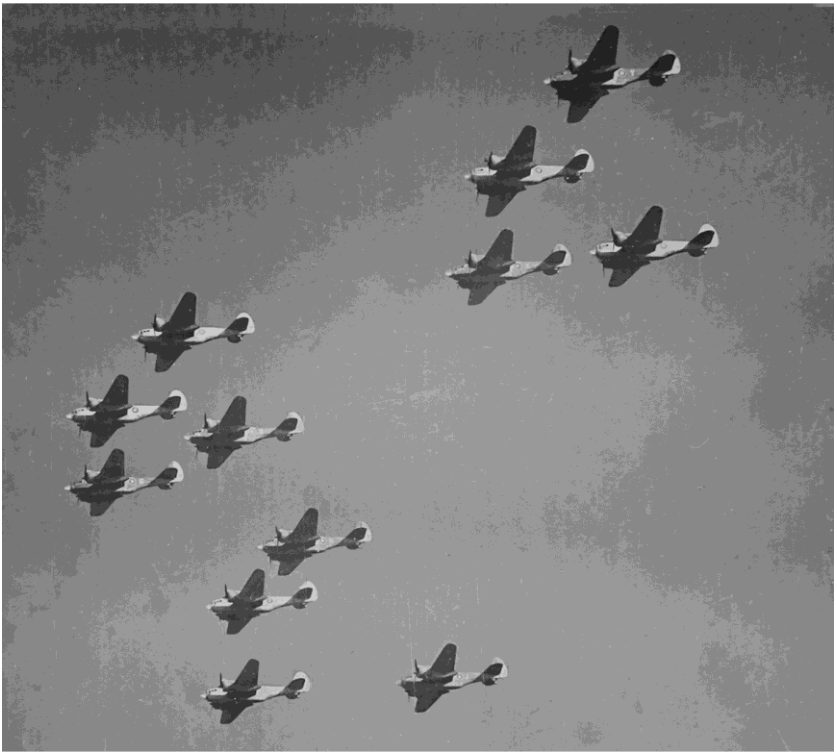
Table 1 – DAF ORBAT in May 1945

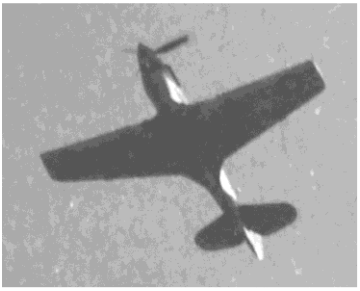
every 30 seconds for 31½ minutes.' No 239 Wg's maths does work, but it would seem to be at variance with the numbers of aeroplanes that appeared to be available. At the time, the Desert Air Force's Order of Battle was as at Table 1. It fielded forty-three squadrons and such photographic evidence as is available does suggest that they flew in formations of 12, but 43 × 12 = only 516. As yet, a copy of the Op Order (there must surely have been one) has not come to light so it is not possible to solve this riddle. Nevertheless, whatever the true figure, the fact remains that a very large number of aeroplanes flew past, without a dress rehearsal and without any unfortunate incidents, employing a variety of complex formations that had been hastily conceived and practised in just 16 days.

Among the VIPs at Campoformido on 28 May were (L to R) Brig Gen T C Darcy, commanding the USAAF's 22nd Tactical Air Command, Air Mshl Sir Guy Garrod, DCinC MAAF (and CinC RAF MEDME) who took the salute, and AVM R M Foster, AOC DAF. Also present, but not shown here, was GOC Eighth Army, Lt Gen Sir Richard McCreery.

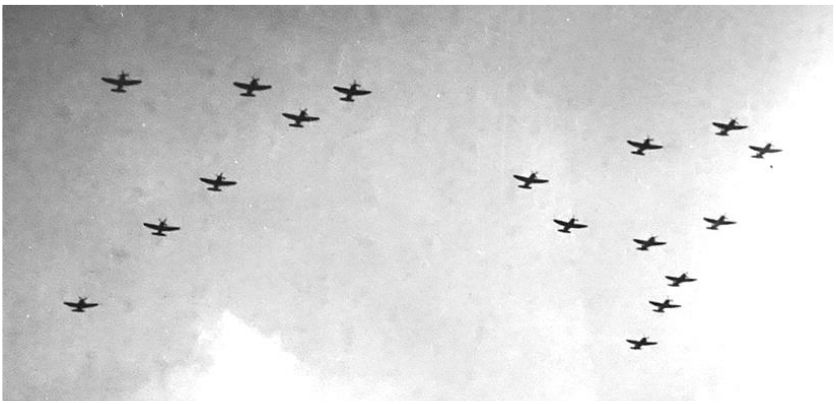


Above, No 112 Sqn's twelve Mustangs in line abreast and, below, a dozen of No 253 Wg's Baltimores.





Above, No 450 Sqn's Kittyhawk IVs, led by a uniquely clipped-winged example (No 250 Sqn's Kittyhawks did three boxes of four), and, below, the 79th FG's skywriting P-47Ds.



BOOK REVIEWS

Note that the prices given below are those quoted by the publishers. In most cases a much better deal can be obtained by buying on-line.

'Sam', Marshal of the Royal Air Force, The Lord Elworthy - A Biography by Richard Mead. Pen & Sword; 2018. £25.00

Richard Mead's biography of MRAF, The Lord Elworthy, fills a major gap in the historiography of the Royal Air Force and does so in a way that honours its subject both in his military and professional life and as a much loved and admired family man and friend. His career as a regular serviceman began at the advanced age of 25, following membership of the little-known Reserve of Air Force Officers (RAFO) and of No 600 Sqn of the Auxiliary Air Force. He believed himself then to be the oldest General Duties pilot officer in the RAF and he and his friends held out little hope of significant future advancement. Circumstances, courage in action, great intellectual powers and personal charm overcame any such impediments to his near meteoric rise which saw him become successively the professional head of our Service and then Chief of the Defence Staff. That he had enjoyed successively the friendly patronage of such figures as Ludlow-Hewitt, Harris, Cochrane, Boyle and Bandon, might today be viewed more critically than in his time but, in reality, served both him and his Service well.

Mead's account of Sam Elworthy's pre-war and wartime service is perforce compressed into 60 of the book's 298 pages and offers refreshing insights into the institutions and personalities of the day. His critical reaction, for example, to the teaching methods of the Central Flying School at an early stage in his career is evidence of his integrity and ability to persuade others to his point of view. His war service was solely in Bomber Command and included flight and squadron command among the Blenheims of No 2 Group of whose AOC, Stevenson, he and others despaired. By contrast, early service under Cochrane and Bandon were much more to his liking. His tours at High Wycombe confirmed his admiration for Harris, if not without the drama of being fired and re-hired within a week. Of Saundby, his opinion was much more guarded. Commanding Waddington and later as Senior Air Staff Officer at HQ 5 Group, he served again under

Cochrane for whom, despite his demanding nature, he had the highest regard. The elderly pilot officer of 1936 ended the war as a highly decorated acting air commodore and there was much more to come.

Sam Elworthy's career until retirement as CDS in 1970 enjoyed a variety unimaginable to later generations and displayed an unmistakable trajectory. Of his many post-war appointments, none might have been regarded as more attractive than that of Chief of the Air Staff. In the event, it was to prove otherwise, given the political and inter-Service tensions and uncertainties of the time. Indeed, in Richard Mead's judgement, 'Sam's time as CAS was the least happy of his career.' The cancellation of major projects, strategic differences with the Royal Navy and tensions resulting from the Templer Committee and the Healey Defence Review of 1966 all contributed to a very difficult time within the Ministry of Defence. Both Healey and CAS were critical of staffing and procurement processes that came to a head with the cancellation of TSR2 but it was in the poisoning of relationships with the Royal Navy that Sam took least pleasure. Despite his own ability to retain the trust of his opposite numbers, the antipathy evident in the middle ranks of both Services was matter of great regret to him. Very sadly, Sam saw his role as CAS as that of a 'military undertaker' as he presided over a decline in the Service to which he was devoted.

Sam Elworthy's time as CDS is briefly covered and sheds further light on his relationship with Denis Healey, not least over the circumstances of the cancellation of the promised buy of F-111 aircraft. The reader is left with the impression of a period in his life of much less intensity than was the case in earlier incarnations. With his appointment in 1971 as Constable and Governor of Windsor Castle, Lord Elworthy continued to live life at some pace, declaring himself to be 'overbusy, not overworked', an enviable state in what passed for early retirement. His later move to his native New Zealand is sensitively described. In the same way, the author's verdicts on Sam Elworthy's long and varied life are measured and very readable.

Richard Mead's book is well written and offers unique insights into the attributes of one of the towering figures of our Service and of many of those whom he encountered. Sam Elworthy's great intellect and integrity, evident charm and ability to confront others without causing lasting offence, his competitiveness and his devotion to his

family are all well set out, to the point where the author feels constrained to defend himself, pre-emptively, against the charge of hagiography. He does so convincingly. The book, with its 87 b/w plates, benefits from access to a wealth of family material, including the tantalisingly frank and sometimes indiscreet observations of Lady Elworthy whose devoted contribution to her husband's advancement was clearly enormous. Some parts of the volume read as if extracted from appointments or work diaries but do illustrate the pace and extent of the Elworthys' professional, social and travel commitments.

'Sam' would have benefitted from proof reading by someone with a deeper knowledge and understanding of the history, structure and crisies of the Royal Air Force. That could have helped avoid the trifling but irritating errors which crop up throughout the book. As it is, I am left with one burning, unanswered question, 'Where is Quigley'? Others may find themselves similarly challenged – but it is certainly not only for that reason that I commend this very valuable and beautifully written biography.

AVM Sandy Hunter

A History of the Mediterranean Air War 1940-1945, Vol 4 by Christopher Shores and Giovanni Massimello with Russell Guest, Frank Olnyk, Winfried Bock and Andy Thomas. Grub Street; 2018. £50.00.

Vols 1-3 having been reviewed in Journals 54, 59 and 65, this series has now reached Vol 4. While Chris Shores remains at the helm, Andy Thomas has been added to his growing panel of contributors.

The subtitle, *Sicily and Italy to the Fall of Rome 14 May 1943-5 June 1944*, is a good reflection of the content but, as before, it focuses heavily on the activities of fighter squadrons. There is some coverage of incidents involving maritime units and of the activities of the medium bombers but the 'heavies' are generally acknowledged only when being employed in a tactical context. The preamble anticipates two further volumes of which one will be dedicated to strategic bomber operations while the other will cover the rest of the Italian campaign and the Aegean including, no doubt, the Balkans.

As in previous volumes, the presentation is strictly chronological, each day's combat claims and recorded losses are tabulated by air

force, providing detail such as the unit and aircraft type with, where known (and in many cases, especially fighters, they are) the serial number and the pilot's name, along with the time and location of the claim/loss and a brief note on what happened. There is usually a narrative account of the day's events which summarises, and often attempts to make sense of, the tabulated data, not least rationalising some extreme cases of over-optimistic claiming of victories. This trend first became apparent in Vol 3, a major contributory factor appears to have been the increasing scale of the air war once the USAAF had become fully committed.

Overclaiming was attributable both to fighter pilots and, especially, air gunners. For example, on 23 August 1943 B-24 gunners made twenty-six claims against admitted German losses of only four. But this was not an exclusively American problem – everyone did it, not least the RAF. For Instance, on 25 July Spitfires of No 322 Wg had encountered a formation of ten Ju 52s and claimed to have shot down all twenty of them. Nevertheless, where possible, the combined expertise of the international team of authors has permitted many of the claims and losses to be reconciled and Vol 4 is a worthy addition to a series that, when it is complete, will present as comprehensive a day-by-day account of operations in this theatre and timeframe as is ever likely to appear in print.

Errors? In a book of this size and complexity there are bound to be a few. For example, the loss of a Liberator of No 148 Sqn is duplicated on 3/4 and 4/5 November 1943 (it was the former) and No 614 Sqn's Halifax JP108 was lost on 20/21 (not 29/30) April 1944. Then again, quite inexplicably, the shooting down of a C-54 by a pair of No 824 Sqn's Sea Hurricanes is recorded as having occurred on 8 January 1944. On that date No 824 Sqn wasn't even in the Mediterranean theatre; it was aboard HMS *Striker* on trade protection work in the eastern Atlantic.[1] Vol 4 notes that, on 3 October 1943, three French squadrons 'received alternate RAF titles for use when operating under British control', which differs significantly from the

[1] This unfortunate incident involved a C-54 en route Stephenville-Casablanca and actually occurred, on 25 March 1944, some 600 miles west of Gibraltar while HMS *Striker* was escorting UK-bound convoy SL152/MKS43. The pilots and aircraft involved were S/Lt P A Clarke (NF674) and S/Lt C J Allen (JS333). **Ed**

official record.[2]

As in previous volumes, with the exception of two-seat fighters, space constraints preclude the identification of crew members other than pilots but a close reading reveals a number of anomalies. For instance, in the case of the thirteen Wellingtons recorded as having been lost on 24/25 November (there were actually seventeen) three of the individuals named were not pilots; they were navigators. Another example occurs on 14/15 May 1944 when a Wellington's nominal 'pilot' was actually an air gunner.

I came across a handful of typos, mostly to do with aircraft serial numbers plus the odd aircraft type, eg Macchi C202 for C205, and unit designation, eg No 32 Sqn which should have been No 35, but these are few and far between. A curiosity, for which I found no explanation, is the addition of a bracketed two-, three- or four-digit number following the tabulated entry of many USAAF losses; while these numbers appear frequently, but inconsistently, they did not feature at all in Vol 3 – so what do they signify?

As ever, I fear that, by pointing out these anomalies and omissions, I will have created the wrong impression. Having become aware that a book does contain errors, I believe that a reviewer has an obligation to point this out, but the fact that there are some inaccuracies does not necessarily mean that a book is fundamentally flawed – and this one most certainly is not. It is another densely written doorstop of a book and it contains such a huge amount of information that the occasional mistake is almost inevitable. As with the previous editions, the illustrations are as impressive as the written content. I made it 230 informatively captioned photographs, the majority of which will have been reproduced for the first time, certainly in an English language publication. The quality sometimes varies, of course, reflecting the quality of the original image, but the reproduction in all cases is first rate. Grub Street are also to be commended on the quality of the binding. While this book is unlikely to be read from cover to cover more than once, if at all, it will be frequently used as a reference work

[2] According to the SD155 (No 1655/43) OPCON of these units had been transferred to the NWACAF on the following dates: GC II/7 on 2 May 1943; GC I/3 on18 August and GC I/7 on 16 September, but they were not assigned RAF designations, as Nos 326, 327 and 328 Sqns respectively, until 1 December (SD 155 No 1765/43). **Ed**

and to withstand the wear and tear that that involves, its 696 pages will need the support of the substantial spine that has been provided. The last 57 pages are devoted to a comprehensive index, although there is no entry for No 241 Sqn (there – I've done it again . . .)

Strongly recommended. Notwithstanding my carping, this is another, *tour de force* by the team; four down – two to go . . .
CGJ

Clipped Wings (Vol 3) by Colin Cummings. Nimbus Publishing (October House, Yelvertoft, NN6 6LF); 2018. £25.

Since this is Vol 3, what follows must repeat much of what was said about Vols 1 and 2 (see Journals 64 and 66). The indefatigable Colin Cummings continues his self-imposed task of locating, collating and publishing the details of losses of RAF aircraft. Vol 1 of the *Clipped Wings* series covered *Pre-Operational Training Aircraft Losses* at units such as EFTSs, SFTSs, AOSs, B&GSs, AGSs, (P) and (O)AFUs, etc based in the UK, Rhodesia, India and minor territories between 1939 and 1942. Vol 2 did the same for units based in Canada, South Africa, New Zealand, Australia and the USA over the same period. This latest addition to the series repeats the Vol 1 exercise but for the years 1943-45. Vol 4 will complete the project by doing the same with respect to Vol 2.

Vol 3 covers some 2,000 incidents and for each one we get the standard Cummings recipe: date and location; aircraft type, identified by serial number and unit; details (generally full name, rank, age and aircrew category) of fatalities, all of this being amplified by a brief description of what happened. As always, the presentation is chronological, cross-referred via an index entered by aircraft type and then serial number.[3] The content is as comprehensive as is practical, but an absence of contemporary records inevitably creates problems. In the case of Vol 3 the major uncertainty concerns Rhodesia. Since the relevant RAF Forms 540, 541 and 1180 pertaining to the RATG appear to be lacking, reliance has had to be placed on the best

[3] Unfortunately, at some stage in the production process, a 325-aircraft section of the index (including Proctors and Spitfires) was omitted. The author has produced a remedial addendum which has been sent to all early purchasers of the book and will be included with later sales, unless it proves practical (and economic) to incorporate this data in subsequent print runs.

evidence to be found in, generally reliable, secondary sources. All of this comes in a 560-page softbound volume but, despite the book's substantial size, the binding is remarkably robust.

Although it means repeating myself, I cannot really improve on my closing remarks from Journal 64 – and 66: 'Books of this nature may be a niche market but for those of us who lurk in this niche, this series is an invaluable resource. Furthermore, a proportion of the proceeds goes to charity.'

CGJ

A Battle of Britain Squadron by Danny Burt. Frontline Books; 2018. £25.00.

This 282-page book's sub-title proclaims that it provides an account of *The men and machines of 152 Squadron in the summer of 1940*. That is a little generous, as most of the content is dedicated to the unit's pilots. The contribution of its groundcrew is confined to a four-page appendix containing the recollections of just one airman – by comparison, Plt Off Pooch, the squadron's Staffordshire bull terrier, gets a nine-page appendix with eight photographs.

So what of the content? I suspect that, as is so often the case nowadays, the galleys were not independently proof read. If they had been, one or two really clumsy passages (undeleted leftovers from exercises in wordsmithing?) would have been tidied up and a couple of howlers might have been avoided. For example, as a recently commissioned pilot officer, Peter Devitt was certainly not 'given command of No 600 Sqn' in 1933 (p89) and at the turn of 1939/40 John Hawtrey was a wing commander at the Air Ministry, not an air commodore at HQ Fighter Command (also p89). Peter O'Brian is said to have arrived on No 152 Sqn with just 'thirty-four hours of flying, of which only six were on Spitfires' (p180), which simply cannot have been true[4] and the Tutor that Edward Deansley wrote off while flying with No 605 Sqn on 21 July 1937 (other, usually reliable, sources give the date as the 24th) was K3459, not X3759 (p82).

[4] At the time, the award of a flying badge was governed by QR811 which required the accumulation of 'not less than' 80 hours. The contemporary syllabus actually specified 150 hours, followed by a notional 40 for pilots destined for fighters. That said, the pressure of the time meant that, within reason, some corners were undoubtedly cut, especially with regard to the post-graduate conversion phase. **Ed**

Despite these 'ha'porths of tar', however, the bulk of the book provides an excellent impression of Warmwell-based No 152 Sqn's activities between 1 July and 31 October, beginning with an eighteen-page transcript of its F540. Appendices list: by pilot, with dates, the claims made by the squadron, which amounted to 81 destroyed, 6 probables and 32 damaged; the serial numbers of thirty-five Spitfires identified as having been allotted to the squadron, fourteen of which are annotated as having been destroyed; a roll of honour detailing the sixteen pilots who died during the battle and another covering a further five who died later. The more than 200 pages in between are devoted to pen sketches of forty pilots. In many cases the basic details of an individual's career, inevitably, closely mirror those provided by Kenneth Gwynn in his *Men of the Battle of Britain* (not acknowledged as a source *per se*, but noted on the rear flap of the dust jacket), but most are significantly expanded by the addition of personal recollections and/or extracts from combat reports. Further amplification is provided by the inclusion of occasional details related to the crews of some of the squadron's victims.

The text is supported by a remarkable collection of 175 photographs. These include formal studio portraits and a few Cuthbert Orde sketches of individuals, but most are snapshots of very young junior officer and sergeant pilots. In the majority of cases they are alone or in small groups, usually wearing a 'Mae West' over a No 1 uniform, often posed with one of their Spitfires. The quality often reflects the amateur skills of the photographers, of course, but the informal nature of these pictures is very atmospheric.

The overall result, which was clearly a labour of love, is an honourable tribute to one of the RAF's lesser known squadrons within a specific, and very significant, timeframe.

CGJ

Shackleton Boys, Volume 1 by Steve Bond. Grub Street; 2018. £25.00.

This is yet another 'Boys' publication from Grub Street by Dr Steve Bond, the author of *Meteor Boys*. First, I need to declare an interest: I provided some text and photographs to the author and I know many of the other contributors. Volume 1 covers the Shackleton stations and squadrons in the UK. Volume 2, to be published in

September 2019, will cover the overseas bases and squadrons, and the Shackleton in the South African Air Force.

Following an introduction describing the development of the Shackleton and a chapter on training units, the bulk of this 272-page book is four chapters covering the UK bases – Kinloss, St Eval, St Mawgan, Ballykelly and Aldergrove (combined) – and the squadrons based there. The remaining chapters cover: the groundcrew view from Ballykelly; the Shackleton involvement in the British nuclear tests at Montebello and Christmas Island; the Beira Oil Patrol in response to Rhodesia's unilateral declaration of independence (UDI); showing the flag; and a final chapter titled 'Last User's' that deals mainly with the AEW variant. Two appendices list respectively the squadrons and other operating units, and the serial numbers of the 191 Shackletons produced. A third appendix briefly describes the 25 total-loss accidents and lists the casualties. There is a useful list of abbreviations and code names. The book is very well illustrated with 16 pages of mostly colour photographs and a further 140 photographs, maps and cartoons distributed throughout the text.

The author has done a good job of editing and linking the individual contributions from the 'Boys', with explanatory passages, where necessary. The contributors cover the 40 years of the Shackleton's service life and, because of the format of grouping the contributions by squadrons, the chronology is sometimes confusing. Although focussed on the home-based squadrons, much of the material concerns overseas detachments and round the world trips to show the flag. Inevitably, the quality of the various contributions is variable. Some contributors' powers of memory are clearly better than others. Nevertheless, most of the accounts live up to the book's sub-title *True Stories from the Home-Based 'Kipper Fleet' Squadrons*. The best contributions give a very good feel for what it was like to be part of the Shackleton Force, something that is lacking from most of the other books about the Shackleton. Having said that, because of the light-hearted nature of many of the stories, the commitment and professionalism of Shackleton operators and maintainers does not come across as strongly as it might. Modern readers may be surprised that the contributions really are all from 'Boys'. I can remember a few WAAFs in air traffic, admin and stores, but I cannot remember any female maintainers on Shackleton squadrons, and of course it was

long before the days of female aircrew.

While I enjoyed the aircrew's yarns, I found the chapter on the nuclear tests and the contributions from the ground crew really interesting. Our ground crew truly were the unsung heroes who worked tirelessly, usually exposed to the elements and often in remote, and inhospitable locations, to keep us in the air. Paul Jessau, an airframe fitter, sums it up well on page 149: 'Just like aircrew, ground crew had to work as a team. We operated to the highest standards possible, and the responsibility we had for the lives of others was enough to make us the best ground crews in the RAF. Being part of that group of people for five years was one of the happiest and most rewarding experiences of my service.' I and countless other Shackleton operators would say 'Amen' to that.

I thoroughly enjoyed reading this book and I learned from it. The author deals well in his introduction with the rather complicated development of the Shackleton throughout its life. This provides a good context for the 'Boys' anecdotes. However, it is not without blemish. I suspect that he has relied too heavily on the specifications and operational requirements that, while authoritative when issued, do not always reflect precisely what went into service. For example, on page 10, referencing specification R.5/46/2 for the production of the MR2, he states 'This amended the nose guns to be moveable and forward firing rather than in a turret, and deleted the mid-upper turret requirement completely.' The nose gun arrangement in the MR2 and MR3 was officially known as the Boulton Paul L turret and the MR2 flew with mid-upper turrets until at least 1956 (see the picture on page 11). When the mid-upper turrets were removed, sufficient to equip four squadrons were kept in storage against any future need to refit them. On page 12, quoting Operational Requirement 320 for the MR3 variant, he states 'it was also to include a magnetic anomaly detector (MAD)'. There is no further mention of MAD and the casual reader would be left with the impression that the MR3 was fitted with MAD as a submarine localisation sensor. In fact, a trial by the Anti-Submarine Warfare Development Unit showed that the Shackleton (20,000 rivets in lose formation) generated too much magnetic noise. MAD was never fitted to squadron aircraft, but subsequently was fitted to the Nimrod. There are some other minor errors that might have been removed by more careful proof-reading: on page 7,

maritime reconnaissance was a task for the Royal Naval Air Service, not the Royal Flying Corps; on page 8, maritime aircraft used general purpose bombs against submarines before the introduction of the air-launched depth charge, not 'traditional torpedoes'; 'Dealer' refers to air-launched acoustic homing torpedoes, not nuclear weapons; and LORAN, a hyperbolic radio fixing system, stands for LOng RAnge Navigation, not astro navigation. On page 12, from my recollection, Vipers could be operated continuously at 93% for several years, not 'about the last year of service'. However, these are minor nit-picks and do not detract from the authenticity of the 'Boys'' accounts. I recommend that anyone who wishes to delve into to the detail of the Shackleton's equipment and development consult Chris Ashton's *Avro's Maritime Heavyweight - The Shackleton* published by Aston Publications Ltd.

Doubtless Shackleton buffs will buy *Shackleton Boys* to revel in nostalgia. I recommend it to the general reader as a fitting tribute to the aircraft and people who were on the maritime front line of the Cold War for 40 years.

Air Cdre Bill Tyack

Spitfire Over Everest by Kenneth D Neame. Hayloft Publishing; 2018. £25.00.

Kenneth Neame was in the RAF only relatively briefly, but his account is so detailed, and so well-written, that, while it covers less than four years, 1944-48, it makes a worthwhile addition to the annals of the air force. In brief, Neame attended a 6-month RAF-sponsored University Short Course at Durham before being inducted into the Service proper in October 1944 via the well-trodden path to No 7 ACRC at Torquay followed by the ACOS at Hereford. The latter was actually an innovation; normally attended by recent EATS graduates and newly commissioned ex-NCOs, Neame's contingent was the first to comprise pre-FTS cadets. From there he progressed via No 11 EFTS at Perth (Tiger Moths) and No 19 FTS at Cranwell (Harvards) to No 8 OTU at Benson whence, in May 1946, he emerged as a newly commissioned photo-reconnaissance Spitfire pilot. He spent the next five months with No 2 Sqn in Germany, before a posting to No 34 Sqn at Palam. The British withdrawal from India concluded that interlude after only eight months, following which he returned to No 2 Sqn

A year before Neame carried out his personal survey of Himalayan peaks, there had been some official interest in the area. While of indifferent quality, this snapshot is of a Mosquito of No 45 Sqn approaching Kanchenjunga in May 1946.

before being demobbed, by then a flying officer, in February 1948. By that time he had logged 450 hours, 235 of them on Spitfires, the serious flying having been done on Griffon-engined Mk XIXs. Following his discharge, Neame turned his hand to medicine and had a distinguished career as a physiologist. He died in 2016.

Some of his account was drafted not long after he left the Service but, as he explains in a short preface dated 1992, it did 'not see the light of day again' for almost half a century. This explains both his very precise recollections of the flights and experiences that he recorded while the memory was still green, contrasted with periods which he could barely recall at all. But the descriptions of incidents and experiences that he wrote, more or less, at the time, especially of his flying in India, are vivid.

The book's title refers to a flight he made in March 1947. The task was to photograph the Himalayan foothills to the north of Darjeeling. The focus of official interest was the limit of the snow line, but Neame was fascinated by the prospect of photographing the peaks beyond – with his own camera. So he took the opportunity to continue north to photograph Kanchenjunga before turning west to take in Everest. This detour was quite illicit, of course, not least because it involved unauthorised penetrations of Tibetan and Nepalese airspace, but in 1947 that would not have been detected – and Neame said nothing at the time. When an Everest expedition began to be planned in the early 1950s, however, by which time he felt that he was probably court martial-proof, his pictures became valuable assets and between 1951 and 1955 they were reproduced repeatedly in the press, netting some

£220 in fees (about £6,000 in today's money). Thus is enterprise rewarded.

This 278-page hardback provides informative insights into pilot training in 1945 and the conduct of Spitfire PR sorties, including the problem of high level navigation in a single-seater with no aids other than, with luck, a QDM. Along the way, Neame provides the reader with his impressions of early post-war Germany and of India in the dying days of the Raj. The narrative is supported by numerous appendices, including analyses of his flying career, details of the Spitfire's performance parameters and a lengthy glossary of contemporary formal and informal RAF terms. There are about 120 illustrations, including maps and photographs of people, places (including those lucrative mountains) and aeroplanes taken with the author's faithful Leica. The text is typo-free and written in an easily flowing style that is a pleasure to read.

CGJ

CORRECTION

Journal 70, page 160. First line, delete 1453, insert 1435.

NOTICE

Members may have noticed that, in the course of a lengthy and extensive redesign of the MOD RAF website, much of the extraneous information that had accreted over the years has been deleted. Unfortunately, that included the pages devoted to this Society.

Fortunately, the RAF Museum has stepped into the breach. At the instigation of its erstwhile Director-General, Michael Fopp, the Museum's website was already carrying much of the Society's published back-catalogue. We are grateful to the Museum's current CEO, Maggie Appleton, for extending this facility to include a downloadable Membership Application form, the Society's GDPR – the General Data Protection Regulation – policy statement and the first entry in the publications list now provides a much-expanded indication of the content of each one. We hope, in due course, to be able to add notification of our next event.

Just Google 'RAF Historical'.

ROYAL AIR FORCE HISTORICAL SOCIETY

The Royal Air Force has now been in existence for one hundred years; the study of its history is deepening and continues to be the subject of published works of consequence. Fresh attention is being given to the strategic assumptions under which military air power was first created and which largely determined policy and operations in both World Wars, the interwar period and in the era of Cold War tension. Material dealing with post-war history is gradually becoming available under the 20-year rule, *although in significantly reduced quantities since the 1970s*. These studies are important to academic historians and to the present and future members of the RAF.

The RAF Historical Society was formed in 1986 to provide a focus for interest in the history of the RAF. It does so by providing a setting for lectures and seminars in which those interested in the history of the Service have the opportunity to meet those who participated in the evolution and implementation of policy. The Society believes that these events make an important contribution to the permanent record.

The Society normally holds two lectures or seminars a year in London, with occasional events in other parts of the country. Transcripts of lectures and seminars are published in the Journal of the RAF Historical Society, which is distributed to members. Individual membership is open to all with an interest in RAF history, whether or not they were in the Service. Although the Society has the approval of the Air Force Board, it is entirely self-financing.

Membership of the Society costs £18 per annum and further details may be obtained from the Membership Secretary, Wg Cdr Colin Cummings, October House, Yelvertoft, NN6 6LF. Tel: 01788 822124.

THE TWO AIR FORCES AWARD

In 1996 the Royal Air Force Historical Society established, in collaboration with its American sister organisation, the Air Force Historical Foundation, the *Two Air Forces Award*, which was to be presented annually on each side of the Atlantic in recognition of outstanding academic work by a serving RAF officer or airman, a member of one of the other Services or an MOD civil servant. The British winners have been:

:

1996	Sqn Ldr P C Emmett PhD MSc BSc CEng MIEE
1997	Wg Cdr M P Brzezicki MPhil MIL
1998	Wg Cdr P J Daybell MBE MA BA
1999	Sqn Ldr S P Harpum MSc BSc MILT
2000	Sqn Ldr A W Riches MA
2001	Sqn Ldr C H Goss MA
2002	Sqn Ldr S I Richards BSc
2003	Wg Cdr T M Webster MB BS MRCGP MRAeS
2004	Sqn Ldr S Gardner MA MPhil
2005	Wg Cdr S D Ellard MSc BSc CEng MRAeS MBCS
2007	Wg Cdr H Smyth DFC
2008	Wg Cdr B J Hunt MSc MBIFM MinstAM
2009	Gp Capt A J Byford MA MA
2010	Lt Col A M Roe YORKS
2011	Wg Cdr S J Chappell BSc
2012	Wg Cdr N A Tucker-Lowe DSO MA MCMI
2013	Sqn Ldr J S Doyle MA BA
2014	Gp Capt M R Johnson BSc MA MBA
2015	Wg Cdr P M Rait
2016	Rev Dr (Sqn Ldr) D Richardson
2017	Wg Cdr D Smathers

THE AIR LEAGUE GOLD MEDAL

On 11 February 1998 the Air League presented the Royal Air Force Historical Society with a Gold Medal in recognition of the Society's achievements in recording aspects of the evolution of British air power and thus realising one of the aims of the League. The Executive Committee decided that the medal should be awarded periodically to a nominal holder (it actually resides at the Royal Air Force Club, where it is on display) who was to be an individual who had made a particularly significant contribution to the conduct of the Society's affairs. Holders to date have been:

Air Marshal Sir Frederick Sowrey KCB CBE AFC
Air Commodore H A Probert MBE MA
Wing Commander C G Jefford MBE BA

SECRETARY
Gp Capt K J Dearman
1 Park Close
Middleton Stoney
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OX25 4AS
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MEMBERSHIP SECRETARY
(who also deals with sales of publications)
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October House
Yelvertoft
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