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**Ex Officio*

SELECTED ABBREVIATIONS

AAA	Anti-Aircraft Artillery
AAF	(US) Army Air Force
AEF	American Expeditionary Forces
AFB	(US) Air Force Base
ATO	Air Tasking Order
C2	Command and Control
C^3I	Command, Control, Communications and Information (or Intelligence)
CAOC	Combined Air Operations Centre
CAS	Close Air Support
CENTCOM	(US) Central Command
COMCENTAF	Commander (US) Air Force, Central Command
FDR	Franklin Delano Roosevelt
FM	(US) Field Manual
GWAPS	Gulf War Air Power Survey
ICBM	Inter-Continental Ballistic Missile
IRBM	Intermediate Range Ballistic Missile
JFACC	Joint Force Air Component Commander
KTO	Kuwait Theatre of Operations
LGB	Laser Guided Bomb
LLAD	Low Level Air Defence
ORB	Operations Record Book (RAF Form 540)
ROE	Rules of Engagement
SAC	Strategic Air Command
SAM	Surface-to-Air Missile
SEAD	Suppression of Enemy Air Defences
SMW	Strategic Missile Wing
USAMEAF	United States Army Middle East Air Force
WDAF	Western Desert Air Force
WDD	Western Development Division

Note on Spelling. To make the text more comfortable to read in the Old Country, I have taken the liberty of imposing the Society's house style and anglicising most of the transatlantic renderings of the spelling of our common language, although I have generally respected the 'colonial' versions where they form part of the formal title of an appointment or institution. **Ed**

The Visiting Team pose with the IWM's B-17 during their visit to the USAF Museum at Duxford..

AIR POWER – ANGLO-AMERICAN PERSPECTIVES. RAF MUSEUM, HENDON, 21st OCTOBER 2003

WELCOME ADDRESS BY THE SOCIETY'S CHAIRMAN

Air Vice-Marshal Nigel Baldwin CB CBE FRAeS

Ladies and Gentlemen

It is a pleasure for me not just to welcome the members of our own Society but, most particularly, friends from the US Air Force Historical Foundation for this joint seminar.

We last met in this country in October 1990 when we looked at our activities together between 1941 and 1945. We recorded the papers and discussion that day in the Society's Journal No 9. This time we are going back much further, even to WW I, but we will also come up to date with a look at the first Gulf War some ten years ago.

Our visitors are led by their President, Lieutenant General Mike Nelson. He has just taken over from General Bill Smith whose initiative underpinned the visit and who chose today's subject. So, this afternoon, General Smith will chair the session.

This morning, we will be in the safe hands of Sir Richard Johns who needs little introduction to the members of the Society, but for the benefit of our visitors, perhaps I should point out a few of the highlights of his career: he taught the Prince of Wales to fly; he commanded the Royal Air Force's Harrier base in Germany; he was Commander-in-Chief of Strike Command, a senior NATO commander and he completed his career as our Chief of the Air Staff (the equivalent of the USAF's Chief of Staff). In his retirement, he luxuriates in an 11th Century castle just west of London overlooking Runnymede by order of Her Majesty the Queen….

But before Sir Richard takes the chair, let me just thank Dr Michael Fopp and his staff here at the Museum for their usual help and interest in us, and for the use of their splendid facilities – without them I don't know what we would do.

THE TAIL TO TOOTH RATIO – ROYAL FLYING CORPS AND AIR SERVICE CO-OPERATION IN MAINTENANCE TRAINING DURING WW I

Dr Roger G. Miller

A former USAF officer, Dr Miller has been an historian since 1980 and has served as such at air force installations ranging from Denver, Colorado to Sembach, West Germany. He is currently on the staff of the Air Force History Support Office at Bolling AFB, Washington, DC where, among other activities, he administers the History of Air Power courses run for the benefit of the Air Force Intern Program and for personnel involved with the Air Force History and Museums Program.

Little need exists here to detail the size, strength, and capability of the US Army at the time the United States declared war on the Central Powers in April 1917. Simply put, in every way possible, the US was incapable of sending a modern army to fight in Europe. A British military mission that reached Washington, DC a few weeks after the declaration accurately summarised the situation in four laconic, well-chosen words: 'They are quite unprepared.'[1] Seldom has the British talent for understatement been more appropriate. This situation, especially in the eyes of British and French leaders, would be complicated over the next year by the American determination to field a separate, independent US Army and a stubborn refusal to 'amalgamate' with the Allied armies.[2] We could spend hours discussing the controversy over amalgamation, but suffice to say that Secretary of War Newton Baker's instructions to the commander of the American Expeditionary Forces (AEF) Gen John J Pershing, issued on 26 May 1917, were clear and firm: 'In military operations…….you are directed to co-operate with the forces of the other countries employed against the enemy, but in so doing the underlying idea must be kept in view that the forces of the United States are a separate and distinct component of the combined forces, the identity of which must be preserved.'[3] And, as European leaders would soon discover, probably no American general between 'Mad'

Anthony Wayne and 'Storming' Norman Schwarzkopf could be more relentlessly determined to follow instructions – especially those he agreed with – than 'Black Jack' Pershing.[4] Thus, the essential question was reduced to how best to organise, train, equip and deploy an independent US army starting from almost nothing. The answer, readily apparent to all competent observers, was that a timely American presence on the Western Front could only be attained through extraordinary assistance from the Allied powers.

Since the United States would receive the vast majority of its modern war materials from France; since the AEF would be assembled and learn its trade in the heart of France; and since the Americans would take their place in the trenches on the eastern part of the Western Front, distant from the British army, it was logical that much of its preparation and training would be in French hands. Where ground warfare was concerned, this logic pretty much held true. When it came to aviation, however, the story was a good bit different. Despite the fact that the Air Service, AEF,[5] would ultimately accept over 4,800 aircraft from the French, and less than 300 from the British, and despite the establishment of aviation instruction centres throughout France, the US Army leaned heavily on the Royal Flying Corps (RFC)[6] in its preparations for combat in the air, and in doing so, it began a tradition of mutual co-operation between the Royal Air Force and the US Air Force that has endured on many fields of conflict until the present day.[7]

Several reasons underlay this development. Most important, undoubtedly, was the common language and heritage. The close presence of Canada and the role it played in the RFC training programme offers another reason. Still another was the compatibility of British methods. One suspects, for example, that the British phased system of flight instruction and the RFC's stress on disciplined air tactics appealed more than the French *Roleur* system and emphasis on individual flying, though both systems were used. And one must also remember the affinity that quickly developed during the war between British air leaders like David Henderson, Lord Tiverton and Hugh Trenchard with Air Service leaders like Benjamin D Foulois, Mason Patrick and Henry H Arnold, not to mention a persistent gadfly who haunted higher military circles named William 'Billy' Mitchell.[8]

The story of US combat aircraft production is well known. The

A handful of British-built SE5as flew with Aero Squadrons, during WW I, notably the 25th. Although plans for domestic production had foundered, about 200, like this one, served with the post-war Air Service until 1925.

Bolling Mission[9] identified British aircraft for production in the United States with a couple of exceptions, notably the Italian Caproni bomber and the French SPAD pursuit. Among the British aircraft selected were the Royal Aircraft Factory SE5a, the Bristol F2B, the Handley Page O/400, and the De Havilland DH 4. This effort turned into a major fiasco, however. Differences between European hand-crafted manufacturing and American assembly line production by unskilled labour hampered the American programme from the beginning. The SE5 programme, for example, was complicated by the arrival of an incomplete sample aircraft from England along with plans and drawings that mixed parts from three different versions of the aircraft. Only one was completed before the programme was cancelled. Likewise, the effort to stuff the massive 400 hp Liberty engine into the frame of the Bristol Fighter failed, and three of the over-powered aircraft crashed killing two crews. This programme was also cancelled. The Handley Page programme was only slightly more successful, complete sub-assemblies for 100 of the huge bombers being shipped to England, although none arrived in time to be assembled and see operational service. Only the DH 4 programme yielded aircraft. Ultimately, some 1,440 Liberty-powered DH 4s reached France, but the airframe was too weak to allow the Liberty to be run at full throttle and the pressurised fuel tank between the pilot and observer gave the aircraft the reputation of being a 'flamer.'[10]

In the case of pilots, Americans joined the Royal Flying Corps by several different routes. Many crossed the border into Canada as individuals and found their way into the Royal Flying Corps, which was willing to turn a blind eye to the citizenship of suitable

volunteers. Something over 300 airmen entered the RFC through this route. Another group of Americans comprised the Oxford Group of 204 Air Service cadets sent overseas in August and September 1917. Originally destined for Italy, they were diverted to the ground school at Oxford University, went through the RFC flying training programme, and joined British squadrons on the Western Front. Third, the Toronto Group included 300 cadets and 800 enlisted personnel sent to Canada for training as a foundation for ten US squadrons, eight of which were formed and sent to Europe. Finally, at least 137 additional individual Americans filtered though the British training system and were ultimately posted to the RFC or were sent through Issoudun as replacements for Air Service units. Ultimately, somewhere between 900 and 1,100 US citizens flew for the RFC, filling a huge gap in British ranks, before most transferred to the Air Service, AEF, bringing much-needed experience. [11]

The Air Service, AEF's basic doctrine and operational practices were largely taken from the RFC. Billy Mitchell, in France as an air observer when the US declared war, spent several days with Hugh Trenchard, RFC commander, touring British facilities, observing operations, and absorbing Trenchard's deep commitment to offensive operations as the bedrock of air power. Subsequently, Mitchell contributed to these attributes during the St Mihiel offensive from September 12 to 16, 1918, during which he massed over 1,481 Allied and US aircraft and hurled them like a mailed fist against the enemy.[12] Mitchell's stress on concentrating his air assets had a permanent impact on Air Service doctrine. In historian Tami Davis Biddle's words: 'His views, reinforced by the apparent success of the autumn campaigns, would establish the principle of concentration as aerial dogma in the United States.'[13] This dogma, combined with Trenchard's emphasis on the offensive, became a trademark of the American way of air warfare.

The British also guided Air Service concepts of strategic bombardment. In November 1917, Maj Edgar S Gorrell presented the new Air Service, AEF, commander, General Foulois,[14] with a plan for bombing Germany, the main body of which was an almost verbatim copy of Lord Tiverton's 3 September 1917 plan for long-range bombing. And later, Gorrell produced an essay, 'The Future Role of American Bombardment Aviation', which included segments of

Trenchard's paper on 'Long-distance Bombing' written in November 1917.[15] The two British papers contributed significantly to the doctrine of high-altitude, daylight bombardment of military and industrial targets that characterised US Army Air Forces operations during WW II and US Air Force doctrinal thinking today.

These are just a few examples of the impact of the close relationship between the veteran RFC and neophyte Air Service during WW I. Another example can be seen in the development of 'maintenance' training or, what we would call today, 'technical' training, for enlisted personnel, which, mundane as the subject appears on the surface, is an absolute necessity in the establishment of a modern, professional air force. The Air Service maintenance training effort during WW I, however, began late and its evolution was chaotic at best before a reasonably defined programme began to emerge toward the end of the war. We need to examine this chaos.

To gain an understanding of this development, one must be aware of a significant point. During WW I, the US Army essentially built two separate and different air forces, the first, a training air force in the continental US, the second, a combined training and combat air force in Europe. A comparison of the chaotic development of maintenance training by the Air Service in the US with the more logical development of maintenance training by the Air Service, AEF, in France – although it was still something less than a smooth process – indicates the importance of the RFC/Air Service, AEF, relationship to US combat capability.

It says a lot that the United States declared war on 1 April 1917; received the Ribot cable[16] from France on 24 May, and passed a bill authorising $640 million for aviation on 14 July, but that the Air Service did not get around to addressing the need for a formal maintenance training programme until October. Until then, the Air Service largely 'winged it' where training was concerned. During the first months of the war, it managed to identify and secure a reasonable number of men who either had, or at least claimed to have, some experience with machinery and some mechanical expertise. These men formed the backbone of the early aero squadrons and enabled army aviation to expand. Tested and classified according to their experience and aptitude, 'trade tested' in the vernacular of the day, these men learned on-the-job and enabled army aviation to expand

rapidly without developing formal training for mechanics and technicians.[17]

While many of the enlisted men had mechanical experience and could learn on the job from the few experienced personnel available, however, this approach was uneconomic at best and useless at worst as large numbers of inexperienced personnel entered the service. And it was apparent that even the most knowledgeable mechanics needed training on the peculiarities of aero-engines and airframes. Some knowledge and skill was transferable from civilian jobs and experienced men could adapt easily. Automobile engine mechanics, for example, could learn to handle aero-engines without great difficulty, and carpenters would have little trouble working with airframes. Greater problems were posed by specialists such as sheet metal workers, welders and tinsmiths who were in short supply. Finally, individuals experienced with skills peculiar to aviation, such as propeller makers, were extremely rare and drafting the few available would seriously hamper aircraft production. Everything pointed toward the need for an extensive technical training programme, but this took time to develop.

Mechanics who made up the earliest squadrons mostly learned through on-the-job training at the various flying fields. Such instruction, however, tended to be haphazard and superficial, especially since, thanks to the shortage of construction troops, most of the early squadron personnel also had to construct barracks, hangars, administrative buildings and other airfield infrastructure in addition to accomplishing other duties. The Air Service did its best, even publishing in August 1917 a training manual that prescribed a ten-week, on-the-job course of practical instruction in electricity, aeroplanes, gasoline engines, office work and telegraphy.[18] This attempt to standardise had merit, but *ad hoc* on-the-job training programmes were not going to meet expanding army aviation requirements.

In October 1917, the Air Service turned to industry for assistance, asking a number of civilian factories to admit enlisted personnel and train them in several specialities where severe shortages existed. This approach had a number of advantages. Enlisted personnel would get extensive training from experienced civilian technicians, while the factories would benefit from the influx, even if temporary, of

trainable, largely enthusiastic workers who did not have to be paid by the company. The first twenty-five enlisted men joined an oxyacetylene company on 11 November 1917, for a three-week course on welding. By the end of the month over three hundred additional men had entered companies where they learned fourteen different technical specialities. Pleased with the success of the initial courses, the Air Service extended the programme on 15 January to the aircraft, aviation engine and tyre industries. In all, over thirty companies eventually took part in this programme, training over 2,000 mechanics and specialists.[19]

At about the same time, winter closed the flying training programmes at Chanute, Hazelhurst, Scott, Selfridge and Wilbur Wright Fields. On 1 November 1917, Air Service officials decided to use these facilities for technical instruction. The Air Service advertised for experienced personnel from industry to come forward as instructors. Seventeen applicants became officers, forty-eight received enlisted rank and five became aviator 'mechanicians.' They then received three weeks of military training at Selfridge Field. The five schools opened on 1 January 1918, with about 315 students, but apparently some slippage took place between plans and performance. From the first, the five schools were hampered by a shortage of instructors and equipment, the severe winter weather and an inconvenient measles epidemic. By the time they ceased operation on 1 April 1918, however, these fields had produced 574 engine and 1,120 aeroplane mechanics, 939 motor transport specialists and 30 welders. [20]

In December 1917, Air Service planners explored the expansion of maintenance and specialist training through civilian vocational schools. A detachment of enlisted students arrived at the Dunwoody Industrial Institute in St Paul, Minnesota, on 10 December. The initial courses proved excellent, and on 1 January the Liberty Engine Ignition School opened under the supervision of five of the Dunwoody Institute's best instructors. Subsequently, the Institute taught courses that ranged from aircraft and motor maintenance to instrument repair. Additional courses opened at the Carnegie Institute of Technology in Washington, DC, on 25 January for coppersmiths, blacksmiths, and motor and aircraft repairmen; at the Pratt Industries, in Brooklyn, New York, on 18 March for carpenters, cabinet makers and motor

mechanics; and at the David Rankin School of Mechanical Arts in St Louis, Missouri, on 1 March for carpenters, blacksmiths, electricians, metal workers, propeller specialists and motor mechanics. The use of vocational schools proved highly successful, and the Air Service soon incorporated the training at St Paul as a permanent part of its wartime technical training programme.[21]

Finally, in mid-November, the Air Service established an Enlisted Mechanics Training Department at Kelly Field near San Antonio, Texas. Initially, this effort bordered on farce. Kelly authorities designed a programme for 320 men and set it up in eight hangar tents, each with an aircraft, engine and instructor. Three days later a 'Texas norther' blew everything down. The officials immediately re-established the programme in two metal hangers, but then no students came. The Kelly Field commander appealed to the commander of the US Army's Southern Department who ordered every squadron forming at Kelly to furnish a cadre of trainees. The squadrons immediately furnished 3,000 men who, first, were not the best men in each unit and, secondly, completely overwhelmed the programme with their numbers. Directed to return to their units, the men responded by stripping the engines and aeroplanes of parts as souvenirs of the experience. Unsurprisingly, on 29 December army inspectors closed down the programme. Opened again in January 1918, the school still proved unsatisfactory. Kelly officials then revised the curriculum, provided increased quantities of training equipment and reference materials, put the instructors through an extensive training course and reopened the programme once again on 18 March. The revised programme was successful and by 30 June it had graduated 419 aeroplane and 300 motor mechanics, as well as 195 motor transport specialists. These men were ultimately rated as some of the best technical personnel sent to the flying squadrons in the United States and in France. Subsequently, the Air Service expanded the programme to a capacity of 1,000 students. Renamed the Air Service Mechanics School, it ultimately became the foundation for the technical training system operated by today's US Air Force.[22]

It is important to note that the men who went through these programmes received general, rather than system specific, training. In the case of engine mechanics, for example, they trained to work on 'an' aero-engine, not necessarily 'the' aero-engine that they would

find when they reached the flight line. This was less true for mechanics assigned to flying fields in the United States, who usually received instruction on the ubiquitous Curtiss and Hall-Scott engines, especially after these became available in large numbers in early 1918. But many mechanics who had never touched anything but a Curtiss OX-5 suddenly found themselves confronting the mysteries of the geared Hispano-Suiza V-8, the water-cooled radial Salmson, or the air-cooled Gnome and Le Rhône rotaries, in which the entire engine spun around its own crankshaft. These men still had to learn on the job, adapting their general knowledge to the peculiarities of whatever equipment their unit operated. In the last few months of the war, however, the Air Service addressed this deficiency by establishing specialised schools at various factories where engines were being built, including the Liberty Motor School in Detroit, Michigan, the Hispano-Suiza School at New Brunswick, New Jersey, and the Le Rhône Engine Course at Swissvale, Pennsylvania. System specific instruction also took place in the Ignition Course at the Splitdorf Magneto Plant at Newark, New Jersey; the Instrument Course taught at Langley Field, Virginia; and the Handley-Page School at the Standard Aircraft Corporation in Elizabeth City, New Jersey.[23]

In summary, by June 1918, the various approaches to maintenance and specialist training had succeeded in meeting the US Army's most serious requirements in the US and in France, enabling the Air Service to concentrate the body of its formal technical training programmes at the Air Service Mechanics School at Kelly Field and the Dunwoody Industrial Institute at St Paul, Minnesota. These programmes functioned until the end of the war. Altogether the different programmes graduated 14,176 enlisted mechanics and technical personnel by 11 November 1918.[24]

Now, where does the RFC come into all this? The Air Service made some early effort to establish its own maintenance training programme in France; however, this approach quickly fell apart because of a lack of facilities, training equipment and instructors. Thus, what training initially took place in Europe was on-the-job at the various flying fields and repair centres so the Air Service turned to France and England to fill the mechanic training gap. The French government proved much less helpful in this regard than in other areas. At French request, in 1917 the Air Service, AEF, ordered some

475 enlisted personnel to French flying fields for instruction, while another 200 aero mechanics were sent to work in French aircraft factories where they received practical experience, if not formal training. These men served in the factories until General Foulois requested their return in January 1918. But this was just a drop in the bucket compared to the number required – and the number trained with British assistance.[25]

Help from Great Britain began in the United States when the Air Service took advantage of a training programme already in existence. In July 1917, Col Cuthbert G Hoare, Commander of the Royal Flying Corps in Canada, proposed a reciprocal training programme in which the RFC would train ten American squadrons in Canada in exchange for the use of three flying fields in the United States for winter training when weather closed many of the fields in Canada. The Air Service accepted the offer and built three fields at Camp Taliaferro near Fort Worth, Texas. Subsequently, Hoare offered to train an additional eight squadrons in exchange for extended use of these fields. Eight of the first ten squadrons trained under this programme saw operational service in France; however, the process was hardly as straightforward as it appeared on the surface. Ultimately, the Canadian programme trained some 4,800 American pilots, ground officers and enlisted personnel. It was a successful programme, but answered only a part of the need for trained mechanics.[26]

The concept of swapping training in exchange for warm bodies lay at the bottom of the most extensive training programme established overseas during the war. Major Bolling had discussed training American mechanics with the British authorities while the Bolling Commission was in England in June 1917, and in September, shortly after the first American air units reached France, several detachments in transit to France were diverted to England for instruction on British aircraft. These included the 34th Aero Squadron and fifty-man detachments from seven other squadrons. These were joined in October by five additional flying squadrons and several construction units. Subsequently, negotiations between General Pershing and Lord Northcliffe led to the Mechanic Training Agreement signed on 5 December 1917. This agreement provided that the Air Service would send 15,000 mechanics to England by 1 March 1918, for training by the Royal Flying Corps. Their presence would release a corresponding

number of British mechanics for service at the Front. When trained, the American mechanics would be released to the Air Service, AEF, in France at the same rate that they were replaced in England by new trainees from the United States. The agreement also called on the Air Service to furnish 6,200 American construction personnel including carpenters, bricklayers and labourers to work on RFC flying fields.[27]

Shipping problems handicapped the programme from the beginning, however, and only 3,931 mechanics had reached England by 1 March, the date by which all 15,000 were supposed to be on hand. Then, the German spring offensive[28] forced Allied and American leaders to revise the shipping schedules in favour of ground troops, further delaying the arrival of trainees. Shortages of shipping also interrupted the transport of construction personnel. As a result, the planned total of 15,000 men in training was not reached until August. Despite such problems, however, the British mechanics training programme made an absolutely vital contribution to the development of Air Service, AEF, capability in France. As of 30 May, the Air Service had seventy-three flying squadrons, eighteen repair squadrons and three supply squadrons, mostly at British flying training fields. Almost all of the men in the flying squadrons had had some experience with Curtiss JN-4 'Jennies' and their OX-5 engines at American training fields. In England, they gained valuable knowledge on a wide variety of combat engines and airframes similar to those that they would service in France.[29]

An officer who visited fifteen training centres in England, observed Americans mechanics doing 'every class of skilled work required in connection with an aerodrome.'[30] Inspectors who reviewed the programme concluded that the Americans were more technically minded than their British counterparts, had greater enthusiasm and higher morale – hardly surprising given that Britain was in its fourth year of seemingly unending bloodshed. Early shortages of training equipment, facilities and experienced instructors took time to solve, but were overcome. One problem proved impossible to resolve. Americans disliked English food. Most, one could say with some accuracy, would walk a mile for American canned 'monkey meat' rather than indulge in English cuisine. And when it came to tea, the word 'despised' suggests itself. Then, as now 'kippers' were hardly an American breakfast staple, and the US Army ran on coffee. Of greater

significance, however, both British and American officials had a tendency to lose sight of the fact that training was the primary goal of the programme. Too many wanted to treat the men as permanent replacements for British mechanics. Additionally, the dispersal of units across England made the programme difficult to manage and forced the Air Service to establish an organisation to track progress. Adoption of a reasonably standardised three-month training scheme aided in this effort, as well. In June 1918, the Air Service also developed a standard squadron organisation for the units in England, which through the addition or subtraction of 10% of its people could be modified into any type of flying squadron required. Still, it might have been more efficient and less disruptive to manage the programme by individuals rather than squadrons. Requests could have gone to England by speciality. Officials in London would then have filled those requests by selecting the best trained personnel from the locations where they could best be spared. These would then be sent to St Maixent in France where the aero squadrons were organised and equipped.[31]

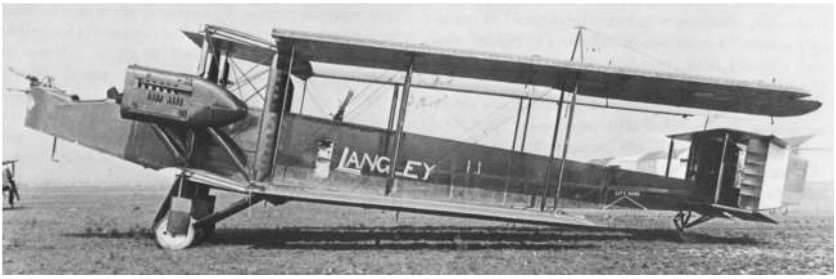
By May 1918, Air Service officials faced a serious shortage of mechanics in France and sought to draw on those in England. British air leaders, however, had become dependent upon American manpower and opposed releasing American units until replacements had arrived in accordance with the agreement of 5 December 1917. 'I am thoroughly convinced that if tomorrow the majority of American Squadrons were to be removed from England,' 1st Lt T P Walker of the Air Service reported, 'the Royal Air Force would be severely crippled and at certain stations their training would come to a complete standstill.'[32] To resolve the problem, General Patrick, new chief of the Air Service, AEF,[33] met with the British air officials in London 'and placed our situation clearly before them.' Bowing to American needs, the British agreed to release 3,500 mechanics who, Patrick agreed, would be replaced as quickly as replacements from the States became available.[34]

In June 1918, the first five squadrons – the 49th, 50th, 93rd, 135th, and 213th Aero Squadrons – left England for France. As of 1 July, seventy-two squadrons were judged trained, and over the next few months many of these rejoined the Air Service, AEF. All in all, the programme provided a huge boost in trained maintenance personnel

for the Air Service in France as well as essential manpower for the RFC. The English programme ultimately trained some 22,059 men, of whom 11,170 were sent to France. At least eighteen of the forty-five flying squadrons that fought with the Air Service on the Western Front received a major portion of their training in England. Other squadrons manned assembly plants, repair depots, flying fields and air parks. Of those remaining in England, several were diverted to man the Handley Page development programme described below. Still others were in the personnel pipeline flowing to the Front when the Armistice took effect.[35]

A large number of mechanics remained stuck in England, however, tied up by a programme which, had the war lasted into 1919, might have led to an Air Service strategic bombing capability. The Handley Page programme grew out of the American desire to develop its own long-range bomber force. On 26 January 1918, General Foulois signed an agreement with the British that provided for the manufacture in the United States of enough twin-engine Handley Page bombers powered by Liberty engines and equipped with all weapons, instruments and accessories to equip thirty American squadrons. These would be shipped to England in prefabricated pieces and assembled at production plants built especially for that purpose. The programme also required shipping American personnel to England to construct the facilities required for the programme as well as to provide enough mechanics to be trained to maintain the big aeroplanes. Final training for the squadrons would take place at several airfields in England.[36]

Work on the project began immediately. Assembly plants were established in two cotton mills near Oldham and five airfields were identified as training sites. The Air Service shipped some 3,000 carpenters, bricklayers and labourers to England to prepare these facilities. Instruction for the flying squadrons began at sites in the United States and continued in England using ten Handley Page bombers borrowed from the British powered by Liberty engines loaned by the US Navy. Unfortunately, as already noted, the project came to naught. First, the same kind of design and fabrication problems that delayed production of the De Havilland DH 4 and other aircraft afflicted the Handley Page programme. The big bomber comprised over 100,000 parts and construction was parcelled out to several companies, but American industry proved incapable of making



The plan to produce Handley-Pages in the USA failed to bear fruit before the Armistice. This one, B9449, is the O/100 that was modified in the UK before being shipped across the Atlantic to serve as the pattern airframe for the Liberty-powered American-built O/400.

such a system function, and production quickly fell months behind schedule. By November 1918, only about 95 percent of the parts for one hundred aircraft and less than fifty engines had reached England. Second, less than 60% of the production and assembly personnel reached England. Finally, bad weather, conflict with British trade unions and frequent strikes delayed construction of the assembly facilities.[37] The one part of the programme that worked well, unfortunately, was the shipping of several thousand potential mechanics to England for training. There they remained, waiting for aircraft that never arrived. Col Henry H Arnold, later commander of the US Army Air Forces during WW II, concluded that 'the only result (*of the Handley Page programme*) was that the American air outfits in France were deprived of their needed services.'[38]

Despite all of the training programmes in the United States, England and France, the Air Service never completely got a handle on maintenance personnel. The problem lay in two spheres, the mis-assignment of trained mechanics and the need to use them to accomplish additional military roles. Col Walter C Kilner, Chief of the Training Section for the Air Service, emphasised the deficiencies in trade testing which was all too often done by army officers with little knowledge of what they were doing. Trade testing, he asserted, should be done by experts in those trades, and he singled out the squadrons formed at Kelly early in the war as examples:

'Wood workers were rated as machinists; farmers as mechanics,

> and good machinists were given fatigue duties. Clerks were made mechanics and good mechanics were made clerks, and then the entire squadron would be turned over to a supposedly technical officer for further training and assignment to duty. Under such conditions it is not strange that mechanical work progressed slowly and that much of it was not properly done.'[39]

Capt Charles W Babcock, Chief Aeronautical Engineer at the Third Aviation Instruction Centre at Issoudun, reported that an improper distribution of mechanics plagued his maintenance efforts until the end of the war, and expert mechanics were often unavailable for duty because they were doing kitchen, police, guard duty or other labour.[40] The problem extended to specialists of all types. In August 1918, newly assigned 2nd Lt R H Wessman, Armament Officer of the 50th Aero Squadron, found his thirteen armourers away from their duty stations 'doing all kinds of fatigue work.' Then, when he finally mustered his troops, he discovered that only three had had any training for their duties.[41] Other units, like the 90th Aero Squadron, fared much better: 'Specialised training was necessary,' the unit history later stated about its enlisted men, 'but nearly all were by trade expert mechanics, who had volunteered for the work to which they were assigned and who were enthusiastic over the prospect of doing their 'bit' along the lines for which they were peculiarly fitted.'[42]

During July 1918, the Air Service formalised the process for assigning mechanics to the flying squadrons and forming the squadrons in France. While most of the earlier squadrons had arrived more or less intact, deficiencies in their organisation, the process of sending thousands of airmen to Europe for training and the need for all pilots to receive flying training after they reached Europe had fragmented the squadron 'mobilisation' process. On 16 July General Patrick directed that all ground officers and enlisted men arriving in France, especially from the schools in England, would go to the Air Service Replacement Concentration Barracks at St Maixent. At St Maixent, the Air Service established a barracks, storage building and trade centre, conveniently linked to the main AEF base ports by railroad. There the new arrivals were trade tested, given additional instruction, issued the correct personal equipment from the stocks maintained there and reorganised into units as required. Once

prepared, the units were sent temporarily to Orly, Romorantin or one of the flying training centres. At these locations, the squadron personnel augmented the permanent work force, gaining in the process additional familiarity with their duties. From there, most units moved to the 1st Air Depot at Colombey-les-Belles where they met their new commanding officer, received contingents of Ordnance and Medical Department personnel, and secured all required squadron equipment and transportation. Aeroplane and motor spares were divided into squadron lots, park lots and reserve lots, and shipped to the 1st Air Depot where they were issued to the squadrons and air parks as appropriate. A second reserve lot was sent to the Air Service, AEF, spares depot. Pilots came from Issoudun and aircraft from the depots, the acceptance field or the production centre. The fully equipped squadrons were then directed to their front line destination as complete units. As of 10 August 1918, the Co-ordination Section at Air Service headquarters managed all aspects of this process. Section personnel always knew the status and location of each element of a particular squadron, enabling them to anticipate requirements at each stage of the mobilisation process, monitor developments and massage any problems. The Air Service now had the ability to send squadrons to the Front according to a pre-planned schedule rather than haphazardly as before.[43]

In summary, starting from almost nothing in April 1917, the United States had developed a modern, by contemporary standards, air force capable of supporting the field army operating on the Western Front. Within the United States, as has been discussed, the Air Service operated a training air force that provided itself with instructor pilots and the AEF in France pilots with basic flying skills. One part of the original programme was never completed: the failure of American industry to produce suitable aircraft prevented the establishment of a complete training programme at home and shifted the main burden of advanced flying training to France. The build-up of the Air Service in Europe had begun slowly, but accelerated dramatically during the last four months of the war. The final numbers cannot be totally reconciled with confidence, but as of the last day of the war the Air Service in France had received 6,364 aircraft: 19 from Italy, 258 from England, 4,874 from France and 1,213 from the United States.[44] Some 2,698 service aircraft had been sent to the Zone of Advance while 714

service aircraft remained at the main depots and acceptance parks. Of those sent to the Zone of Advance, the operational flying squadrons had received 2,495 aircraft while 203 remained in the advance air depots. Attrition had been high, and 1,627 service aircraft had been lost through accident or combat.[45]

At the Armistice, the forty-five squadrons of the Air Service, AEF, at the Front were capable of providing reasonable reconnaissance and bombing support for the ground troops and aerial defence for itself. On the other hand, the size and strength of the AEF at that time actually justified a much larger air force, well over 100 squadrons. Further, the forty-five squadrons at the front were terribly under strength, fielding only 457 operational aircraft out of an authorisation for over 700.[46] In part, this was a result of the heavy losses during the Meuse-Argonne fighting. In part, it resulted from difficulties with the type of equipment available like, for example, the complex and delicate Hispano-Suiza geared 220 hp engine that powered the SPAD XIII. In part, it reflected a shortage of replacement aircraft, spares and parts from the hard-pressed French. But in part, it also was a result of the weaknesses in the maintenance training programme that had taken so long to develop. WW I, in short, presented the US Air Service and its successor organisations with mixed results. Thanks to the assistance from the European allies, and especially the Royal Flying Corps, it had come an incredibly long distance in an extremely short time. Yet, at the Armistice, many weaknesses remained and much more needed to be accomplished. Perhaps it is most accurate to say in summary that a foundation for the future had been established, but little more.

Notes:

[1] Quoted in Edward M Coffman, *The War to End All Wars: The American Military Experience in World War I* (Madison: The University of Wisconsin Press, 1986), p11. Coffman remains perhaps the best single-volume study of the US experience during WW I.

[2] On amalgamation, see *ibid*., pp9-10.

[3] Quoted in John J Pershing, *My Experiences in the World War*, 2 vols. (New York: Frederick A Stokes Company, 1931), I, p38

[4] The standard biography of Pershing is Donald Smythe, *Guerrilla Warrior: The Early Life of John J Pershing* (New York: Charles Scribner's Sons, 1973) and Donald

Smythe, *Pershing: General of the Armies* (Bloomington: Indiana University Press, 1986).

[5] For clarity, the term 'Air Service' in this paper will refer to the military aviation establishment in the continental United States, and the term 'Air Service, AEF,' will refer to that in Europe. The distinction is indicative of the division in US military aviation at the time. Military aviation in the US began under the Aeronautical Division of the Signal Corps and remained under that branch of the service until 1918, although the name of the office changed several times. On 20 May 1918, aviation was separated from the Signal Corps and embodied in two organisations, the Director of Military Aeronautics and the Aircraft Production Board. These two, known already as the Air Service, were finally combined into a single organisation on 27 August 1918. By contrast, Pershing had separated aviation from the Signal Corps in the AEF in July 1917. The establishment in France thus became the Air Service, AEF, and continued under that name throughout the war.

[6] Again, for clarity, the Royal Flying Corps became the Royal Air Force on 1 April 1918, but this paper will use RFC throughout. RAF will used to refer to the service after the war.

[7] John H Morrow Jr, *The Great War in the Air: Military Aviation from 1909 to 1921* (Washington, DC: Smithsonian Institution Press, 1993), p338. See also Lee Kennett, *The First Air War, 1914-1918* (New York: The Free Press, 1991). On the US Air Service during World War I, see Arthur Sweetser, *The American Air Service: A Record Its Problems, Its Difficulties, Its Failings, and Its Achievements* (New York: D Appleton, 1919); Lt Lucien H Thayer, *America's First Eagles; The Official History of the US Air Service, AEF, (1917-1918)*, ed by Donald J McGee and Roger J Bender (San Jose, Cal: R James Bender Publishing, 1983); James J Cooke, *The US Air Service in the Great War* (Westport, Conn: Praeger, 1996).

[8] Rebecca Hancock Grant, *Training to Fly: Military Flight Training, 1907-1945* (Washington, DC: Air Force History and Museums Program, 1999), pp101-99, describes the development of Air Service flight training programs during WW I.

[9] Maj Raynal C Bolling, former counsel for the United States Steel Corporation, led a team of military and industrial experts to Europe in June 1917 to determine the best equipment and materiel to be produced in the US.

[10] Morrow, *Great War in the Air*, pp268-71, 321, 340-43. For extensive examination of US manufacturing failures, especially in aviation, see, Benedict Crowell, *America's Munitions, 1917-1918* (Washington, DC: Government Printing Office, 1919), and I B Holley Jr, *Ideas and Weapons: Exploitation of the Aerial Weapon by the United States; A Study in the Relationship of Technological Advance, Military Doctrine, and the Development of Weapons*, New Imprint (Washington, DC: Office of Air Force History).

[11] James J Sloan Jr, *Wings of Honor: American Airmen in World War I* (Atglen, Penn: Schiffer Military/Aviation History, 1994), pp104-107.

[12] Morrow, *Great War in the Air*, pp336, 337. Mitchell's activities during the St Mihiel offensive are detailed in James J Cooke, *Billy Mitchell* (Boulder, Col: Lynne Rienner Publishers, 2002), pp.84-94.

[13]Tami Davis Biddle, *Rhetoric and Reality in Air Warfare: The Evolution of British*

and American Ideas About Strategic Bombing, 1914-1945 (Princeton, NJ: Princeton University Press, 2002), p53.
[14] Brig Gen Benjamin D Foulois, one of the US Army's earliest aviators, replaced Brig Gen William Kenly as Chief of the Air Service, AEF, on 27 November 1917.
[15] Biddle, *Rhetoric and Reality*, pp53-56.
[16] Alexandre Ribot was the French Premier. His cable called for the US to produce 4,500 aeroplanes, 5,000 pilots and 50,000 mechanics, and became the basis for early Air Service planning.
[17] Hiram Bingham, *An Explorer in the Air Service* (New Haven: Yale University Press, 1920), pp59-60; Sweetser, *The American Air Service*, pp.140-41.
[18] Royal D Frey, 'Evolution of Maintenance Engineering, 1907-1920,' Historical Study No. 327 (Historical Division , Air Materiel Command, July, 1960), p83.
[19] *Ibid*, pp86-87.
[20] Sweetser, *The American Air Service*, pp143-44; Lt F J Pendergrast, 'History of the Air Depot at Fairfield, Ohio, 1917-1943,' pp6-7, Microfilm Reel A2107, Frames 186-626, Air Force Historical Research Agency, Maxwell AFB, Alabama. (Hereafter cited as AFHRA).
[21] Frey, 'Evolution of Maintenance Engineering,' pp88-89.
[22] Henry H Arnold, 'Aviation Section, Signal Corps, and Division of Military Aeronautics, April 1917-October 1918' nd, p10, 168.65011-4, Ernest L Jones Collection, AFHRA; Sweetser, *American Air Service*, p144; Frey, 'Evolution of Maintenance Engineering,' pp85-86.
[23] Frey, 'Evolution of Maintenance Engineering,' p106.
[24] *Ibid*, pp89-90.
[25] Maj Gen Mason M Patrick, 'Final Report of the Chief of the Air Service, AEF,' in Maurer Maurer, ed, *The US Air Service in World War I*, 4 vols. (Washington, DC: Office of Air Force History, 1978), I, pp55, 58-59; Memo, Maj Birdseye B Lewis, Materiel Division, Air Service, AEF, to ACA, 25 Sep 1917, atch. to Supply Section Questionnaire, 4 Jan 1919, Box 4, The Papers of Colonel Halsey Dunwoody, AFHRA.
[26] Arnold, 'Aviation Section, Signal Corps, and Division of Military Aeronautics,' pp5-6; Frey, 'Evolution of Maintenance Engineering,' p87; S F Wise, *Canadian Airmen and the First World War*, Vol 1, *The Official History of the Royal Canadian Air Force* (Toronto: The University of Toronto Press, 1980), pp91-97.
[27] Rpt No 6, Maj Raynal C Bolling to Chief Signal Officer, subj: Conference Between American Representatives and Sub-Committees of the Air Board, 29 Jun 1917, Box 4, Dunwoody Papers, AFHRA; Patrick, 'Final Report of the Chief of the Air Service, AEF,' p59; Thayer, *America's First Eagles*, pp249-50. Pershing's cable announcing the program may be found in Lt Col G M P Murphy, General Staff, AEF, 'Recapitulation of United States Air Service Work in Great Britain & Ireland,' nd, Series A, Vol. 16, Roll #4, 'Col Gorrell's History of the US Army Air Service,' Microcopy No T-619, The National Archives, Washington, DC. Hereafter cited as Gorrell.
[28] This operation, code named *Kaiserschlacht*, erupted on 21 March 1918, and for a time threatened to rupture the entire Allied front. The emergency lead Pershing to

agree to transport riflemen by ship from the US in large numbers, rather than as complete, balanced infantry divisions. Less room remained for personnel from other organisations like the Air Service, AEF, as well.

[29] Thayer, *America's First Eagles*, p251.

[30] Memo, 1st Lt T P Walker, to Chief of Personnel, Air Service, AEF, subj: American Squadron Training in England, nd, Series A, Vol. 15, Roll #4, Gorrell.

[31] *Ibid*; Frey, 'Evolution of Maintenance Engineering,' pp137-44, 168.

[32] Memo, 1st Lt T P Walker, to Chief of Personnel, Air Service, AEF, subj: American Squadron Training in England, nd, Series A, Vol. 15, Roll #4, Gorrell.

[33] Maj Gen Mason M Patrick, an Engineer and non-flyer, replaced General Foulois as Chief of the Air Service, AEF, on 29 May 1918. He served in that capacity until the Armistice.

[34] Maj Gen Mason M Patrick, *The United States in the Air* (Garden City, NY: Doubleday, Doran and Company, 1928), pp19-20.

[35] Thayer, *America's First Eagles*, pp252-53; Frey, 'Evolution of Maintenance Engineering,' p146.

[36] Crowell, *American Munitions*, pp261-62; Thayer, *America's First Eagles*, p37.

[37] Rpt, Capt N W Owens, Adj, Night Bombardment Section, to Aviation Officer, BS No 2, SOS, AEF, subj: Handley Page Operations in England, 16 Jan 1919, Series A, Vol. 15, Roll #4, Gorrell; Thayer, *America's First Eagles*, pp253-54.

[38] Henry H Arnold, *Global Mission*, (New York: Harper & Brothers, 1949), p71.

[39] Col Walter C Kilner, Chief, Training Section, in Maurer, *US Air Service*, IV, p328.

[40] Capt Charles W Babcock, Chief, Aeronautical Engineer, Third Aviation Instruction Center, in *ibid,* p244.

[41] 2nd Lt R H Wessman, Armor Officer, 50th Aero Squadron, in *ibid,* p234.

[42] Leland M Carver, Gustav A Lindstrom, and A T Foster, *The Ninetieth Aero Squadron, American Expeditionary Forces* (Hinsdale, Il: E Harold Griest, 1920), p10.

[43] Supply Section Questionnaire, 4 Jan 1919, p28, Box 4, Dunwoody Papers, AFHRA; Maj Gen Mason M Patrick, 'Final Report of the Chief of the Air Service, AEF,' in Maurer, *US Air Service*, I, pp73, 78; Toulmin, *Air Service, AEF*, pp130-32, 234; Air Service Memo No 22, 16 July 1918, and Memo No 44, 10 August 1918, which set up the squadron mobilisation process are reprinted in *ibid*, pp118-22, 125-27.

[44] 'Statistics With Relation to Supply as of November 11, 1918,' Box 3, Dunwoody Papers, AFHRA.

[45] Col Halsey Dunwoody, Chief of Supply, Air Service, AEF, subj: Complete Record of Service and Training Planes Delivered by Supply Section, Air Service, to Air Service Troops and Schools in France and England from the Beginning of Operations to November 10th, 1918, nd, in 'Notes on Supply,' Book I, Box 3, Dunwoody Papers, AFHRA.

[46] Morrow, *Great War in the Air*, p338.

THE RAF AND THE US ARMY AIR CORPS BETWEEN THE WARS

Air Cdre Henry Probert

A Cambridge history graduate, Henry Probert joined the RAF Education Branch in 1948. During the 1960s he served in Singapore and on the Staff College Directing Staff before becoming, in 1976, Director of RAF Education. After 'retirement' in 1978 he spent the next eleven years as Head of the Air Historical Branch. He is the author of three notable books, his most recent being his acclaimed biography of Sir Arthur Harris.

I count it a great privilege to have been invited to speak today about the inter-war relationships and contrasts between our two air forces. As one who joined the RAF in 1948 and has been committed to it ever since, I belong to that generation who have regarded the bonds between us as an article of faith. I think they are closer than those between the sister services in our two countries, and indeed I believe they are probably unique in history. So I know that today I am among friends.

It has not been easy, however, to decide exactly what to say in the short time allotted to me, and my mind has turned back to a visit I paid to Bolling Air Force Base in Washington nineteen years ago, at the time of a Conference on Air Leadership. I had been Head of the Air Historical Branch for some five years and it proved to be one of the most memorable and challenging occasions in my time there. Dick Kohn, then the USAAF Chief Historian, had invited me to be their after-dinner speaker and to comment upon Pete Copp's recently published two-volume history of the Army Air Corps and USAAF before and during the Second World War. So I found myself addressing a huge gathering for some forty minutes, with none other than Curtis LeMay sitting at the same table and listening intently.

So I have looked back at what I said and make no apology now for reiterating two major themes that seemed to me to run through both books. First of these, quite simply, was the control of air power, where there was a major contrast between your experience and ours. If we

take the years immediately after World War I as our starting point, both our nations suffered from severely limited military budgets, but we in the UK already had our own independent air force. This resulted essentially from the scale of air operations that had built up over several years of war, plus growing competition between the Army and Navy for the supply of aircraft, engines, etc, and the public outcry over the virtually unopposed daylight bombing of London in 1917. This had showed how air power could be used independently of land or naval operations and was a major factor influencing General Smuts' recommendations and his momentous prophesy about the future. It was Smuts' insistence, strongly supported by General Henderson of the RFC, that ensured the establishment of our Independent Force in 1918; otherwise there is little doubt that we, like you in the States, would not have become independent between the wars.

It is a strange paradox, however, that while the basic case for our independent RAF rested on a belief in the strategic role of air power, it was in the defensive role that the RAF eventually won its first great victory – and it was its independent status that made that victory possible. I just do not believe that a Royal Flying Corps, firmly under Army control, would have allowed the unfettered development of the Fighter Command that enabled us to win the Battle of Britain. As John Slessor said much later: 'If the RAF had been split up again between the two older Services after the First World War, it would have suffered the fate of the Tank Corps and we should have lost the Battle of Britain'

So we in the UK have cause to be thankful for the truly inspired decision to create the RAF amid the tumult of World War I. Nevertheless I find it totally unsurprising that the USA did not go the same way. You had been in the war a much shorter time, your military aviation did not develop on the same scale, and you were far from the scene of the action. Moreover, as I understand it, you had made no attempt to study and draw lessons from the war in Europe prior to April 1917. So afterwards yours was a long uphill struggle to win for your air force more and more freedom from Army control, but I find it intriguing that one of our great arguments for maintaining the RAF intact – the indivisibility of air power – never seems to have been used. Throughout your fight for independence the right of the US Navy to run its own aviation was never challenged, and indeed there

was obviously enormous growth of naval aviation throughout the inter-war years – presumably with much competition for resources and little if any co-ordination of design, procurement, training, tactical doctrine and so on.

For us, on the other hand, there was a unity about air power and the profession of flying. Slessor, a key figure in the development of RAF policy in those days, felt strongly enough about this that he took the American Admiral Ernest King to task for stating that the basic profession of the maritime airman was sailing; in Slessor's judgement the profession was that of an airman, regardless of where he flew. So while you were fighting between the wars for the independence of land-based air power, we were struggling to retain the independence of all forms of air power – a fight which of course, we did not win in relation to ship-borne aircraft.

But it doesn't really surprise me that, in your circumstances in North America, military aviation was allowed to develop for so long as an appendage of the two older services. Given the basic tenet of US foreign policy, namely isolationism, your armed forces were required only for home defence, so there was no role for strategic air power and therefore for an independent air force – bearing in mind the available technology. For us in Europe, with operating ranges far shorter, the independent role was practicable much earlier. Yet I do wonder if, when men such as Arnold were putting forward their ideas for greater independence, they had in mind, or indeed used in arguments, our thinking and practice in Great Britain, or maybe were refused permission to use such ideas in evidence.

I am astonished too that at the beginning of World War II Arnold was not privileged to sit on the Joint Army-Navy Board where military strategy was worked out, whereas here CAS was on a par with his opposite numbers for all purposes and could exercise enormous influence in times of crisis. We need think no further about this than to cite the Battle of France, when Cyril Newall and Hugh Dowding fought successfully to prevent Fighter Command being whittled away. Arnold did, of course, receive enhanced status once the Army Air Forces were created, but this really was a bit on the late side.

So much for the first theme in my talk at Bolling: the control of air power. My second was the use of air power as an independent

strategic weapon, and since most of what I said related to wartime it is outside my scope for today. But I do want to mention two brief points. One relates to the inception in 1918 of the RAF's Independent Force, which had very little time to achieve anything before the war came to an end. I wonder, however, what would have happened if the war had continued into 1919 and what the consequences would have been for the development of strategic bombing doctrine. What in fact happened was that we went into the peacetime years assuming, largely on the basis of our experience of the German attacks on London, that strategic bombing was bound to be a highly potent weapon in any future war. So our Home Defence Force was constituted on the premise that the best form of defence would be offence. In the USA, by contrast, you had that small group of aviators who believed passionately in strategic bombing but were unable to convince either the main military establishment or the politicians. They were, quite simply, ahead of their time. Yet I find it thought-provoking that, whereas we did not even issue the first specifications for our four-engined bombers until 1936, your first B-17 actually arrived at Langley Field the following year, fully three years before our first Stirling appeared.

This brings me to my second point: how could it have been that, given your early lead, you were not allowed to exploit it. When the European War started, particularly after the fall of France, your politicians seemed more eager to export military aircraft to us than to equip their own Air Corps. For us, of course, the assistance we received in this way was of incalculable value, and the generosity of the decision in 1940 to split your aircraft production equally with us needs no underlining by me. Yet I cannot but sympathise with Arnold's dilemma. Believing that the USA needed an air force in being, he was really facing the greatest problem that ever confronts the military commander: where is the decisive point? Just as we in the UK had to insist in 1940 that the Battle of France was not the crucial point and that our fighter force must be kept intact for the decisive battle that was still to come, you had to weigh the merits of sending much of your desperately needed equipment across the Atlantic, knowing that if we nevertheless were to collapse you would be putting your own position in jeopardy. You took the risk, for which we must be eternally grateful, but I find it easy to understand the anxieties that

Arnold must have felt.

This brings me to a third theme, one which I did not develop at Bolling, namely some of the personal contacts between the top British and American airmen which developed before Pearl Harbour and were to be so critical thereafter. I was particularly reminded of these when researching my biography of Harris, who first visited the States in April 1938 when the CAS, Cyril Newall, sent him on an urgent and secret mission to investigate the possibility of ordering aircraft for early delivery to the RAF in order to accelerate our expansion programme. He was highly impressed by the business efficiency of the factories he was allowed to visit, and particularly those of the Lockheed Company. Their Super Electra airliner struck him as ideal for adaptation for reconnaissance work and, drawing on his ideas, the Hudson aircraft was developed and an initial RAF order for 200 followed, accompanied by another for 400 Harvard trainers. Here then was the beginning of the highly important flow of American military aircraft to the RAF which has continued in one way or another ever since.

This was not all Harris did during his brief visit. His superiors had instructed him also to find out what he could about American aviation, including air traffic control, navigational systems, crew policy and airfield facilities, and his subsequent report commented expertly and in considerable detail on a wide range of flying and equipment matters. What impressed him most was the civil air traffic control organisation but in most respects – including navigation, crew training, fog and night flying landing gear, and ground and ancillary equipment, he felt the RAF had little to learn. As for the B-17, shown to him by Colonel Bill Olds, he admired its long range and load-carrying capacity, but thought it would be virtually defenceless against a modern fighter. His conclusions, as stated in his report to the Air Ministry, were firm: neither in its equipment nor organisation could the American Air Force be counted among the first-class air powers. America had money, enthusiasm, enormous industrial potential and a vast reservoir of potentially efficient personnel, and could certainly have a magnificent air force if it decided to, but at present it possessed only an elaborate piece of window dressing. These were not views which Harris kept to himself; he had stated them frankly to the senior officers he had met, including General Arnold, and his honest, no-

nonsense approach – based on recognised expertise – had done him no harm. Here was the start of the friendships which were so important in war and, of course, continue to this day.

It was two years later, in mid-1940, that the next high-level contacts occurred; this time they were in London, when 'Tooey' Spaatz headed the Air Corps element of a military team sent to advise the President on Britain's prospects now that France was out of the war. It was John Slessor, as Director of Plans, who took them in tow, got to know them, and reported them confident – unlike their Army and Navy opposite numbers – that Fighter Command would be able to cope. Soon afterwards it was Slessor who was sent out to Washington – as CAS's representative – to explain the Air Staff's plans for RAF expansion and the replacement of wastage. As he put it, they needed to understand what the RAF was doing because what they were supplying to us was bound to be at the expense of their own expansion programme. What he found on arrival, despite a pretty chaotic staff organisation, was much goodwill and determination to help, and he was certainly impressed when General Marshall told him that in November the Air Corps had received a mere six new aircraft compared with the RAF's 300. He summarised in a letter to Portal, the new CAS, the challenge as he saw it:

> 'I am sure the vital thing to get across to these people, who are genuinely out to help us, is that, whereas their declared policy is to do everything short of war, actually on present form they are doing about 25 per cent of what they could do short of war.…if we are to compete with the Boche and act as their outpost and front line, they must really take their coats off and we must have an end, for instance, to this absurd condition in which owing to the five-day week 28 per cent of their precious machine-tool capacity is unused. In fact, if they want to keep out of military war they must mobilize themselves for industrial war, and do it *now*.'

It was during this time that Slessor got to know Hap Arnold; they got on very well together, quickly establishing mutual affection and respect. He was less struck by the quality of most of Arnold's subordinates, with the exceptions of Vandenberg and Hansell, and it was partly for this reason – the lack of sufficient experienced officers

– that he counselled against the establishment of an autonomous air force, similar to the RAF, at this juncture. Slessor's role in building links between the airmen of our two nations in these days was certainly important and what became known as 'The Slessor Agreement' of 27 March 1941 set the scene for the allocation of US aircraft production between your needs and ours. Another contribution was his role in the ABC conversations, ie American-British-Canadian, about a possible joint strategy in the event of war against Germany and Japan. These led to the establishment of inter-Services Missions in each of the three capital cities and the appointment of Arthur Harris in May 1941 as the first head of the British Air Delegation in Washington.

His task, as summarised in the History of the Delegation, was to try to guide the young, inexperienced, self-conscious and rapidly expanding air service of a foreign nation and, simultaneously, to draw off a proportion of the aircraft, supplies and equipment which that nation needed for itself. Almost immediately there arrived a totally new dimension: the entry into the war of the Soviet Union and the decision of Britain and the USA to send her all possible supplies. Effectively this meant the end of the Slessor Agreement, though some aircraft allocations did continue and there were other important forms of aid for the RAF, most notably the Arnold-Towers flying training scheme.

I think it's worth saying here a little about the atmosphere in the States as Harris saw it in those days before Pearl Harbour – making allowances of course for his own tendency to exaggerate in order to make his point:

> 'It is a mistake to imagine that contact and discussion with individuals such as Arnold, Lovett, Stimson and even Hopkins and the President is the path to accomplishment here….their promises often peter out to nothing in practice through material lack or departmental opposition….the arrogant American assumption of superiority and infallibility makes it hard indeed to get them to accept even our ideas – still less our help or our material demands….we have been living in a fool's paradise where expectations of quality and quantity in American production and releases are concerned….However if the war

> goes on long enough the sheer weight of production made possible by their unlimited resources and manpower should make up for it in smothering effect. As to production generally, up to date they have had a damned fine war on British dollars….they are firmly convinced they are taking a major and direct part in the war….they are convinced of their own superiority and super efficiency and of our mental, physical and moral decrepitude….there has been no inkling of any interference with their own high standards of living. The best of them, however, now appreciate that we are getting not only nothing like enough American production for our vital minimum requirements, but not even our money's worth by any standards of business honesty.

But whatever the difficulties I believe that Harris's eight months in Washington did much to prepare the way for the co-operation between the US Army Air Force and the RAF that was to be so important in so many ways from 1942 onwards. Think of the influential friendships he made, with men such as Roosevelt, Hopkins, Harriman, Lovett and Marshall, and with the senior American airmen from Arnold, Andrews, Spaatz and Eaker down. Think of the impression he left behind in the War Department. As Pete Copp summarises it, he was 'an independent-minded, outspoken bomber advocate – articulate, forceful, sure of the correctness of his views, and wickedly critical of those high or low who differed with him'. And, finally, think of Hap Arnold's farewell letter in February 1942 on behalf of the USAAF and referring to his 'splendid co-operation and ever-present spirit of helpfulness'. 'Your presence here has aided materially in bringing our airplanes up to combat standard and in changing our organisation from one of peacetime training to one of preparation for war.'

RAF-USAAF CO-OPERATION IN AIR SUPPORT IN NORTH AFRICA DURING WW II

Dr Daniel Mortensen

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Introduction

A few weeks ago a colleague, knowledgeable about Latin American nations, as well as current coalition planning techniques, reminded me that Latin American air forces tend to model themselves after the USAF. That surprised me a little, although I guess it shouldn't have. One would think that other, more modestly equipped and trained, nations would serve as better examples for the South American air forces, since they cannot possibly aspire to match the capabilities of the vastly superior United States Air Force. Perhaps, by acquiring similar equipment and adopting similar doctrine they hope to be able to reproduce the USAF's extremely successful modes of operation. The US has recently received ample validation of its operational practices, among which success and size have been shown to be the dominant considerations in the mounting of co-operative ventures. I suggest this points to the one overriding principle of coalition warfare, no matter when it occurs, which is, that *the 'gorilla' directs planning.*

Of late, the US has made it clear that it associates size and success with the right to make the choices. He who carries the weight in combat must be 'the gorilla' at the operational planning stage. Similarly, the anti-Axis forces of WW II, as organised for North Africa, were primarily a coalition, albeit one without specific formal agreement. Nevertheless, it was a partnership formed for a particular purpose. Today, the American military establishment would probably

prefer to conduct its operations without the help of any partners and it is quite clear that our recent coalitions have not involved a gaggle of equals, in which everyone had a say in the selection of operational methodology. Some partners are demonstrably more equal than others. Some nations that have participated in combat operations mounted during the last decade or so, and Great Britain is one of them, have played as major partners to the United States; others were content to plug into minor operations as and when they could. Some chose not to play at all. I think this condition has always been with us. It has never been a case of 'equal' partners, even when international politics and the press have suggested otherwise. But there are some long-term connections between the UK and the USA, making their partnership the most interactive of the past half-century.

One of the more delicate Anglo-American issues facing this partnership during WW II was US disapproval of the British Empire. Time and again, Franklin Delano Roosevelt and his diplomats worked the partnership in ways that would weaken the British Empire, even as they supported a common cause. Ironically, however, in August of this year (2003) *The Economist* reported that commentators everywhere believe that the US of the 21st Century is developing an American Empire. This idea is substantiated by power and size, wherein the United States is recognised as possessing overwhelming military power, unrivalled economic power and a degree of cultural influence that would have been the envy of the British East India Company. Is it not just a little bit odd that we are here today, considering the coalition of WW II, when the British were the major military power, deployed globally to protect their imperial interests, whereas the Americans are now the predominant military power and one which threatens to spawn an empire? It has been suggested that we are still operating within the same technological cycle, one that still employs aircraft, radar, electronic communications and joint mobile warfare. Half a century ago the British were in the driving seat because they had the military experience, superior aircraft and had evolved appropriate operational procedures. Today it is the USA that leads the field.

Background to WW II

I think we should remind ourselves that the great coalition of WW II did not have a long nurturing history. Pershing committed the

American Expeditionary Force of 1917-18 to operate independently, even before it had had time to train and gain experience. In which context it is also interesting to recall that Pershing had also said that it would take two years to train and equip a force for large-scale separate operations. He was right and the US Army was fortunate to survive the Meuse-Argonne engagement when Ludendorff's offensive forced a premature employment of American forces. Although American airmen received advanced training in England, Italy and France, and bought aircraft and absorbed air doctrine from all three nations, the French provided the primary model. It may also be significant that many of the American pilots who went to war early chose to fight as the *Escadrille Lafayette*, not in an English squadron. David Trask's recent study of the WW I coalition summed up the situation thus:

> 'The prime lesson of 1918 is that coalition warfare is a difficult enterprise. Victory comes to allies who persevere in the trying but essential effort to co-operate effectively in the common cause despite inevitable conflicts of interest and outlook.'[1]

Although the British and American navies co-operated and learned from each other in the two decades after WW I, the American Army distanced itself from Britain, some individuals, like George Patton, who was clearly an Anglophobe, adopting quite extreme views. It was not until the late-1930s that the military, particularly the air forces, began to explore each other's practices. By that time, the Air Corps had three disadvantages in the context of its potential as a coalition partner to the Royal Air Force. It was significantly backward in equipment, training and ideas about air warfare; it was also stifled by the US Army's bureaucracy, and thus unable to promote new ideas openly; and, like all of the American military, it was obliged to adopt a posture that reflected the prevailing isolationist foreign policy. This inevitably led to both operational doctrine and the procurement of equipment favouring the defensive at the expense of offensive capacity and skills for which there was perceived to be little need.

When war broke out, the British were very proactive in promoting common interests with the American military. Their attempts to bring US airmen up to speed included inviting General Carl Spaatz and other staff officers to visit the UK in August 1940, during the Battle of Britain. The pretext was to learn lessons from British *defensive*

operations but the RAF's offensive activities provided equally important lessons. One aspect of the air battle exerted a particularly significant influence on American assessments of mission rates and attrition, or wastage, as the British called it. By January 1941, the Air Corps had doubled its predicted monthly loss rates for bombers from 10% to 20%, and increased the rates for other types from 15% to 20%. When production finally caught up with expectation, these rates provided ample stocks and the USAAF never wanted for aircraft replacements in the great air superiority battles of 1944.[2]

Additional guidance came from an RAF group based in Washington, as well as from the RAF component of a delegation that came from the United Kingdom in January 1941 for the 'ABC Conversations' (American-British-Canadian). Air Vice-Marshal Slessor was head of the RAF team. Because the meetings with the British military were being concealed from both Congress and the public, the British officers wore civilian clothes and, because the Air Corps did not have a seat at the conference table, the RAF and Slessor played a vital role in keeping the Air Corps informed of trends.[3] A little later, in April 1941, Air Chief Marshal Sir Hugh Dowding, fresh from the Battle of Britain, 'participated in the planning organised directly under the War Department for the air defence of various US overseas departments as submitted to the Air Defense Command..…at Mitchell Field in New York.'[4] Unfortunately, our Army and Navy Departments did not adopt Dowding's ideas. In effect, he was ignored; his expertise was not exploited and Dowding returned to England as an untapped resource. [5]

Then again, when Air Marshal Evill came over in the fall of 1943 to explore some other co-operative possibilities, many of them were rejected by the AAF, including, for instance, a proposal that would have integrated US personnel into British squadrons to help restore the depleted strength of the RAF. Another idea would have eliminated co-pilots from American heavy bombers in order to provide more training capacity for RAF pilots. This was not pursued because the demands of prolonged, US-style, daylight formation flying demanded the attention of more than one pilot. Another request, to allocate more aircraft to the British, was acceded to, but only for aircraft for which the US had little use, the Lockheed Hudson for example.

Joint Strategic Planning.

The initial steps taken in the US to address the developing international situation during the later 1930s were directed by the State Department which maintained that it was their responsibility to make policy, and thus to assert civilian supremacy over the armed forces. The military had little direct influence on policy matters until the war started, although when the fear of Axis activity in the southern hemisphere surfaced in 1938, the State Department did establish some joint military/Secretary of State committees. The earlier, so called, 'colour plans' had therefore been devised by the military working in isolation without the benefit of guidance from national authorities or the State Department and it is interesting to note that the 'Red Plan' had actually cited the British as the potential threat, both for commercial and proximity reasons. Air power was still being advocated exclusively for hemispheric defence, but it involved only defensive proposals – the posture was strictly non-aggressive and non-provocative.[6]

By 1939 later colour plans, 'Rainbow 2' and 'Rainbow 5', featured the UK and France as allies – a coalition – but the US military still could not project American power beyond the hemisphere. The United States and Britain were also having secret talks by the spring of 1939 and the exchange of destroyers for basing rights in the Caribbean was one result of these early Anglo-American discussions. With the German victories in 1940 came warmer relations – rather a British Empire than a German one. Although Roosevelt was prepared to support the British with materiel, he was not prepared to engage directly in military operations and he believed that providing goods, rather than soldiers, via the Lend-Lease Act of 1941, would carry the day.[7]

The first of the formal coalition meetings, which took place at Argentia, Newfoundland, in August 1941, before America had actually entered the war, saw General Hap Arnold acting as an equivalent to the RAF's Chief of the Air Staff with a status equal to that of the US Army Chief of Staff and the Commander-in-Chief of the US Fleet. Arnold was, incidentally, also made a member of the newly established Joint Chiefs of Staff organisation which supplanted the Army and Navy Boards. The Argentia Conference was where Churchill began his close collaboration with Roosevelt and where they

first began to consider what to do about Germany if the United States were eventually to join the fray[8].

The first high-level wartime meeting, the Arcadia Conference held in Washington, DC between December 1941 and January 1942, demonstrated British dominance in planning and strategic direction. Churchill had called the meeting to confirm that the Americans would still be prepared to pursue a 'Germany first' policy. Marshall put forward a revolutionary concept that became the accepted model throughout the war, the idea of unity of command exercised by a supreme theatre commander. The British, anxious to secure agreement to their 'closing the ring' strategy, concurred and the first unified organisation, the ABDA Command, (Australian, British, Dutch and American) was established to co-ordinate activity in South-East Asia and the Pacific. Both sides also accepted the British idea of an Anglo-American Combined Chiefs of Staff, and the Americans endorsed the British strategy of attacking the periphery of Germany.

It was his sensitivity to the political implications of heavy casualties that persuaded the President to accept this indirect approach, because it emphasised the use of sea and air power, which, being less manpower intensive than land campaigns, were likely to be less costly in terms of lives. In adopting this policy, however, Roosevelt was at variance with the views of his military advisers, particularly Marshall, who thought the British approach to be militarily defective and politically manipulative. (The American would learn to be manipulative later.) Marshall wanted to use American manpower and production capability to force a showdown, and he succeeded in avoiding having his forces dispersed thinly around the globe by instituting Operation BOLERO, a build-up of manpower in England, to include five army divisions, in preparation for a projected assault across the Channel. The British concurred in the deployment of these troops, but were strongly opposed to their proposed employment, because the plan depended upon a British division – British blood with American equipment. The British had their own agenda, of course; they were looking towards Africa.[9]

When Tobruk fell to Rommel, Marshall offered to send guns and tanks; FDR offered to send troops. Both King and Marshall rebelled against FDR, even threatening to abandon the 'Europe First' doctrine and send forces to the Pacific. The British would not back down and

FDR supported Churchill, overruling the Chiefs and directing that forces were to be sent to North-West Africa. At the Casablanca Conference, in early-1943, the British still would not agree to a cross-Channel attack. The Allies were able to agree on a plethora of other issues, such as concentrating resources to counter Germany's U-Boats, providing aid to Russia and co-ordinating the combined bombing offensive, but Africa was still a problem.

Resentful of British influence, America's military leadership resolved never to allow itself to be steamrollered again. That said, the Americans were permitted to continue the BOLERO build-up and its demand for 'unconditional surrender' was accepted while the British won agreement to a continuing focus on the Mediterranean, to include, Sicily and Italy.

The American military had learned a vital lesson at Casablanca; that it was necessary to co-operate and solve problems *before* they went to Roosevelt with their ideas. In fact both sides had become more intense, sophisticated and realistic in their planning and manoeuvring. Another very real problem that the Allies had had to work around was the nature of the personalities involved, which was hardly surprising in view of the egos associated with many prominent military leaders of that era – still a factor that has to be considered today, of course.[10] Interesting too is the fact that, at the time, none of the Americans had commanded so much as a regiment in battle, let alone an army, and the British were 'convinced of the superiority of their own military wisdom based on experience and were disposed to regard the Americans as bright but annoyingly persistent children.'[11]

At the Washington Trident Conference in May 1943, at Marshall's instigation, Roosevelt asked Churchill to consider constraining the campaign in Italy so as to not interfere with a cross-Channel invasion in 1944. The Allies argued about this at the Quadrant Conference in Quebec in August 1943 and again at Teheran in November, when Churchill agreed to let Stalin decide whether the effort should be applied in the Mediterranean or in North-West Europe. Stalin seems to have swung the election in favour of the Channel, thus ending a two-year debate.[12]

The Americans and British in the Mediterranean

Having previously supplied tanks, aeroplanes and trucks, after

A sand-finished B-25C of the 12th BG, which joined Gen Brereton's USAMEAF (later the 9th AF) in August 1942 to fight its way from Egypt to Tunisia alongside the WDAF. Note the RAF fin flashes.

Pearl Harbour the Americans committed a sizeable air contingent in support of British operations in the Western Desert. Air Vice-Marshal Coningham's air forces combined expertly with General Montgomery's Eighth Army to win a great victory between August and October 1942. Here was the most famous exercise of co-equality between air and ground component commands. It was, for a short while, the best example of joint operational practice, one capable of teaching lessons, even today. Some have said that this operation became the basis of American doctrine, and was transmitted to the US Army by Major General Brereton who commanded the newly formed Ninth Air Force in the Western Desert.[13] But, in fact, US air support doctrine, as noted in Field Manual 1-5, which had been published in the spring of 1940, already emphasised the need for co-locating the air and ground commanders.[14] That is not to say that British airmen did not fertilise the idea, but it does show that it was already in print by 1942 and that the concept of co-equality was plainly already on its way to becoming the foundation of US tactical air doctrine.

The North African campaign provided an early opportunity for the American establishment to express its confidence in the effectiveness of air power, which Roosevelt did by devising an overall strategy that would require fewer ground divisions and more air groups, backed by

Marshall who granted Arnold a substantial degree of independence. In tactical terms, the Mediterranean became a theatre in which air power was a major player, not just a support element. Tactical air doctrine had entered this arena as 'theology' but it left as a tried and tested means of waging war.[15]

The invasion of North Africa became, in effect, the testing ground for coalition warfare. Joint and combined planning at Norfolk House, London led to the TORCH landings in Algeria and Morocco in early November 1942 with Eisenhower appointed as the supreme commander. The bulk of the forces were American or American-led for political reasons. The landings were highly successful and the French forces surrendered within a few days. Few are wont to remember, given what happened, that the British forces under Lt Gen Anderson (who seemed to know less than the Americans about the lessons from the Western Desert) needed to make a rapid advance towards Tunisia to help corral German forces that had begun moving to the west. Because the Germans had decided to contest northern Tunisia, and Anderson had neither the proper doctrine nor the necessary strength, the Americans were called upon to assist, obliging them to abandon their original plan, which had been to resume training once the French had surrendered.

Unfortunately, the Americans were neither efficient nor terribly effective and weather and distance factors in Tunisia were not overcome until the spring of 1943. Meanwhile, a US force operating on the flanks of the main Allied thrust was militarily saved at Kasserine by British forces and militarily damaged by negative British press reports that embarrassed the American military leaders. In the dramatic coalition reorganisation that followed, the Americans were permitted to salvage the supreme theatre command, with Eisenhower retaining his post, but all component commands were headed by the British: General Alexander on the ground, Air Chief Marshal Tedder in the air and Admiral Cunningham at sea.[16] The 'gorillas' with the best combat experience ran the operations.

Lack of practical alternatives at the time of the Casablanca Conference in January 1943 forced the Americans to accept a peripheral strategy based on the Mediterranean, rather than their preferred concept of hitting directly at the Nazi forces in North-West Europe. In the course of 1943 the coalition went on to invade first

Sicily and then Italy, further consolidating patterns for the application of air power in mobile warfare. American and British troops fought on separate, but necessarily parallel, fronts. It was not so intended in Sicily, but Patton chose to strike out on his own, eventually turning away from the forces directed by Montgomery. He got away with insubordination, but only because he had succeeded in reaching the port city of Messina before the British.

It bears repeating that, while the Mediterranean experience had provided the opportunity to put tactical doctrinal theory into practice, it had not been the breeding ground for such ideas. A careful examination of American aviation writing will show that US airmen had already discussed and documented most concepts relating to modern tactical air power before the start of WW II, and that the Army leadership in Washington, especially the Chief of Staff, George Marshall, had signed off on it. Modern ideas had begun to appear in American papers discussing the provision of air support as early as 1935. On the other hand, it is equally true to say that few ground, and air, leaders actually understood the emerging doctrine. Why? Because there was never sufficient time for meaningful exercises or war games, and events would show that it took months of battlefield experience for commanders to became really familiar with the principles of air-ground support. Thus, while some pre-war soldiers continued to be resolutely opposed to the idea of air-ground 'equality' – these principles had nevertheless been enshrined 'in the manual'.

The significance of the Mediterranean campaign, in the context of coalition warfare, is that it proved the viability of the concept by providing invaluable experience, demonstrating the value of tactical air power and teaching lessons that resonate even today. Some examples will illustrate what I mean. Perhaps the most important, lesson, from the airman's point of view, was the need for co-equality of air and ground leadership in a theatre campaign. Centralised command of resources is the first corollary of tactical air power (air superiority being the 'other first' corollary). The British validated this principle during more than two years of fighting in the Western Desert. They also established: the necessity for support elements to be as mobile as the operational echelons; the predominance of the offensive; the flaws inherent in defensive umbrellas; the value of dual-role aircraft, especially fighter-bombers, in tactical support operations;

the need for preparation of the battlefield; the importance of co-location of commanders; the value of training; and the need for rapid and reliable communications. Some of these factors are explored in more depth below.

Centralised Control: One of our most codified concepts of air power is that of centralised control, an idea that both nations had begun to investigate in WW I; we Americans like to cite the Battle of St Mihiel as our watershed battlefield experience. The principle of centralised control, in the sense of co-ordination of effort, became a mainstay of the combined strategic bombing campaign mounted by the Eighth Air Force and the RAF's Bomber Command, but it had manifested itself long before that and it was certainly in place by the time of TORCH – perhaps reinforced by lessons learned from the Western Desert experience.

It had not been easy to establish this principle, because both air forces had originally been founded as subordinate formations within existing army organisations with elements being assigned to support individual armies – in other words, they had actually operated under a system of decentralised control. As a result, air tacticians, on both sides of the Atlantic, had had an uphill struggle persuading sceptical ground force commanders that centralised control would be essential if air power was to be employed to best effect.

The British learned their first hard lesson in France in the spring of 1940. There they had operated two separate commands, the Advanced Air Striking Force and an 'Air Component' of the Army. Experience in France illustrated the need for a single authority to direct and administer all air formations in a theatre of war, and thus the need for one supreme commander for all air forces. Such a commander's ability to make the best use of limited resources provided a powerful argument in support of this contention.[17]

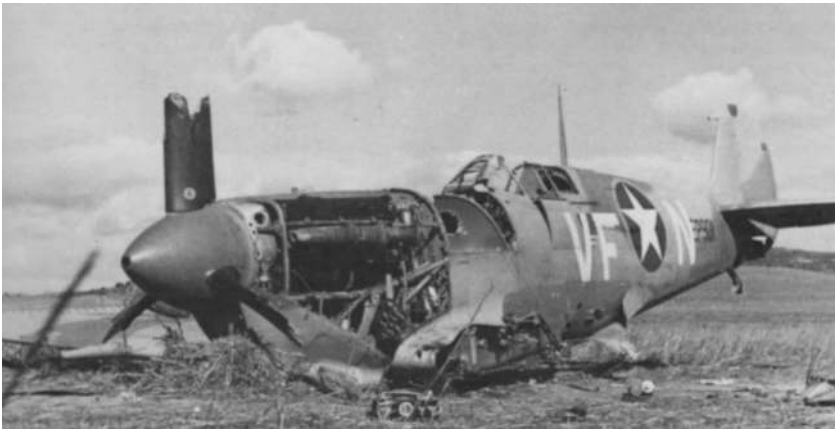
The RAF had always dedicated a proportion of its assets to support the ground campaign. The United States did the same with its Air Support Commands which formed discrete elements within each autonomous air force. US operational doctrine was eventually published in Field Manual 100-20 which appeared in April 1943, although this had been preceded by the broadly similar 'Operational Memo 17' by the time that they landed in Africa. Eisenhower was the first coalition commander to be designated as a 'Commander-in-

Chief' but, because of the distances involved with the three separate TORCH landings – at Oran, Algiers and Casablanca – authority was delegated and forces were divided between the various invasion commands. Thus the Twelfth Air Force was split three ways, creating an impression that American air was allocated to the ground commanders. Few remember that within a couple of weeks the various air commands had been re-centralised.

The British forces under Anderson had quite a record with poor ground judgement of suitable air employment. And even when operating under the centralised control of their respective national air commanders, General Doolittle in the case of the Twelfth Air Force and Air Marshal Welsh in the case of the British Eastern Air Command, long-range bombers and fighters were sometimes programmed for interdiction missions. Leaving such anomalies aside, it is true to say that tactical air resources were usually dedicated to the support of ground operations, under the overall direction of the senior ground commander, whereas the fighters and, particularly, the heavy bombers were generally subject to more centralised air control, although the Commander-in-Chief could also call directly on these resources to help him achieve his mission.

As an aside, I should point out that we are discussing a period of history when conditions were very different from those which pertain today. Having spent so much time and effort in learning how essential it is to have centralised control, it is ironic that advances in technology are now tending to negate that principle. I think that we may be witnessing a revolution that will take us from an era of 'centralised control and decentralised execution' to centralised control, on a level *above* senior airmen, and centralised execution, on a level above even the component air commander. The fact is that we no longer need the centralised control mechanisms necessary to marshal a thousand bombers over Germany; today we can hit a specific objective with one aircraft, or perhaps even a single bomb from that one aircraft – and one hardly needs to 'centralise' the direction of the efforts of one aeroplane.

The need for the close co-ordination of air forces became apparent early in 1943 when the Allied armies driving towards Tunis from the west began to close with Montgomery's army advancing from the east. By mid-February, the *Luftwaffe* had concentrated its forces in



A Spitfire of the 12th AF's 52nd FG down on its luck in Tunisia.

Tunisia to good effect, as demonstrated by their performance at Kasserine. Following decisions taken at Casablanca, the Allies did the same thing, forming the Mediterranean Air Command with Tedder as Air Commander-in-Chief. Subordinate air commands were divided up between British and American officers. The most important of these was Coningham who commanded the Northwest African Tactical Air Force, comprising the US XII Air Support Command and the RAF's No 242 Group and Western Desert Air Force. The air units were not fused except for some American squadrons which flew with the WDAF, but they did operate as one when necessary. The establishment of air superiority was the first priority; most of the ground support effort was allocated to the 8th Army.

Air Superiority: The second lesson learned in France in 1940 was that air superiority was essential because success on the ground depended upon it. The Germans had clearly gained air superiority, although this did not necessarily imply that they had had superior aeroplanes. Nor did it follow that their success in the land campaign had been due to their employment of dedicated ground attack aircraft. A properly balanced air force also needed to included an effective bomber element (to neutralise enemy air) and fighters (to protect the ground forces). The British had recognised the need for heavy bombers, to attack aircraft on enemy airfields, but the idea of escort and offensive air-to-air fighter combat was not practised early in the

An increased degree of mobility was conferred when the 316th Troop Carrier Group's four squadrons of C-47s joined the 9th AF; again, note that this USAAF aeroplane sports RAF fin flashes, a common practice in North Africa.

war – fighters were for defensive purposes. The RAF would eventually come to understand that the establishment of air superiority was critical to success through its experience in the Western Desert. For their part, the Americans were to discover that, even though they had been able to deploy more aircraft than the Germans over Tunisia in early 1943, there was more to securing air superiority than merely fielding superior numbers. In fact, the application of tactical air power had completely failed the ground forces in the first stages of the Tunisian campaign. Of course the Air Force took advantage of the losses incurred at, and of the subsequent embarrassment of, the Kasserine Pass battles to blame the Army for micro-management. This led to Washington's acceptance of the doctrine laid down in FM 100-20 which ensured that air superiority was always given top billing in future plans. This was another case of battlefield experience validating long-discussed concepts – air superiority had been written about in air and ground theory for years.

Mobility: The British learned the need for mobility of all air force support units because of the rapid movement, forwards and back, during its early clashes with Italian forces in late 1940 and this lesson was driven home during the many later engagements fought between Egypt and Tunisia against the Italians and the *Afrika Korps*. To begin

with, both sides tended to outrun their supplies. Both depended upon taking ports as they advanced. This was still necessary, even in 1942-43, by which time the British had created a very efficient and sophisticated transport and re-supply system, featuring a pipeline and employing lots of American-supplied trucks. Nevertheless, the employment of air forces could be difficult as they endeavoured to move forward to stay as close as possible to the advancing troops. The ports just could not be opened fast enough and the British lacked US-style air transport until December 1942, when C-47s of the Ninth Air Force arrived in theatre to support the British advance. Thereafter, because it wanted the WDAF as far forward as possible in order to provide air support, the British Army's objectives became the capturing of airfields as much as chasing Rommel. Although the Americans should have learned of the crucial importance of mobility from observing the British, trucks were left off the shipping manifests for the TORCH operation in preference for more troops across the beach. As a result, the Americans did not get sufficient transport capacity until February 1943 – one of the reasons behind the battlefield reversals in Tunisia, especially at Kasserine.[18]

Defensive Air Support: During Operation BATTLEAXE in the summer of 1941, the land commander had asked for full time air cover to provide complete freedom from attack by enemy air. He got it and the campaign was largely successful, but it engendered arguments about whether the provision of such 'umbrellas' was an efficient use of air power, and whether it was actually even feasible. The dispute reached as far as Churchill who took the view that complete invulnerability from attack should not be expected and thought it unwise to engage in an umbrella-type defence system.

> 'Although the full power of the Air Force was to be directed to winning the land battle, this did not imply a local employment and control of the air forces.…The Air Force has its own dominant strategic role to play and must not be frittered away in providing small umbrellas for the Army…'[19]

Defensive patrols had been discussed in various doctrinal statements throughout the 1930s, generally being acknowledged as a very inefficient application of air power. Nevertheless, the difficulties of the American II Corps in Tunisia made the use of umbrellas

imperative for a time. Despite, the recognised policy, even the airmen advocated the use of continuous air patrols over forward bases in central Tunisia. One effect of this was that by the time of Kasserine, the main US fighter group, the 33rd, had exhausted its resources and had to be moved back to Morocco. The RAF's Eastern Air Command also conducted protective patrolling over important locations in North-West Africa, like Algiers, Philippeville and Bone. As a consequence, some bombing missions had to be mounted without fighter escorts, resulting, in one notorious case, in the loss of an entire squadron of Blenheims. Since standing patrols were wasteful, the RAF devised the alternative approach of carefully timed fighter sweeps and relied on anti-aircraft guns to provide permanent air defence.[20]

Fighter-Bombers as CAS Weapons: Both the Americans and the British had failed to find a truly suitable aircraft for close air support (CAS). The army co-operation/attack aircraft of the mid-1930s flew slow and low, hoping to avoid detection until they got to the target. Unfortunately, these aircraft were unable to carry a worthwhile bomb load and proved incapable of operating in the face of concentrated anti-aircraft fire so these 'low and slow' support aircraft were soon withdrawn to rear areas or confined to night operations. The Americans arrived in Tunisia with their shiny new A-20 attack bombers. It was fast enough to avoid enemy fighters, but still did not carry much in the way of bombs, nor could it operate at low level because of German guns. The A-20s spent the rest of the war flying at medium altitudes, without an appreciable bomb load. That said, A-20 groups suffered few casualties, because, if the prime US air support aircraft of the early war years could not bomb effectively, it *could* run away from enemy fighters.

In the spring of 1942 the Western Desert Air Force developed the fighter-bomber as its counterpart to the *Stuka*. As such it had a faster response time and the additional flexibility to handle air superiority tasks in between ground support missions. Hurricanes were transformed into 'Hurribombers' and P-40s into 'Kittybombers'. Limited bomb loads were still a problem but this was offset by the speed with which these aircraft could respond to tasking and the accuracy with which they could deliver their attacks, these characteristics making the fighter-bomber the most effective CAS weapon of the war. Many were lost to ground fire, but they were

The senior allied airmen in theatre in early-1943, Air Chf Mshl Sir Arthur Tedder (Mediterranean Air Command) and Gen 'Tooey' Spaatz (Northwest African Air Forces).

cheaper than twin-engined bombers, although they needed fighter escort to avoid excessive wastage.[21]

Conclusion

I started out with the premise that, in a coalition venture, the most powerful member of the coalition makes the major decisions. So who was 'the gorilla' in the Mediterranean Theatre? Even at this distance in time, I am not entirely sure of the answer. The British had the most experienced leadership and trained troops, even beyond North Africa. Strategically, Britain got us there, against the will of the American military leadership, with the crucial exception, of course, of the President. At Yalta, the Americans won the second battle for strategic focus to get us beyond the Mediterranean, against the wishes of the Prime Minister.

In early 1943 the Allies devised a combined command structure

that suggested a conjoint organisation operating under Eisenhower. On the ground, the national armies fought separately, their efforts being co-ordinated, in North-West Africa, by Alexander's 18th Army Group, similar arrangements later being established for the invasions of Sicily and Italy. The air forces were unified as the Mediterranean Air Command under Tedder, but subordinate to him was Spaatz and the Northwest African Air Forces that was composed of both American-led and British-led commands – Coningham the Northwest African Tactical Air Force, Doolittle the Northwest African Strategic Air Force and Lloyd the Northwest African Coastal Air Force. Centralised command was important, but I think that, in practice, national air forces often tended to fight pretty much in support of their individual nation's campaigns.

The record shows that there was lots of squabbling, and at all levels of the military. Nonetheless, the Allies defeated a tough opponent, which must say something about the effectiveness of the organisation. I think that much of the success is owed, not to technology, not to quantity, nor to the commanders who had the brightest ideas, but to effective overall leadership – the personal factor. The imprimatur of hero may lay with several men; Eisenhower, Tedder and Alexander all come to mind. Without much need for reflection, the highest accolade is owed to a man that both sides claim. It helps perhaps that he had an American mother and an English father. He made a vital decision that separated the snarling air and ground commanders in mid-1941, a lesson appreciated by American air thinkers in the US at the time and confirmed in battle again for Americans in Tunisia in 1943 – the need to concentrate air resources and avoid constant defensive air patrols. Simon Schama in his remarkable history of Britain, pointed to a remark by Clement Attlee who, when asked what, exactly, Winston had done to win the war, replied, 'I would say, talk about it.' Further corroboration comes from Edward R Morrow, the American news correspondent in England, when he wrote of Churchill's 'mobilisation of words.' Winston also gripped, as intended, the attention of politicians and people in the United States.[22] For good or bad, success in the Mediterranean campaign is owed to Churchill when he was the 'gorilla'.

Notes:

[1] David F Trask, *The AEF and Coalition Warmaking, 1917-1918,* (University of Kansas Press, 1992), pp177.

[2] William R Burt, *Adventures with Warlords: Insight into Key Events of World War II,* (New York, NY: Vantage Press, 1994), pp40-41.

[3] *Ibid*, pp40-42.

[4] *Ibid*, p61.

[5] *Ibid*, p62; Maurice Matloff and Edwin M Snell, *Strategic Planning for Coalition Warfare, 1941-1942*, (Washington, DC: Center of Military History, 1953), pp32-53.

[6] Mark A Stoler, *Allies and Adversaries, The Joint Chiefs of Staff, the Grand Alliance, and US Strategy in World War II,* (University of North Carolina Press, 2000), pp1-10.

[7] *Ibid*, pp27-37; Mark A Stoler, *George C. Marshall, Soldier-Statesman of the American Century,* (Boston, Mass: Twayne Publishers, 1989), p81.

[8] Bernard C Nalty, *Winged Shield, Winged Sword, A History of the United States Air Force, (*Washington, DC: Air Force History and Museum Program, 1997), pp188-90.

[9] Matloff and Snell*,* pp91-100.

[10] Stoler, *Marshall*, pp100-103.

[11] Kent Roberts Greenfield, *American Strategy in World War II: A Reconsideration,* (Baltimore, MD: John Hopkins Press, 1963), p44.

[12] Stoler, *Marshall,* pp103-107.

[13] Daniel R Mortensen, *A Pattern for Joint Operations: World War II Close Air Support North Africa,* (Washington, DC: Office of Air Force History and US Army Center of Military History, 1987), pp47-49.

[14] *Ibid*, pp17-19.

[15] Greenfield, pp3-16, raises the interesting concept of air theology. For the most part, Greenfield, a ground army historian, was one of the few in the Army that could write about air power in an objective manner.

[16] Mortensen, pp47-70.

[17] Trask, pp1-30.

[18]*The Second World War, 1939-1945 Royal Air Force, Air Support,* (London: Air Ministry, 1955), pp50, 76.

[19] *Ibid*, p54.

[20] *Ibid*, p83.

[21] *Ibid*, pp64-67.

[22] Simon Schama, *A History of Britain, The Fate of Empire, 1776-2000, Vol III,* (New York, NY: Miramax Books, 2002), pp509-510.

RISING FROM THE ASHES: ALLIED AIR POWER AND AIR SUPPORT FOR THE 14TH ARMY IN BURMA, 1943-1945[1]

Dr Sebastian Ritchie

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While this paper is concerned with Allied air operations, it is important to stress at the outset that alliance, or coalition, warfare is by no means the central issue here. Rather, the primary focus is the incremental nature of air power capabilities, albeit within the context of an Allied air campaign. But the Burmese theatre nevertheless illustrates very clearly what can be achieved through effective Anglo-US collaboration, and it would certainly prove an extremely worthwhile subject for future research into RAF-USAAF relations. Therefore, in concluding, I will suggest a few specific issues which could fruitfully be explored if the topic of alliance air warfare were to be addressed more directly in a study of Burma in the Second World War.

The spring 1945 offensive that brought General Slim's 14th Army from northern Burma to Rangoon in just six months, after more than two years of stalemate, would have been impossible without air power. During the campaign, British and American transport aircraft supplied an army of more than 300,000 ground troops; without their efforts, Slim's operations would have been logistically unsustainable. Allied close air support aircraft were guided onto ground targets by forward air control teams, helping to punch through Japanese opposition. Allied bombers cleared particularly difficult obstacles in so-called 'earthquake' operations. Fighters shielded Slim's advance from Japanese reconnaissance aircraft, ensuring that their high command remained oblivious to the developing threat on their western

flank; at the same time Allied aerial reconnaissance provided vitally important targeting intelligence and battle damage assessment information. And, as the ground troops moved south, so too did Allied air power; by early 1945 former enemy airfields were being brought into operational use within days of their capture by Slim's forces. This both ensured the maintenance of airborne supplies, and enabled close air support and fighter aircraft to be positioned near to the battlefront.

On the eve of hostilities with the Japanese, Allied air power in South-East Asia was virtually non-existent.[2] Yet in 1944-45 the British Empire and American air forces in Burma participated in one of the war's most outstanding feats of air support for a land campaign. The full range of land-based air operations which underpinned 14th Army's victory included air defence, offensive counter-air, close air support, air interdiction, strategic bombing, photographic reconnaissance, tactical air transport, airborne operations, glider operations, special operations and maritime air reconnaissance. A truly dramatic transformation had occurred.

Histories of the air war in Burma have predominantly offered narrative accounts of the growth of Allied air power from its inauspicious beginnings through to the victories of 1944 and 1945, culminating in the liberation of Rangoon. But the aim of *this* paper is to provide a more analytical approach to the problem; by focusing here on air superiority, air transport, and close air support operations, the objective is to demonstrate how and why air power came to play such a crucial role in the Allied victory.

Inevitably, the specific issue of army-air co-operation, whether through airborne supply or close air support, has featured prominently in the historiography of Allied operations in Burma. Yet none of the air operations in support of 14th Army would have been possible without one fundamental precondition – air superiority. During the early stages of the war with Japan, Allied air forces in South-East Asia found themselves heavily outnumbered and outclassed. On 7 December 1941 the RAF possessed just 181 serviceable aircraft in theatre, and their principal fighter, the American-built Buffalo, quickly proved no match for modern Japanese fighters. Although reinforced by small numbers of British Hurricanes and American P-40s, the squadrons committed to the defence of Burma were soon wiped out.[3]

The task of rebuilding Allied air power in Burma afterwards passed

to the British and American commands in India. It was a slow process. The Allies invariably accorded South-East Asia the lowest importance in the allocation of resources and although more aircraft began to reach India during 1943, the most modern types were held in Europe.[4] But such aircraft would in any case have been difficult to employ to optimum effect without the necessary supporting infrastructure, which had to be created almost from scratch. This inevitably took time, but it enabled air power to be far more decisively projected later on. The various infrastructure projects included a massive airfield construction programme, the multiplication of supply and maintenance depots, the improvement of communications, and the establishment of a radar chain and fighter control facilities.[5] No less important was the creation, in the final months of 1943, of a properly unified and integrated command and control structure, Air Command South-East Asia, covering all British and American air forces in India and Burma.[6]

While these preparations were under way, Allied air strength was being steadily augmented. Compelled to spread their air forces across several theatres, and unable to produce sufficient numbers of aircraft or pilots, the Japanese lost the numerical superiority that they had enjoyed in 1942. Over Burma, by January 1944, the Allies possessed an advantage of almost 5:1 in fighters; moreover, by then fighter squadrons were being re-equipped with aircraft like the Spitfire, soon followed by American P-38s, P-47s and P-51s, which proved more than a match for the best Japanese fighters. Japanese air operations over Allied territory began to incur unsustainable attrition rates.[7] In the second Arakan campaign in February 1944, Japanese air attacks on the so-called 'Admin Box' were beaten off, and the Japanese Army Air Force proved unable to stop airborne supplies from reaching the surrounded Indian ground troops; sixty-five Japanese aircraft were destroyed or damaged, for the loss of only three Spitfires. The same pattern was to be repeated in the battles of Kohima and Imphal.[8]

At the same time Allied long-range fighters and bombers embarked on an offensive counter-air campaign against the principal Japanese airfields in Burma, destroying numerous aircraft on the ground and in air combat. The Japanese were compelled to operate from distant bases; some of their sorties over Imphal were flown from airfields 600 miles from the front.[9] Concurrently, Allied air strikes against Japanese

supply lines left numerous aircraft at forward airfields grounded by shortages of spare parts.[10] The final tally of Japanese aircraft destroyed or damaged between December 1943 and May 1944 was 760.[11] By mid-1944 the Allies were able to conduct air operations virtually unchallenged; by January 1945 the Japanese could field only 126 frontline aircraft in South-East Asia, while Air Command South-East Asia numbered more than 1,500 aircraft, almost evenly divided between the RAF and the USAAF.[12]

The advantages which air superiority conferred on the Allies were nowhere more in evidence than in the air transport operations mounted in support of 14th Army between 1943 and 1945. Logistics lay at the heart of the British Army's initial inability to confront the Japanese. Typically, the Japanese would mount flanking movements through the jungle around road-bound British columns. While engaging British forces frontally, they sent mobile units to strike vulnerable lines of communication. To protect them, the British then withdraw troops from the front line, only for the Japanese to increase the intensity of their frontal assault. The British were repeatedly left with no alternative but to retreat.

The potential for the Japanese themselves to be outmanoeuvred through the application of air power only gradually became clear. In the late-1930s the RAF had largely been constructed around Bomber Command and Fighter Command, and when Burma fell in 1942 an air transport force was still in the early stages of development.[13] But air transport occupied a far more prominent position in USAAF doctrine, and the United States possessed significantly larger numbers of transport aircraft.[14] Air transport was employed on a limited scale by both air forces during the retreat from Burma in 1942 to bring emergency supplies to ground troops and to evacuate personnel. It subsequently became central to American efforts to support China from India, and to the supply of isolated garrisons, and ground troops cut off by the monsoon.[15] Elsewhere in the Far East, such as Papua, transport aircraft were used to supply American and Australian ground forces.[16]

But the turning point in Burma was the first of Wingate's long-range penetration expeditions in February 1943. Wingate demonstrated beyond doubt the feasibility and military economy of air supply of ground troops in jungle combat. Each of his columns had its

own RAF liaison officer, responsible for relaying supply requirements and for organising drop zones.[17] Some 178 sorties were flown by RAF transport aircraft in support of Wingate's forces, dropping 303 tons of supplies.[18] Thereafter, the potential for supplying ground forces by air would always be considered by Allied commanders.

The second Arakan campaign began in November 1943. For the first time, Allied planning now presupposed total dependence on airborne supply for at least one of the divisions involved. After early progress, the Allied advance was itself confronted by a Japanese offensive, which was conducted on the same tactical principles that had proved so successful in the past. The difference was that Messervy's 7th Indian Division did not respond to the Japanese flanking manoeuvres by retreating; instead they were ordered to stand and fight, and to rely on airborne supply.

Concentrated around the Admin Box, they repelled the Japanese onslaught, while a stream of Dakotas sustained them with rations, weapons and ammunition. These missions were executed in close proximity to the enemy, and many aircraft were damaged by fire from the ground; nevertheless, 700 supply sorties were flown to the Admin Box, while in total Allied transport aircraft flew 3,000 sorties to convey 10,000 tons of supplies to the divisions deployed in the Arakan in February 1944. Soon the forward Japanese units were themselves running out of supplies, and by the end of February they were in full retreat. Second Arakan demonstrated that through the use of airborne supply, Japanese jungle tactics could be defeated.[19]

The experience was repeated on a larger scale at the battles of Kohima and Imphal in March, but not before a further radical development in the employment of air transport. This was the movement of an entire division from the Arakan front to shore up the defences around Imphal, which were threatened by the second stage of the Japanese offensive – a redeployment requiring 750 transport sorties. The ground forces at Kohima were subsequently maintained in a tiny garrison area by transport aircraft flying in daylight at an altitude of only 200-300ft. At Imphal a force of 150,000 troops in contact with the enemy and 140 miles from the nearest railhead had to be sustained entirely from the air. Their requirement of more than 400 tons of stores per day had to be flown into a valley ringed by Japanese guns. In total, Allied transport aircraft brought more than 32,000 tons

of stores into the Imphal-Kohima area between April and June 1944, moved nearly 59,000 personnel into or out of the battle area, and evacuated 15,000 casualties. By the end of June it was again the Japanese who were compelled to withdraw.

At Second Arakan, Kohima and Imphal, 14th Army drew decisively on air transport, but largely did so spontaneously – in the heat of battle. But the potential for building air transport into many different stages of operational planning was in the meantime illustrated by the second of Wingate's long-range penetration expeditions. The first Chindits had their powers of endurance stretched to the limit by their infiltration through the jungle on foot; they only depended on the air for supplies. But Wingate's second, far larger, operation relied on air transport for deployment, supply, casualty evacuation, and in part for extraction. The initial deployment, by transport aircraft and gliders, conveyed 12,500 troops along with field equipment, pack animals, bulldozers, jeeps, tractors, armoured cars, ammunition, rations, anti-aircraft guns and artillery; this force was then sustained by 2,000 tons of airborne supplies per month. More than 2,000 casualties were evacuated by light aircraft and by Sunderland flying boats, which landed on Lake Indawgyi.[20]

In summary, between the beginning of 1943 and mid-1944, air transport operations in Burma established a range of precedents, which came to exert a decisive influence on Allied planning and tactics. The first Wingate expedition introduced the principle of airborne supply for fielded forces; the second Arakan campaign witnessed the deployment of a regular division dependent on air supply, and the first defeat of a Japanese offensive in Burma, partly through airborne supply; the second Wingate expedition saw the deployment of a major ground force by air, and the partial extraction of that force by air; Imphal demonstrated the Allies' capability to use air transport to switch an entire division from one front to another, and to sustain an entire corps by air. Hence, air power could demonstrably fulfil virtually all the essential transport and logistical requirements of 14th Army; moreover, it could give the Allies a critical advantage in movement and logistics over the Japanese, who were dependent on land lines of communication and water-borne transport. After Imphal it was possible to plan the recapture of Mandalay and the advance on Rangoon overwhelmingly on the basis of air transport and supply.

The second field of operations which could not have been conducted effectively without air superiority was close air support (CAS). The RAF's limited tactical capability during the early years of the war is well known. In fact, any doctrinal obstacles to effective CAS had largely been swept away by the time hostilities started with the Japanese, as a result of experience gained in North West Europe and North Africa. Again, however, resource constraints impeded the development of CAS in Burma.

During the first Arakan campaign in late 1942 and early 1943 the only bombers available for CAS were three squadrons of Blenheims, which proved quite unsuited to the task. Fighters also provided direct support, but were more successful strafing enemy lines of communication. Enemy targets in jungle locations were often impossible to identify from the air, so instead they were indicated to pilots by pin-point positions or by smoke shells fired by artillery. The effectiveness of such methods was often hard to gauge, however, and there was a chronic shortage of accurate battle-damage assessment; many Japanese bunkers and foxholes in fact emerged unscathed from bombing attacks. It also proved difficult to co-ordinate air and ground operations effectively.[21] During the operation No 224 Group, based at Chittagong, had overall responsibility for providing air support, while an organisation called the Army Air Support Control operated alongside 14 Division's headquarters to control aircraft engaged in CAS; Air Support Controls were linked to Brigade and RAF Wing headquarters. The Army Air Support Control seemed to function well enough, but the small scale of operations probably meant that it was not rigorously tested.[22]

By the *second* Arakan campaign, Allied air forces were numerically stronger and more capable, but could hardly be considered modern by the standards of the air forces in North West Europe. The aircraft available for direct support included Hurricane fighter-bombers, Vengeance dive-bombers, American B-25s and British Wellingtons. But the results were disappointing and were in many respects similar to those observed in the earlier campaign. Accurate targeting again proved exceptionally difficult; Japanese defences were deep, strongly protected, well camouflaged and hence very resilient. The heavier bombers could only periodically be diverted from other operations, and any advantage which they

conferred on the attacking forces from the impact of their bombing was invariably offset by their greater margin of error, which compelled Allied ground troops to begin their assault too far from their ultimate objectives.

Operational control of CAS aircraft engaged in Second Arakan was again vested in No 224 Gp, but the Group headquarters was located about 100 miles from the relevant army Corps headquarters (15 Corps HQ). So CAS during Second Arakan was again directed through an Army Air Support Control located with 15 Corps. Difficulties arose because, while 15 Corps was entirely committed to the Arakan offensive, No 224 Gp was engaged in a variety of other operations. In these circumstances there was inevitably strong competition for resources between the two headquarters.[23]

Second Arakan nevertheless witnessed two significant tactical developments. First, in the later stages of the campaign, ground forces communicated directly by radio with tactical aircraft to guide them towards their targets – a technique then also emerging in Italy and (under American sponsorship) in northern Burma. Second, a system was introduced whereby heavier bombing attacks were swiftly followed up by precision attacks by tactical aircraft, designed to keep enemy forces pinned down until ground troops had closed on their positions. Properly practised and refined, these tactics would in time solve the problem of co-ordinating air and ground attacks in the Burmese theatre.[24]

Ground operations in the spring of 1944 provided a further stimulus to the development of CAS. The tactical aircraft of No 221 Gp flew more than 25,000 sorties from March to July over Kohima and Imphal. The battle raised many of the same issues that had arisen on the Arakan front, but inter-service co-operation improved considerably, not least because No 221 Gp headquarters was located forward on Imphal plain, along with some of the squadrons actually engaged in CAS. This greatly facilitated army-air liaison.[25] Closer co-operation was reflected in more effective targeting and co-ordination between air and ground forces.[26]

In the same period Wingate's second expedition witnessed the more systematic employment of ground-to-air radio to direct tactical aircraft on to their targets. RAF sections – the RAF Component Special Force – deployed with Wingate's brigades and worked as

forward air controllers. The supporting aircraft were themselves assigned to a special unit named the Air Commando Force, a controversial measure but one that worked in the specific circumstances of the expedition. Tactical air operations during the expedition provided ample opportunity for comparing attacks by aircraft with and without radio contact with the ground, and it was found that CAS was far more effective when ground-to-air radio was employed. The difficulty of targeting enemy forces in the jungle environment also encouraged efforts to exploit photographic reconnaissance more effectively. Altogether some 382 tactical operations were conducted during the campaign involving 1,900 sorties.[27]

14th Army's campaigns in the first half of 1944 contained numerous lessons on CAS. They demonstrated that operations would benefit from closer army-air co-operation at headquarters level, that tactical air control could be improved by the more widespread use of ground-to-air radio and photographic reconnaissance, and that air and ground attacks could be better synchronised without undue risk to ground troops. During the second half of the year these issues were studied intensively, together with developments in the application of CAS in Europe. The result was a series of organisational changes, which drew on European experience while at the same time making allowances for topographical and other differences between the two theatres.[28]

First, the decision was taken to co-locate the headquarters of 14th Army with the headquarters of No 221 Gp, which was to be responsible for controlling all CAS aircraft engaged in the forthcoming campaign in central and southern Burma.[29] When the speed of 14th Army's advance threatened to open too great a gulf between the headquarters and units near the battlefront, it was decided to form what was known as a Group Control Centre, to move as far forward as possible with the most advanced Wing headquarters to take control of all CAS operations.[30] Secondly, once the controlling function of the Air Support Controls had passed to the Army/Air headquarters, they were replaced by Air Support Signals Units. Their role was to operate a dedicated signals network solely for air support, functioning at corps, division and brigade level and at group and wing headquarters.[31] At the battlefront itself the basic organisational unit,

underpinning the entire system, was the Visual Control Post. Visual Control Posts were joint mobile Army/RAF teams functioning at brigade level and equipped with ground-to-air radios. They controlled tactical aircraft visually from a position on the ground commanding a view of the battle area.[32]

Alongside this new organisation, important tactical changes were introduced to maximise the impact of Allied air support. There were particularly marked improvements in the exploitation of heavy and medium bombers immediately preceding the assault of enemy strong points by the Army. The tentative experiments witnessed during the second Arakan campaign were rationalised and refined; there were extensive exercises. The 'earthquake' operations that resulted were designed to exploit the psychological effect of bombing on the enemy and not simply the material damage inflicted.[33]

Earthquake operations scheduled an initial strike by heavy or medium bombers, followed by fighter-bomber attacks which receded as the ground troops advanced, and which finished with dummy attacks. Ground troops were brought to within 700-800 yards of their objectives during the heavier bombardment, and closed to 200-300 yards while the fighter-bombers were in action. By launching their final assault so close to the Japanese positions, they were able to exploit the demoralisation and disorientation which bombing invariably generated among enemy forces to overwhelm their defences.[34]

In 14th Army's southern offensive to liberate Burma in 1945 all the components of Allied air support for ground operations described in this paper can be identified. When operations commenced, Allied air superiority protected Slim's troops from all but the most limited and ineffective attacks by the Japanese Army Air Force. It also ensured unhindered air transport and CAS in support of ground forces; air transport provided the army's logistical chain, while CAS played a crucial part in destroying Japanese resistance. As soon as territory had been seized, captured airstrips were re-opened, bringing air superiority fighters and ground support aircraft close to the front, and allowing supplies and reinforcements to be flown in; this in turn provided the impetus behind further advances on the ground. The application of these tactics had almost brought 14th Army to the gates of Rangoon when the monsoon started at the end of April 1945. By that time the

Japanese had fled the city.

The process by which air power was developed to support Allied ground forces in Burma can only be described as incremental – the absorption of lessons from previous operations and from other theatres, and their application to future campaigns. After the initial defeats of 1942, Allied air power was gradually rebuilt, like the proverbial phoenix rising from the ashes. Air superiority had been won by mid-1944. The scope for using air transport to solve the army's fundamental problems of movement and logistics became clear partly from unplanned measures of last resort, and partly from the inventive initiatives of Wingate's expeditions. In Wingate's second operation it was for the first time *planned* that virtually all long-range movement and logistics should depend on air transport. The same basic approach, vastly extended, was then employed by 14th Army during the reconquest of central and southern Burma. The evolution of CAS was similarly incremental, the exigencies of battle producing organisational and tactical changes which were then studied, refined, rehearsed and adapted in the light of European experience. By the later months of 1944 the Allies had established a formidable CAS capability, which was applied with devastating effect in the final Burmese campaigns.

An explanation of air power's triumph in Burma in 1945 must begin with the disastrous defeats of 1942 and early 1943. These early campaigns showed that the Japanese were better prepared for jungle warfare than the Allies in almost every respect. In a straightforward confrontation between Allied and Japanese ground forces, the Japanese clearly held too many advantages; the task of evicting them from Burma using ground forces alone would have proved enormously difficult, drawn-out and costly. It was air power which by 1944 gave the Allies a means of defeating the Japanese army, particularly (although by no means exclusively) through the systematic exploitation of airborne movement and logistics, and close air support. At the same time these vital capabilities were denied to the Japanese, so that their ground forces were placed at a decisive disadvantage. Behind these developments lay the Allies' pursuit of a general air strategy, and their willingness to allocate material and human resources to air power on a scale that dwarfed the combined efforts of the Axis powers, who tended to view air warfare merely as

an adjunct to land or naval warfare.[35]

If the alliance issue were to be addressed more directly in a study of air operations in World War Two Burma, I would suggest two key areas for analysis. The first would be the divergent interests of Britain and the US in the region, Britain being primarily concerned to regain her colonies, the US seeking chiefly to maintain support for China. It would be important to establish how these very different interests were reconciled, and what the implications were in terms of command and control, and resource allocation. The respective contributions of the two Allies would also have to be carefully considered: clearly the RAF and the USAAF complimented one another in purely numerical terms, but there were also quite distinct yet mutually reinforcing contributions: hence the US provided equipment on a substantial scale, including the all-important Dakotas, and long-range fighters, while the British provided bases and other infrastructure, and a good deal of know-how. But we need to find out much more about the interchange of ideas and expertise between the RAF and the USAAF before we can establish how they overcame the most challenging operational problems in this theatre.

Note:

[1] This paper was initially prepared for and presented to the Chief of the Australian Army's annual conference on military history in July 2003.

[2] R J Overy, *The Air War, 1939-1945* (New York: Stein and Day, 1981), p114.

[3] Air Cdre Henry Probert, *The Forgotten Air Force: The Royal Air Force in the War Against Japan, 1941-1945* (London: Brasseys, 1995), pp84-6, 93-4; British Intelligence Objectives Sub-Committee report, BIOS/JAP/PR1987, 'Air Operations in China, Burma, India, World War II', 11-12, copy held at Air Historical Branch.

[4] Hilary St George Saunders, *Royal Air Force, 1939-45, Vol. 3, The Fight is Won* (London: HMSO, 1975), p299. Photo-Reconnaissance Spitfires had arrived earlier, however.

[5] Saunders, *The Fight is Won*, pp299, 307-8.

[6] BIOS/JAP/PR1987, *Air Operations in China, Burma, India, World War II*, pp7-8.

[7] *Ibid*, p14.

[8] Probert, *Forgotten Air Force*, pp168, 192.

[9] Saunders, *The Fight is Won*, p331.

[10] BIOS/JAP/PR1987, *Air Operations in China, Burma, India, World War II*, pp14-15.

[11] BIOS/JAP/PR1987, *Air Operations in China, Burma, India, World War II*, p15.

[12] Probert, *Forgotten Air Force*, p244; the exact total of 1,516 was divided between 787 RAF aircraft, and 729 USAAF aircraft.

[13] Humphrey Wynn, *Forged in War: A History of Royal Air Force Transport Command*, 1943-1967 (London: The Stationary Office, 1996), p6.
[14] Arthur Pearcy Jr, *The Dakota* (London: Ian Allan, 1972), pp13-20.
[15] BIOS/JAP/PR1987, *Air Operations in China, Burma, India, World War II*, p27; Air Command South East Asia, *Air Transport Operations on the Burma Front* (unpublished official account, 1944), p8, copy held at Air Historical Branch.
[16] JG Taylor, *Air Supply in the Burma Campaigns* (Air University USAF Historical Division Study, 1957), p12, copy held at Air Historical Branch.
[17] Taylor, *Air Supply in the Burma Campaigns*, pp14-15.
[18] Saunders, *The Fight is Won*, p302.
[19] Probert, *Forgotten Air Force*, pp169-70; Air Command South East Asia, *Air Transport Operations on the Burma Front*, p14.
[20] BIOS/JAP/PR1987, *Air Operations in China, Burma, India, World War II*, p31.
[21] *The Campaigns in the Far East, Vol. 3, India Command, September 1939-November 1943* (unpublished official narrative, undated), pp82-7, copy held at Air Historical Branch.
[22] AP3235, *Air Support* (unpublished official monograph, 1955), pp126-7, 139, copy held at Air Historical Branch.
[23] *The Campaigns in the Far East, Vol.4, South East Asia, November 1943 to August 1945*, (unpublished official narrative, 1952), pp56-8, copy held at Air Historical Branch.
[24] *Ibid*, pp56-7, 369.
[25] Probert, *Forgotten Air Force*, pp188-92.
[26] *The Campaigns in the Far East, Vol. 4*, p125.
[27] *Ibid*, 184; Probert, *Forgotten Air Force*, pp174-9; AP3235, *Air Support*, p139.
[28] Air Mshl W A Coryton, Despatch covering operations of Third Tactical Air Force from 1 June 1944 to 4 December 1944, December 1944, pp8, 41, copy held at Air Historical Branch.
[29] AP3235, *Air Support*, p134.
[30] *The Campaigns in the Far East, Vol. 4*, pp377-8; Air Headquarters Burma, *The Reconquest of Burma: A History of the Air Support Rendered to Ground Forces, 14 Army, by No 221 Group, RAF, January 1945-September 1945* (unpublished official narrative, 1945), p88, copy held at Air Historical Branch.
[31] AP3235, *Air Support*, pp118, 134; Ian Gooderson, *Air Power at the Battlefront: Allied Close Air Support in Europe, 1943-1945* (London: Frank Cass, 1998), pp26-7.
[32] AP3235, *Air Support*, p135.
[33] Air Mshl W A Coryton, Despatch covering operations of Third Tactical Air Force from 1 June 1944 to 4 December 1944, December 1944, pp8, 43-4.
[34] AP3235, *Air Support*, p137.
[35] Overy, *The Air War*, p262.

MORNING DISCUSSION

Mike Meech. A little known example of Anglo-US co-operation occurred in late 1944-early 1945 when British troops were attached to the USAAF's 3rd Combat Cargo Group at Dinjan to act as air dispatchers delivering supplies to British, American and Chinese forces in Burma. My father was involved in this and he recalls that these could be quite large-scale operations with up to twenty transports circling the drop zone while escorting P-38s suppressed enemy ground fire, although this did not guarantee that one would not find bullet holes in your aeroplane when you got back to base. Operating with mixed crews, clearly implied a high degree of co-operation at the coal face.

Tony Richardson. Some reference has been made to air superiority. Some of us may remember a seminar that we held about ten years ago when Sir Harry Broadhurst pointed out that, while it was great to have air superiority, the problem was knowing when you had actually got it. To make his point he said that he had been in the control tower of an airfield in Northern Germany, very late in the war, with Gp Capt 'Bing' Cross, when the supposedly beaten *Luftwaffe* turned up in considerable strength and did a great deal of damage.

Dr Roger Miller. That would probably have been a kind of one-time *Blitz*, rather like the attack that lead to the Battle of the Bulge. In essence, the Germans wasted what remained of their air force in an attempt to take out a large number of Allied aircraft. They succeeded but the Allied losses were immediately replaced whereas the Germans had exhausted their reserves. The point is well made, however; if you are on the ground and you don't have air superiority you are soon going to know it.

Air Cdre Henry Probert. I am sure that we are talking about an operation mounted on New Year's Day 1945, a good four months before the end of the war. While it was certainly a wasted gesture on the part of the *Luftwaffe*, it did have an effect on Allied morale – and it taught a valuable lesson – that wars are not won until it is all over.

John Davis. We have heard a great deal about the wonderful collaboration between the American and British air forces but we have somehow managed to avoid mentioning any of the things that went

wrong. As one who flew in the Middle East – fighters over Sicily and Italy – I know that some things did go badly wrong. I am thinking, for instance, of the fact, because of the inexperience of some of the American transport crews, many troops were dropped in the sea during the landings on Sicily. Then again, we stored the fighter aircraft earmarked for Sicily on an airfield in North Africa that was the hottest place on earth so that the Spitfires were quite useless when they had to be flown in. I could also add that my own aircraft was hit only twice in combat – both times by Americans! (*Laughter*)

Sir Richard Johns. Thank you for introducing some reality into the proceedings! Could I invite some comments from the panel?

Miller. I suppose that we have been doing the 'glass half full' side of things. You can, of course, do the 'glass half empty' and there were undeniably a lot of problems, both at high and low level. The wonder is that there were so few of them and that people worked so hard to overcome them.

Dr Sebastian Ritchie. From the perspective of the Burma campaign there were certainly things that went wrong. A lot more work remains to be done in analysing what went on in Air Command South East Asia, especially on aspects of command and control, but it is clear that close air support was not very effective at all in the early stages. My impression is that there was some quite serious friction between the British and Americans over the allocation of the transport aircraft which were required, on the one hand, to sustain the Chinese through operations over 'the Hump', and, on the other, to supporting 14th Army in central and southern Burma.

Johns. I would only add that cock-ups were not confined to WW II. I was not in the RAF then, of course, but I can assure you that I have been involved in one or two in my time!

Kenneth Short. I was interested in Air Cdre Probert's remarks that implied that he has still not forgiven the government for returning the Fleet Air Arm to the Navy. Having heard about the inadequacy of America's pre-war air preparation, however, perhaps they were right always to have kept their naval air arm independent because the US Navy entered the war with an efficient, effective carrier force – and American naval aircraft were certainly superior to those which the

Royal Navy had to put up with until they too began to receive American aeroplanes.

Johns. I would agree entirely with that comment. The record of the United States Navy's operations throughout the Second World War is absolutely staggering and there is no doubt that the great naval battles that followed Pearl Harbour, like Midway, Coral Sea and Leyte Gulf, were the foundation stones of ultimate victory in the Far East.

In that context, I would suggest that, in a strategic sense, we in this country lack a proper understanding of 'distance'; the sheer scale of the war in the Pacific involved distances that the European mind cannot easily grasp. Its ability to think on this sort of scale was a great strength in the US Navy's strategic planning between the wars. Despite some remarkable successes, the hounding of the *Bismarck,* the epic of Taranto and so on, our Fleet Air Arm certainly went into action with aeroplanes that couldn't really cut the operational mustard. Furthermore, the ships that they flew off were not really fleet carriers; our ships were intended primarily for operations in the Mediterranean and North Atlantic. I have no difficulty at all in accepting your observation, but perhaps our professional historians are going to shoot me down.

Miller. No, not at all. I entirely agree with what you have said. There is, however, a big 'what if?' embedded within all of this. The basis of the American Navy's pre-war planning had envisaged that it would sail off towards Japan with all of its battleships and confront the Japanese Fleet in a huge surface action – our version of Jutland. Unfortunately, the Japanese forestalled that by sinking the battleships lined up at Pearl Harbour. Once the battleships had gone, all we had left was a small force of carriers, so, rather than having planned for it, we were actually forced to adopt carrier warfare as the basis of Pacific operations from the outset. As it happened, that was the right thing to do and it is, of course, to the great credit of the US Navy that we already had the necessary carriers, and carriers with the necessary range.

Probert. I actually introduced that point in the hope of prompting some discussion! – specifically, perhaps from the American side. Rather to my surprise, when I spoke at Bolling (and we did have a long discussion period), nobody from that largely air force audience

rose to the bait. They simply seemed to accept the point that I was making. There is a lot more work that could be done to assess the relative merits of land-based and sea-based air power to establish whether we have actually got it right. We seem rather to have avoided that question, however, so it is, I think, still an open one.

Dr Daniel Mortensen. I think one of the real problems in military historiography is the lack of cross-Service awareness: airmen know air history; soldiers know ground history; sailors know naval history – but nobody seems to be able to put it all together. I can think of only one or two professional historians in the United States who can put together a 'combined' or 'joint' campaign history. The same is true over here, even though some of the excellent WW II official histories that you produced – like Playfair on the Mediterranean – did try to address the activities of all three Services, the results are still not fully integrated. The story is still compartmentalised, although less so than our American efforts, because we wrote completely separate volumes! I suppose that it is simply difficult for us to go there – for an airman to really understand the navy. After all, it has taken me a lifetime to try to learn how the air works and, because I have always been interested in tactics, I also know a little about the ground as well. But it is very difficult to have a firm grasp on everything, which is, perhaps why a USAF audience was reluctant to take issue with Henry's point about the Navy.

THE THOR IRBM

Dr Jacob Neufeld

Jack Neufeld has been working in the field of aviation history, in a variety of appointments mostly at Bolling AFB and/or the Pentagon since 1970. His present assignment is as the Senior Historian and Chief of the Special Projects and Production Division within the Air Force History Support Office and, at the same time, he is Editor-in-Chief of Air Power History*, the award winning journal of our sister organisation, the Air Force Historical Foundation.*

In this paper, I shall explore two basic questions:

1 Why did the United Kingdom agree to accept American Thor missiles on its soil?

2 Why were the missiles removed?

Background

The United States Air Force missile development programme began after WW II, with a broad – albeit ambitious but under-funded – programme. Because aircraft enjoyed greater priority, the missiles were 'on again, off again' until after the end of the Korean War and the advent of the Eisenhower administration. Other factors that brought missiles to the forefront were the intensification of the Cold War – due primarily to thermonuclear breakthroughs by both the US and USSR – and, of course, the outbreak of the Korean War had loosened defence spending.

The American military Research and Development community at this time was blessed with extraordinarily able managers, technical experts and scientists. For example, the Air Force had Trevor Gardner and General Bernard Schriever; the Army was represented by General John Medaris and Dr Wernher von Braun; and the Navy had Admirals William Raborn and Hyman Rickover.[1]

Since this paper deals mainly with the Air Force's Thor intermediate-range ballistic missile (IRBM), and because I represent

the Office of Air Force History, you may detect a 'slight tinge' of the colour blue in this presentation.

Because there is not sufficient time to recount the full story of the American ballistic missiles, I shall summarise it. Briefly, the modern programme began after WW II, but was launched in earnest with the advent of the Eisenhower administration in 1953. As the administration sought to economise, Secretary of Defense Charles Wilson, assigned a thorough review of missile programmes to Air Force Secretary Harold Talbott, who, in turn, delegated the task to his assistant for R&D, Trevor Gardner. The latter handpicked a group of scientists and aircraft industry leaders to make recommendations regarding the future direction of the dormant missiles programme. Dr John von Neumann, a renowned mathematician headed this strategic missiles evaluation committee, known informally as the Teapot Committee. In February 1954, the committee concluded that the Soviet threat was so grave that the United States was compelled to embark on a crash development programme to build an intercontinental ballistic missile (ICBM). Moreover, the Teapot Committee predicted that the job could be done within six years, but only if an appropriate agency was granted the requisite authority to carry out its mission.

Trevor Gardner appointed the newly-promoted Brigadier General Bernard A Schriever to head the Air Force's Western Development Division, to be located in Los Angeles, California, where they would build the Atlas ICBM. Subsequently, Schriever added a 'family' of missiles, including the Titan and Minuteman ICBMs, the Thor IRBM, and a space satellite programme. Unfortunately, there is not sufficient time today to cover the history of the Western Development Division (WDD).[2]

The Thor IRBM story gained momentum with the issuance of the Killian Committee report in February 1955. A major recommendation of the Killian Committee was that the Eisenhower administration should fill the existing strategic gap, until the ICBMs became operational, by speeding development of an IRBM of 1,500 nm range by using ICBM components. According to this strategy, the IRBM would be the first to enter service and, if necessary, be able to retaliate.[3]

Aided by US Senators Henry Jackson and Clinton Anderson,

Length	64 ft 10 in
Diameter	8 ft
Engine	Rocketdyne liquid-propellant engine
Thrust	150,000 lbs
Cost	$660,000
Speed	10,250 mph/8,907 kts
Range	1,725 st miles/1,500 nm
Altitude	390 st miles/339 nm

Thor Specification.

Trevor Gardner, urged the President to declare missile development the top national priority. They succeeded. Indeed, during autumn 1955, Soviet IRBM tests had obliged President Eisenhower to order the acceleration of the Atlas ICBM and to authorise a go-ahead on the two-stage Titan ICBM. The seriousness of the decision was demonstrated by the President's requirement that the Air Force provide him with monthly progress updates.

In December 1955, the Air Force signed a contract with Douglas Aircraft for the IRBM, to produce 120 Thor missiles by July 1959. The WDD would develop the missiles, and train and equip the units, while the Strategic Air Command (SAC) would deploy and operate them.

Meanwhile, the United States armed forces were engaged in their own particular brand of arms race – also known as 'inter service rivalry' or the 'roles and missions contest' – whose object it was to win exclusive rights to operate the missiles.

The United States Army had its own programme underway. Led by Maj Gen John B Medaris, the Wernher von Braun team developed the Jupiter IRBM, a successor to the Redstone missile. For a time, the United States Navy was a partner with the Army, and planned to operate the liquid-fuelled Jupiter from surface ships! (Fortunately, cooler heads prevailed and the Navy subsequently turned to the solid-propellant Polaris IRBM.)

Both the Thor and Jupiter IRBMs were regarded as interim weapons, intended to fill the brief period before ICBMs could be produced in quantity.[4]

The Air Force's Thor IRBM development proceeded very rapidly,

with the first production model ready in October 1956. Within three- -and-a-half years the Thor achieved Initial Operational Capability. A remarkable feat.

Faced with deciding which of the two IRBMs would continue to undergo development – the Air Force's Thor or the Army's Jupiter – Defense Secretary Charles Wilson, in November, chose to produce both missiles. However, he assigned the operation of the Jupiter IRBM to the US Air Force. In part, the decision to build Jupiter was based on the unrealistic assumption that America's European allies were eager and willing to deploy strategic missiles on their soil.

The Suez Crisis

In the autumn of 1956, Great Britain, France and Israel responded to the nationalisation of the Suez Canal by attacking Egypt. This act ultimately produced an international crisis that led President Eisenhower to demand that the allies withdraw. Needless to add, the Suez adventure soured relations between the United States and its allies.

Curiously, at about that same time the US and Great Britain held initial discussions about IRBMs. In January 1957, at a meeting in Washington, DC, the US broached the idea of establishing Thor bases in the United Kingdom. Defence Minister Duncan Sandys met with his American counterpart, Secretary Wilson, to seek American aid in ballistic rocketry.[5] Specifically, Great Britain's IRBM programme, the BLUE STREAK,[6] had encountered technical difficulties.

Another factor motivating the IRBM discussions was the desire of both the United States and Great Britain to mend fences after the Suez Canal debacle. And, undoubtedly, British and American strategic fears about Soviet advances in rocketry and nuclear weapons played a part.

Several published sources suggest that President Eisenhower was anxious to 'patch up the quarrel.'[7] Evidence for this appears in two letters. One letter from President Eisenhower to Prime Minister Harold Macmillan states it directly. In the second letter, Eisenhower replied favourably to a missive he had received from Winston Churchill, urging that good relations be restored.[8]

Other scholars assert that the 'Thor emerged as a useful vehicle for repairing the special relationship.'[9] Harold Macmillan said that the Thors represented 'proof of the restored relationship' but at the same

time he also claimed that the agreement was advantageous to Britain. (Since it is unlikely that Macmillan would admit the arrangement was made primarily to improve relations, it is difficult to know whether this was true.)[10]

High-level discussions, between Eisenhower and Macmillan, followed in February-March at the Bermuda Conference, where they issued a joint statement announcing the decision to deploy sixty Thors to Britain.

Not all Britons supported the arrangement. Indeed, parliamentary and public protests were staged arguing against accepting the IRBMs on technical, political or pacifist grounds.[11] Nonetheless, although some Conservative party members voted with the opposition, the House of Commons voted 289-251 in favour of the Thor deployment

The Soviets' launch of Sputnik on 4 October 1957, electrified public opinion all around the globe. In another sense, however, it was 'good medicine' for the American missile programme in that it liberated funding and ensured that both the Thor and Jupiter would be produced.[12]

At the 16 December 1957 NATO summit conference, the US formally offered to deploy its IRBMs to Europe. The Americans were stunned by the Europeans' frosty response, which came, in part, because the US had insisted on retaining control of these missiles. France's Charles de Gaulle, for example, lost no time in rejecting the American offer. In general, the Europeans' reactions reinforced the position of those American factions who favoured deploying US-based and controlled ICBMs over placing IRBMs on foreign soil.[13] Only the United Kingdom, Italy and Turkey accepted, with Italy fielding thirty Jupiters; Turkey took fifteen.

Another interesting twist was that while some of the Europeans had aspired to share in the technical fallout, the US groups who advocated dependence only on American-based ICBMs frustrated their plans. Even Great Britain's participation with the Thors was as a passive recipient – not as an active partner in the missile's development. Moreover, while some European nations acknowledged the superiority of American technology in ballistic missiles, they also highlighted the apparent disadvantages of liquid-fuelled, slow reacting, unprotected, immobile and indiscriminately destructive IRBMs.

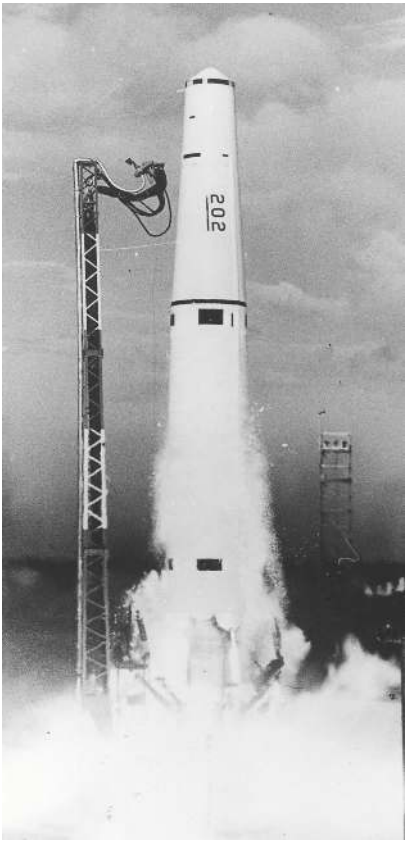
A Thor arriving at Hemswell via a C-133 Cargomaster.

Thors Deployed to the UK

The American-British deployment agreement, signed in February 1958, called for the United States to provide the missiles and training. The Royal Air Force was to furnish the bases and crews. The Third Air Force would assist with the construction of the missile sites and deliver the Thors. Targeting would be performed jointly by SAC and the RAF's Bomber Command. The force consisted of sixty Thors, apportioned among twenty re-formed RAF squadrons, with each assigned three missiles.

On 20 February SAC activated its 705th Strategic Missile Wing (SMW) at RAF Lakenheath. It later moved to South Ruislip with 7th Air Division. SAC retained control over the Thor's nuclear warheads. It assigned a detachment to: maintain and control re-entry vehicles and warheads; receive and initiate American warhead release orders; operate US Air Force communication facilities; and train RAF crews.

In July 1957, the US Air Force activated the 704th SMW to train British missile crews at Cooke Air Force Base (AFB), California, (in October 1958 it was renamed Vandenberg AFB). RAF crews also trained at Douglas's school at Tucson, Arizona.



An RAF Thor about to fly from Vandenberg AFB.

The deployment plan called for establishing four bases, with five complexes of three missiles at each. Each base had a staff of about 1,000 officers and men commanded by a group captain assisted by three wing commanders. HQ Bomber Command exercised operational control of the Thors, while SAC's 7th Air Division retained custody of the warheads. Both the RAF and USAF had to agree to 'reciprocal physical control based on a dual key system' launching the missiles; either side could veto a launch. While an American veto could be overridden, it was inconceivable that a British veto could be overridden.

On 19 September 1958, the first Thor was flown in aboard a C-124 Globemaster and delivered to No 77 Sqn. The next group came nearly a year later, on 22 July 1959. SAC's 1st Missile Division crew launched the first successful Thor on 16 December 1958.

On 16 April 1959, a crew from No 98 Sqn launched the RAF's first Thor. The crew consisted of a Launch Control Officer (usually a flight lieutenant), two ground crew technicians and an American Authentication Officer – a captain. The following month, five more RAF units became operational.

Despite the secrecy surrounding the location of the Thors, townspeople realised that the missile sites, running from Yorkshire to Suffolk, represented NATO's frontline nuclear arsenal. Launch orders would come from High Wycombe, where HQs 7th Air Division and

RAF THOR DEPLOYMENT

Unit	Station	Sqn Formed	SAC Turnover	SAC Inactivated	Sqn Disbanded
Driffield Complex					
No 98 Sqn	Driffield	1 Aug 59	22 Dec 59	Apr 63	18 Apr 63
No 150 Sqn	Carnaby	1 Aug 59	22 Dec 59	Apr 63	9 Apr 63
No 226 Sqn	Catfoss	1 Aug 59	22 Dec 59	Apr 63	9 Mar 63
No 102 Sqn	Full Sutton	1 Aug 59	22 Dec 59	Apr 63	27 Apr 63
No 240 Sqn	Breighton	1 Aug 59	22 Dec 59	Apr 63	8 Jan 63
Hemswell Complex					
No 97 Sqn	Hemswell	1 Dec 58	11 Sep 59	15 May 63	24 May 63
No 269 Sqn	Caistor	22 Jul 59	11 Sep 59	15 May 63	24 May 63
No 104 Sqn	Ludford Magna	22 Jul 59	11 Sep 59	15 May 63	24 May 63
No 106 Sqn	Bardney	22 Jul 59	11 Sep 59	15 May 63	24 May 63
No 142 Sqn	Coleby Grange	22 Jul 59	11 Sep 59	15 May 63	24 May 63
North Luffenham Complex					
No 144 Sqn	North Luffenham	1 Dec 59	29 Apr 60	Sep 63	23 Aug 63
No 223 Sqn	Folkingham	1 Dec 59	29 Apr 60	Sep 63	23 Aug 63
No 254 Sqn	Melton Mowbray	1 Dec 59	29 Apr 60	Sep 63	23 Aug 63
No 218 Sqn	Harrington	1 Dec 59	29 Apr 60	Sep 63	23 Aug 63
No 130 Sqn	Polebrook	1 Dec 59	29 Apr 60	Sep 63	23 Aug 63
Feltwell Complex					
No 77 Sqn	Feltwell	1 Sep 58	22 Jun 59	1 Jul 63	10 Jul 63
No 113 Sqn	Mepal	22 Jul 59	22 Jun 59	1 Jul 63	10 Jul 63
No 220 Sqn	North Pickenham	22 Jul 59	22 Jun 59	1 Jul 63	10 Jul 63
No 107 Sqn	Tuddenham	22 Jul 59	22 Jun 59	1 Jul 63	10 Jul 63
No 82 Sqn	Shepherds Grove	22 Jul 59	22 Jun 59	1 Jul 63	10 Jul 63

Note. There is clearly some inconsistency here between the tabulated dates of the RAF's 'Formations' and 'Disbandments' and the corresponding USAF 'Turnovers' and 'Inactivations'. The British terms are, I think, self-explanatory; they are the dates promulgated in the SD155 (or were when the Ministry still used to pay attention to such niceties) which define the period during which each unit was recognised as having a formal existence. The first American term appears to have no official definition; the second means 'to withdraw all SAC personnel' (and, presumably, the nuclear warheads). In the absence of definitive data, that which appears here is the best available. **Ed**

Bomber Command were located. To launch the Thors required a 'dual key system,' in which the RAF could initiate a countdown but could not execute the launch before a USAF officer armed the warhead.

Withdrawing the Thors

Although the US had planned to remove the Thors in November 1964, the initiative for the withdrawal came from the British. Perhaps the missiles had served their purpose, or the enterprise may have proven too costly. At any rate, in August 1962, Britain's Defence Secretary, Peter Thorneycroft, announced to Parliament that the Thors would be phased out by end of 1963.

Not long after, in October 1962, the Cuban Missile Crisis erupted, when it was learned that the Soviets had installed long-range ballistic missiles in Cuba – an island which is, at one point, within 90 miles of the United States. The crisis marked one of the most dangerous episodes of the Cold War; it came at the time the United States and Soviet Union were on the brink of nuclear holocaust. The crisis ended suddenly, after the Americans threatened to retaliate against the USSR unless the Soviets agreed to withdraw their missiles from Cuba.

Many scholars believe that the resolution of the Cuban Missile Crisis came about due to a *quid pro quo*. Thus, in return for the Soviet withdrawal of their missiles from Cuba, the US would withdraw its Jupiter and Thor missiles from Europe. This is a plausible scenario inasmuch as the Soviets had been preoccupied with keeping watch on the Turkey-based Jupiter IRBMs, while acting unconcerned about the Thors. The crisis produced an unwritten understanding for a *quid pro quo*, provided that the US pulled out its missiles from Turkey and that the Soviets would not discuss it publicly.

The Soviets never even mentioned removing the British-based Thors. In fact, when Macmillan had broached the subject of offering to remove the missiles voluntarily, President Kennedy dismissed the idea out of hand.[14] Years later, commenting on the question of the Thors, General Curtis LeMay said that if there was a *quid pro quo*, he had been unaware of it.[15]

The decision to withdraw the Jupiters from Turkey having been taken, the United States subsequently announced that it would discontinue logistics support for Thor after 31 October 1964. Thereafter, Thors from the UK were sent to Johnston Island in the

Pacific to serve as anti-satellite weapons or handed over to NASA who used them as 'workhorse' space boosters.

Perhaps more significantly, during October 1962 the United States had brought a flight of ten solid-fuelled Minuteman ICBMs to operational alert status, thereby obviating the need for the European-based IRBMs altogether.

On 24 January 1963, President Kennedy confirmed reports that the Jupiter missiles would be phased out of Italy and Turkey. The last fifteen Thors were declared non-operational in August 1963 and the entire Thor force was phased out by year's end.

Postscript

The Thor deployment began merely as an interim measure, scheduled to terminate in November 1964, but it ended nearly a year earlier, by which time the Atlas ICBM was available to the US Air Force and the RAF had completed the deployment of its V-Force of Valiant, Victor and Vulcan bombers.

In retrospect, Thor had provided limited benefit as a retaliatory weapon for one reason – that the requirement for joint control made it unlikely to be used as a first strike weapon. Former Secretary of State Henry Kissinger labelled the Thor 'an added advantage rather than a military necessity.' That is, it 'might have' deterred an attack.[16] Another technical factor, was that Thor's reaction time varied widely – from 15 minutes to 57 hours. Not until May 1960 was a configuration decision made to co-ordinate the missile warheads in line with Britain's V-Force.

Looking further down the balance sheet, the deployment of Thor may have contributed to the Soviet decision to site IRBMs in Cuba – their SS-7 ICBM was having problems (unknown to the West) which had left the USSR vulnerable. On the other hand, the deployment of the Thors did succeed in restoring the close American-British relationship and it marked a new era in Western deterrence.

Finally, I mentioned that when the Thors were returned to the US they were employed as anti-satellite missiles. SAC's last Thor was launched on 8 February 1967. In March, SAC transferred its remaining Thor boosters to Air Defense Command. When the USAF created its Aerospace Defense Command on 1 November 1979, SAC re-acquired the Thors. On 4 September 1981 SAC transferred the last

modified Thor from Vandenberg AFB to storage at Norton AFB, California.

Notes:

[1] Michael H Armacost, *The Politics of Weapons Innovation: The Thor-Jupiter Controversy* (New York: Columbia University Press, 1969), pp270-71.

[2] The history of the Western Development Division is recounted in Jacob Neufeld, *The Development of Ballistic Missiles in the United States Air Force, 1946-1960,* (Washington, DC: Office of Air Force History, 1990).

[3] Bernard C Nalty, Editor, *Winged Shield, Winged Sword: A history of the United States Air Force, Vol II, 1950-1997*, (Washington, DC: Air Force History and Museums Program, 1997), p85.

[4] Armacost, p262ff.

[5] Armacost, p191.

[6] Britain's BLUE STREAK was a long-range (2,500 nm), liquid-fuelled, single-stage, silo-based surface-to-surface missile. Subsystem contractors included de Havilland (airframe), Sperry Gyroscope (guidance) and Rolls-Royce – licensed from North American Rocketdyne (engines). Static test facilities were built at Spadeadam in Cumbria; flight testing was undertaken at Woomera, Australia. The BLUE STREAK was cancelled in April 1960, in favour of the air-launched Skybolt. The official explanation was for 'cost and vulnerability considerations.'

[7] Anthony Sampson, *Macmillan: A Study in Ambiguity*, (New York: Simon and Schuster, 1967), p123.

[8] Harold Macmillan, *Riding the Storm,* (New York: Harper and Row, 1971), p176.

[9] Stephen Twigge and Len Scott, *'The Other Other Missile of October: The Thor IRBMs and the Cuban Missile Crisis'; Electronic Journal of International History*, p2. (Internet. http://www.historry.ac.uk/journal/arts/htur 15 Aug 03/10:30am)

[10] Macmillan, pp245-46.

[11] Armacost, p195.

[12] Armacost, p180ff.

[13] Nalty, pp136-37.

[14] Ernest R May and Philip D Zelikow, Editors.,*The Kennedy Tapes: Inside the White House during the Cuban Missile Crisis*, (Cambridge, Mass: Harvard University Press, 1997).

[15] Curtis E LeMay and Dale O Smith, *America is in Danger*, (New York: Funk and Wagnells, 1968), p140.

[16] Armacost, p207.

RAF-USAF AIR POWER IN GERMANY DURING THE COLD WAR

AVM Stuart Peach

Stuart Peach joined the RAF via Sheffield University in 1977. His 4,500 hours of flying time includes a tour on Canberras and three on strike/attack Tornados, the last as OC IX Sqn. More recently he has been Director Defence Studies (RAF), Director UK Defence Electronic Warfare Centre and Assistant Chief of Staff (Intelligence) at Strike Command. He was an active participant in 'coalition warfare' at one-star level between 1999 and 2002 and is currently Director General Intelligence Collection.

Introduction

There are many myths about the Cold War. One enduring idea that has become accepted wisdom amongst air power historians is that the contemporary – and unparalleled – intimacy between the Royal Air Force and the United States Air Force is a direct result of the shared experience in the air power European front line of the Cold War: West Germany. This myth has it that it was the common tactics and common beliefs of the RAF and USAF, which that led to a shared view of a 'way' in air warfare. In turn, this dominated the tactical development (and equipment) of other European air forces. This tactical paradigm has subsequently shaped and dominated air warfare developments since the Cold War in several 'hot' air operations in the Gulf War of 1991, the Balkans, Afghanistan and Iraq in 2003. This short comparative study will examine this view in order to offer the hypothesis that the shared experience of the two air forces during the Cold War was really divergent. The consequence of that divergence remains with us. The focus is on the Royal Air Force and the United States Air Force. The place is West Germany: the front line of the Cold War from 1945 to 1990.

The Post War Dilemma

The behaviour of the two most powerful tactical air forces of the

Cold War was conditioned and shaped by the growing pains of their experience during the Second World War. In 1939, the two air forces could not have been more different. The Royal Air Force had celebrated in April 1939 its 21st birthday as an independent Service. It had come of age. Since the end of the First World War, under the leadership of Trenchard, the Salmond brothers and Newall, the apprentice schools and cadet colleges had turned out a generation of technically aware and confident young pilots, observers and engineers. Many had been tested by small scale, but often violent, air operations scattered around the British Empire. In addition, the growing uncertainty of the strategic situation of the 1930s had led to a rapid expansion of the auxiliary and reserve squadrons whilst retaining the essential ethos of Trenchard's Service: to fly and to fight. Technically aware, confident in themselves and their equipment, despite the wide variety of social background inside the officer and pilot corps of the RAF, they believed they were the leading if not the largest air force in the world. In the United States Army Air Force of 1939 on the other hand, the ghost of Billy Mitchell and the dominating influence of the air tactical school and college at Maxwell Field, Alabama did not proffer the same freedom of action and independent spirit. When the Second World War broke out, following first contact with the *Luftwaffe*, even if the RAF hierarchy was sticking rigidly to doctrine as 'that which is taught', the 'young turks' of the RAF knew that they would have to throw their doctrine manuals away in order to make any progress either in offensive or defensive air operations. This happened as early as 1939.

In the USA on the other hand, the 'gurus' at Maxwell had studied the performance of the *Luftwaffe* in the Spanish Civil War and drawn evidence to support their core doctrine of the primacy of the unescorted, heavily armed bomber. They were confident it would be a bomber war. The six years of total war between 1939 and 1945 were to prove both theories and all associated doctrines completely wrong. As the celebrations of May 1945 faded, the respective commanders of the RAF and USAAF reflected on how much the situation had changed. In so many ways, air power and air warfare were on the map. No army or navy commander would commit forces without the required and defined degree of air superiority. New air bases glistening with concrete runways, dotted the globe. The dropping by

the United States Army Air Force of the two atomic weapons on Japan in 1945 confirmed the primacy of the 'new' arm in the strategic sense, guaranteeing independence. At the operational level, air power had come of age – especially from 1943 onwards – delivering a decisive effect across all Theatres, within all roles and missions. Air Power had operated as the supported element during the Combined Bomber Offensive taking the war to Germany, whilst the armies and navies readied themselves for combined operations. At the operational level, air forces had played a no less valuable supporting role in tactical air/land operations, which had set the conditions for the unconditional surrender of the German Armed Forces. On the surface, the relationship between the RAF and the USAAF was closer than any coalition parallel in the history of warfare. But, when we examine this legacy in a little more detail, the cracks in the relationship were starting to show.

The Baggage of 1945

As Robin Niellands in his recent book 'The Bomber War" has clearly demonstrated, there were divergent views on how to 'bomb to win'. Some commanders went to print with their censored and sanitised version of events as early as 1947. Often because they needed the money. The bureaucracies extended the veil of wartime secrecy into peacetime, especially as the Cold War became a reality. This unfortunate, if inevitable, restriction prevented early debate based on true extracts from the archives. But, from the early 1960s, the official histories appeared and clearly demonstrated US/UK friction on air policy, doctrine, tactics, targeting and – especially – command and control. There were two separate elements at work. The first element was to exert maximum influence over air strategy. This affected policy (and therefore doctrine) and command and control arrangements. The pendulum in this crucial relationship between the two air forces had swung from the RAF as the dominant influence (where it had rested since 1918), towards the USAAF (never to swing back) in the Western Desert of North Africa in early 1943. The second element was that, as the war continued, the USAAF quest for full and final independence from the clutches of the United States Army became a complicating rather than a complimenting factor in the relationship.

Henry Probert's recent biography of Harris does not shy from explanation of the impact of Anglo-American friction from 1944 into 1945. The debate over bombing strategy highlighted the echoes of earlier influences: US searching for panacea target sets which would bring the enemy to its knees, the RAF adopting a more pragmatic attritional approach. Following victory, the friction over what Allied bombing had or had not achieved deepened. The USAAF was very quick off the mark to instigate what was to become an enormous effort: the American Strategic Bombing Survey. This fitted the USAAF's main effort: to gather overwhelming evidence on the effect of strategic bombing in order to accelerate the creation of a separate USAF and justify the resources in blood and treasure which had been expended. British efforts were much more cautious. As Noble Frankland has demonstrated in his autobiography, *History at War*, the issue of the devastation wrought by Bomber Command of the RAF in the name of total war against Germany became a political and sensitive issue. And so it has remained.

Cold War Realities

Viewed from the vantage point of the windswept airfields of occupied Germany in 1945, the effect of unrestricted bombing on the infrastructure and people of Germany and the elements already located in the Soviet sphere of influence was having a profound (and long lasting) impact on the young servicemen within the occupying forces. Many surveyed the devastation with horror and disbelief. Many, both from the RAF and USAAF, were based well forward in occupied Germany near to where the war had reached its culminating point. They just wanted to go home. As the summer of 1945 and the euphoria of victory faded a long, hard winter lay ahead. The USAAF were much the quicker to demobilise. With customary efficiency US forces went home leaving enormous quantities of materiel in Germany. The RAF, for many structural and financial reasons, was much slower to demobilise. In fact during the bitter German winter of 1945/46, conditions for many of the RAF personnel, aircrew and support alike, serving on remote, bleak, former Nazi air bases were little better than for those of the people they were supposed to protect. Indeed, after questions in the British Parliament, extra rations were flown to the beleaguered forces. Many were asking why they were

still there anyway. Own forces morale became a crucial issue for commanders. There was even talk of mutiny. Alarmed, UK authorities speeded up demobilisation, improved the rations and relaxed over-rigid 'no-contact' rules.

Many history books understandably stop at the ceasefire or surrender. In fact the command tasks for commanders changed from warfighting, to what would now be called complex operations. Some were no less dangerous. For example, Air Marshal Sir Philip Wigglesworth was given the complex, challenging and difficult task of supervising the disbandment of the *Luftwaffe*. The proud title Second Tactical Air Force (2TAF) disappeared into the eponymous British Air Force of Occupation (BAFO). In the US zone of occupation, tactical assets were in short supply as the numbers of aircraft based forward in Germany dropped dramatically. During 1946, however, the strategic situation changed again. Churchill's misgivings and policy concerns over Soviet intent at Yalta cut little ice with a jubilant Stalin. Stalin's remorseless and relentless exhortations to his commanders and forces in the closing weeks of the war in Europe contrasted sharply with the priorities of Britain and the USA. Stalin, as Churchill had warned, occupied the strategic high ground. Possession of the moral high ground made little difference. In many ways, the Potsdam Conference of July 1945, represented a damage limitation exercise rather than a sharing of the spoils. Churchill fumed once again. Out of office, his polemic warnings against communism culminated in his famous 'iron curtain' speech at Fulton, Missouri in 1947. But, if all this politics seemed a long way from the airman of the USAAF and RAF who remained in occupied Germany, they could see the reality of it in the air. The few remaining forward-based air forces – responsible for the sovereign airspace of Germany – flew daily combat air patrols along and around zone boundaries. They were increasingly met and 'escorted' by Soviet air patrols. The risk of miscalculation was high. The Cold War was becoming real before Churchill invented the term.

By January 1946, BAFO had shrunk to ten squadrons, down from a strength of eighty only six months earlier. Those remaining were not a happy bunch. Even the Commander-in-Chief was unhappy. In his autobiography, Sholto Douglas explains his bizarre take over from Montgomery as Commander-in-Chief of the British Sector. Monty

refused him a handover and disappeared to the UK with a number of key staff and documents, not to mention continuing to write to Prime Minister Attlee on policy issues affecting Douglas's command in Germany. Douglas' personal morale was so bad that he wrote to Tedder asking to be relieved of his command. The request was refused and Douglas was persuaded by Attlee to stay on. Challenges exceeded the resources available. In the US section, there were similar difficulties. The small US forward-deployed element faced difficulties in force posture, readiness and force ratios compared to the Soviet Air Force. Tension increased. At the strategic level, the wartime unity of effort had disappeared; the glacis plate of Soviet influence crept across Eastern Europe; international relations dominated the headlines. As the Marshall Plan started to take shape and the desperate plight of the German people and the millions of refugees displaced by the war started to gain strident media attention, the flashpoint was Berlin.

In April 1948, the Soviet authorities closed all land and road access to the British, French and US sectors inside Berlin. Stalin was very confident that the Allies were so weak, that they would not possibly risk war. The Cold War looked set to become a hot one. The RAF thought of a tactical solution that was to achieve a strategic effect. The British believed that Berlin could be re-supplied by air in order to allow the diplomatic line of operations time to work. Given the severe resource constraints, the US authorities, particularly General Lucius Clay were cool to the idea. As ever, airmen at the tactical level proved to be more than up to the challenge. By May 1949 more than 3½ million tons of essential supplies had been delivered by the 'raisin bombers'. This was the definitive use of tactical air power to achieve a strategic effect through the mission of air mobility. Moreover, the RAF and the USAF were joined at the hip in terms of combined air operations. There were no differences in *modus operandi*. It was also the first operational 'outing' for the newly independent USAF. Tactics, techniques and procedures were virtually identical. Airlift had proved again to be a critical role for air power and the RAF/USAF links in air mobility operations have stayed close ever since.

The political/strategic effect of the Berlin airlift was to accelerate the moves – by highlighting the realities of Soviet intent – to bind the nations of Western Europe into a treaty-based common cause against the design of the Soviet Union. The North Atlantic Treaty

Organisation was born at the Washington Summit in May 1949. Now, the tactical air forces of both nations – based in Germany – could unite in common cause, once more. Force levels grew quite quickly. World War Two vintage aircraft types started to be replaced by jets offered to NATO air forces on very generous terms by the US in order to match growing Soviet strength. As the build-up continued, it was a flashpoint in another divided country that caused the first hot air war of the Cold War – Korea. In addition to the diversion of forces from Germany to Korea, conflict in Korea was to have an inevitable and profound effect on NATO, and thus RAF and USAF, procurement strategies, operational doctrine, tactics, techniques and procedures.

Strategic bomber, jet fighter and fighter-bomber developments were all speeded up, although conventional air-to-ground weapon development lagged that of nuclear weapons and air-to-air and surface-to-air missiles. It was a question of research and development (R&D) capacity. Given the structural weakness in the UK economy, the amount of national treasure devoted to military R&D in the mid-1950s was extraordinary. The V-Bombers, Hunter, Swift, Javelin, Lightning, Buccaneer were all born from this post-Korea war spurt. Moreover, the rapid advance of Chinese and North Korean forces across the Korean peninsula required a rethink on forward basing of scarce and vulnerable tactical air forces in Germany. In both the British and US zones a veritable redoubt *á la* Maginot Line of fighter and fighter-bomber bases was created along the Rhine. Force levels and readiness ebbed and flowed throughout the 1950s and early 1960s. NATO summits invariably led to declarations of unity of purpose and common cause in meeting NATO force goals. The reality was always different and much lower. The UK settled on a baseline force structure of ten tactical squadrons. This was sold to NATO given the UK's major commitment to NATO's tripwire strategy in the shape of three different types of V-Bombers based in the UK and the massively expensive US airborne deterrent with bombers, nuclear weapons, air-to-air refuelling tankers, command and control networks, bunkers and so on. The military paraphernalia of the rather aptly named strategy of 'mutually assured destruction' (MAD) covered the globe.

Down at the operational level, command and control of tactical air forces settled into the familiar tactical air force structure, this time across the whole of Europe. Air marshals and generals were

comfortable with the model; it fitted the strategy of forward defence which required detailed and integrated air/land battle plans in order to maximise the force multiplier/concentration effect of air power in the event of a Soviet invasion. In West Germany, the front line, the British held command of the Second Allied Tactical Air Force at Rheindahlen. Force elements were drawn from the UK, Belgium, Netherlands, France (until 1966) and (from 1955) Germany. The US commanded the Fourth Allied Tactical Air Force based in Southern Germany with US, Canadian, French (until 1966) and German elements. Tactics between the two groupings during the 1950s were broadly similar: large Corps-level exercises held to hone tactical skills with air forces flying tactical reconnaissance, counter air, interdiction and close air support missions. Veterans of the First World War would have understood the mission if not the technology. Throughout this time, tactical relations between the RAF and the USAF were excellent. Both encouraged the NATO European air forces, by now largely equipped with British or American-supplied aircraft, to participate in competitions linked to exercises. Particular emphasis was given to air defence with the gradual creation of an integrated air defence network across West Germany. But, what of the putative enemy?

Intelligence assessments continued to paint a remorseless picture of growth in the Soviet threat and the relentless acquisition of western military technology through fair means or foul. In addition, captured German scientists were encouraged to redouble their efforts for new masters. German *wunder waffen* were developed orthogonally, building on key Soviet strengths for the mass production of guided weapons and the radars and command systems to go with them, especially missiles. Western efforts to quantify Soviet strengths went to even more elaborate lengths in terms of intelligence missions. Both RAF and USAF aircrew took dramatic risks to obtain photographic evidence, culminating in the shooting down of Gary Powers' U-2 in 1962. This tactical event was to have a profound strategic impact in that it accelerated the US military space reconnaissance programme and led the RAF to conclude that the balance of investment between defensive electronic warfare systems which would allow aircraft to continue to penetrate Soviet air defences at medium level altitudes had switched to low level tactics to avoid known defences. This, in turn,

put pressure on the military intelligence community to provide greater threat and performance definitions and so on. The airborne tactical measure, counter measure, counter-counter measure, paradigm was now to extend to new levels of sophistication. Unexpectedly, this development was to sow the first seeds of tactical dissension between the RAF and USAF.

The USAF adopted a different conclusion following the Powers' shoot-down and the Cuba crisis. The latent electrical capacity in their B-52 bombers permitted continued investment in electronic warfare equipment rather than the adoption of low level tactics. As the US became engaged in another Cold War 'hot' conflict in Vietnam, this tactical split was to grow. USAF, USN and USMC aircraft losses in Vietnam to Soviet-supplied, radar-directed anti-aircraft artillery fire (AAA) – also modelled on captured German technology – became a decisive point in US air operations. The solution (as was to become a norm) for the USAF was to throw resources at technology to solve a tactical question. In short order – and with impressive speed – anti-radiation missiles were fielded along with a new tactical concept, the 'Wild Weasel' aircraft to engage enemy surface-to-air weapon systems deliberately in order to 'out shoot' them. The counter-measure, counter-counter measure battle intensified. Israeli experience in the first Arab/Israeli conflict of 1967 added to the urgency. The Egyptian Air Force was wiped out in a few minutes, but as the conflict continued, so the Soviet-supplied SAMs shot back. Even though still a lightning campaign by comparison with WW II, the Six Day War became a war of attrition. NATO air planners also realised that lines of aircraft were extremely vulnerable even if the base was well behind the front line, particularly given Soviet investment in accurate long-range counter-air operations. In consequence, the hardened aircraft shelter was born. With a shelf life of twenty years, they still litter the eastern bank of the Rhine Valley. The Rhine redoubt had regained its glacis plate. But not for long as the belated development of air-to-ground weapons designed to penetrate the shelters was to show in 1991.

Back in the mid-1960s, the RAF's tactical and strategic planners were in foment. The Royal Navy had taken hold of the nuclear deterrent with the submarine-launched Polaris and were unlikely to give it back. Skybolt, the last fully independent UK long range missile

programme had been scrapped, as had the TSR-2, (the Canberra/Vulcan replacement) and the British Government made it clear that, despite the Soviet threat, the RAF would have to live within its means rather than meet its aspirations. A depressing period followed. Various projects came and went. None became a technical or tactical reality. In the end the Buccaneer production line was re-opened to fill the tactical gap until the Tornado 'European' solution arrived. This background helps to explain how the RAF was forced to adapt tactics to meet technical and budgetary realities whilst maintaining its tactical credibility. The RAF concentrated on self-protection electronic warfare equipment and techniques, coupled with low level tactics designed to lower the enemy's percentage kill opportunity. The RAF honed this skill whilst the USAF honed their medium level 'way' in air war. By the 1980s, this tactical divergence between 2 and 4 ATAF was 'institutionalised' within NATO's Tactical Evaluation Exercises (TACEVAL) and Tactical Leadership Programme (TLP). TACEVALs began in the 1970s on the back of USAF Strategic Air Command Operational Readiness Inspections and were adapted to meet NATO requirements. The careers of Squadron and Base Commanders depended on their performance on these exercises. TLP began in 1980 and was standardised and checked by top quality tactical leaders drawn from across NATO. Despite, the lack of combat experience, NATO's tactical air preparation and training during this period was probably the most intensive in the history of air warfare. But the TACEVAL scores and TLP Certificates hid the growing divergence between the RAF and USAF.

This tactical issue was more than semantics. As the Cold War fizzled out, the RAF's and the USAF's 'ways' in air warfare were both to face a serious challenge in the Middle East. By the mid-1980s, the entire RAF tactical front line was optimised for the predicted low level dominated conflict with the ever-modernising Soviet Air Force. The Tornado (both variants), JP233 and Eurofighter represent this tactical legacy. In the 1991 Gulf War, human flexibility and ingenuity wore out. It was a combination of US and UK tactics which prevailed. The daring and determined British low level attacks employing the combination of Tornado and JP233 set the conditions to allow unrestricted USAF medium level operations. NATO integrated training paid off. TACEVALs and TLP ensured a common language

and a cadre of tactical leaders. In addition, NATO doctrine and procedures – especially for deconfliction and *unity* – (every post Cold War air commander's nightmare) were vindicated. Total air synergy through unified air effort was achieved.

Since the end of the Cold War, the USAF and the RAF have continued to serve as an integrated whole in the Middle East, the Balkans and Afghanistan. The degree of intimacy, understanding and interoperability which the modern generation of airmen take for granted was hard won. It still has echoes to the day in early 1943, over sixty years ago when the pendulum of big brother, little brother swung away from the RAF to the USAAF. The tactical differences, as much as the similarities, are an important – and understudied – area of air power history. All our recent operations offer lessons unique to their strategic context, operational setting and tactical situation, but they also offer a few constants and more than a little food for thought.

Consequences: myth or reality?

The contemporary integrated nature of UK/US air operations represents no cause for complacency. The survival of a distinct RAF 'way' in air war is crucial for both credibility and influence in a world where the four leading air forces are all from the USA. This way in war requires tactical commanders able to operate comfortably in a dual role – integrated within a USAF structure, yet with the strategic awareness and moral courage to influence both courses of action and mission analysis. Despite the friction picked over by recent historians between the USAAF and RAF in 1943-45, the central tenet remains: credibility was born of tactical prowess, operational strength aligned with national main effort but, above all, the strategic determination of inspired and impressive commanders.

As we enter an era, post-'9/11', of a revolution in strategic affairs, continual air operations are the one constant. Of course, the tempo will shift: persistent surveillance, patrol operations, constant mobility or traditional air fighting. Regardless, all generations of airmen need to study the past and grasp the present in order to understand the future. The co-history of the RAF and the USAF during the Cold War as brothers in arms provides a very useful pointer.

RAF-USAF CO-ORDINATION FOR COMMAND AND CONTROL IN THE 1990–91 PERSIAN GULF WAR

Dr Mark D Mandeles

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'*It has been facetiously said that war without allies is bad enough –- with allies it is hell!*' Sir John Slessor[1]

Introduction

When I first began thinking about the 1990-91 Persian Gulf War for this seminar, I was reminded of late Chinese premier Zhou En-Lai's reflection on the implications of the 1789 French Revolution: 'It's too soon to tell.' Certainly, we are living through some unanticipated implications of the first Persian Gulf War for relations between Western and Arab regimes. So, in the context of relations among regimes, it is probably too early to identify political implications of that war. Yet, we also are living through very rapid changes in the conduct of war – some driven by new technologies and some driven by organisational efforts to give senior military and civilian leaders more extensive control over the disposition and manoeuvre of forces. The first Persian Gulf War provides some examples of these implications – especially in the relations between the RAF and USAF. In this presentation, I will:

1. outline the problem of co-ordinating forces in modern war;

2. describe RAF-USAF co-operation and co-ordination in the Persian Gulf War;

3 examine the role of informal and *ad hoc* organisation in co-ordination, and

4. discuss the role of friendship and trust in coalition warfare.

Examining these factors will support my contention that friendship and 'good' personalities among senior leadership were an essential element in military success.[2]

The Problem

The conduct of modern war by Western nations, and in particular, by the US and UK, entails the interaction and co-ordination of a great number of people having diverse occupational specialities, bureaucratic interests and organisational perspectives. These people may work in various civilian policy and analytical offices, supporting defence agencies, military services, combatant command staff directorates, and the parallel military organisations of allied states and multi-national security organisations, such as NATO. Of course, this interaction and co-ordination of people and offices conducting combat is complicated by the watchful gaze of legislatures, senior political officials, international political institutions, non-governmental organisations,and the media. Indeed, in the aftermath of WW II, some prescient scholars predicted great difficulties in co-ordinating multi-national forces. In 1950, political scientist Charles S Ascher observed:

> 'During World War II our activities – already focused upon the unified purpose of winning the war – had to be co-ordinated with those of half a dozen principal allies. Neither the United States nor any other nation has yet solved the problems of co-ordinating its activities with those of sixty other nations through the organs of the United Nations and its specialised agencies.'[3]

The difficulties of co-ordinating multi-national forces have not diminished over the last fifty years. They may have increased. The conduct of modern war makes one wistful for the time when Clausewitz asserted:

> 'Everything in war is very simple, but the simplest thing is difficult. The difficulties accumulate and end by producing a kind of friction that is inconceivable unless one has experienced war . . . . Countless minor incidents – the kind you can never really foresee – combine to lower the general level of performance, so that one always falls short of the intended goal.'[4]

The Persian Gulf War air campaign is an especially interesting example of friction at work because of the extent to which friction – over time – was ameliorated by a redundancy of resources, munitions, aircraft and skilled aircrews. Friction was very much in evidence in the first forty-five days of the deployment, and uncertainty, confusion and anxiety were palpable over potential Iraqi military options.[5]

The military personnel brought together in Riyadh built a complicated organisational architecture to control large numbers of air sorties. Components of this *ad hoc* organisational architecture combined data from sensors, satellite communications and compartmented information. The overall architecture had so many linkages and pathways that naming them – let alone tracing all the connections – may be impossible. These largely informal connections and linkages were not represented on any official organisational chart. Air planners had constructed a detailed Air Tasking Order (ATO) for the initial attacks during a five-and-a-half month grace period created by Saddam Hussein's political efforts to split the coalition and to retain Kuwait. But building an ATO in the absence of real combat was very different from preparing a plan while fighting and evaluating incoming results, where imperfect and ambiguous information and uncertainty were the rule, not the exception.

Compounding the co-ordination problem in the volatile environment of DESERT STORM combat was the fact that those arriving in Riyadh had served in staff positions at a variety of commands, including NATO, Royal Air Force (and air forces of other NATO countries), Strategic Air Command (SAC), Tactical Air Command (TAC), US Air Force, Central Command (CENTAF), US Air Force, Europe (USAFE) and US Air Force, Pacific (PACAF). Each officer brought the somewhat unique experience, traditions and standard operating procedures from his particular command. At CENTAF, a key managerial task was to establish a common set of perspectives on the respective roles, duties, and responsibilities of officers staffing critical positions under the pressure of combat. In the end, uncertainties about the air campaign were ignored and the lack of co-ordination, eg between planners and the CENTAF intelligence office, was overcome by a massively redundant effort against all known Iraqi targets.[6] Friendly and respectful relations among planners and senior officers also helped ensure actions were co-ordinated

despite problems.

The *ad hoc* organisational arrangement and informal organisation compensated for the deficiencies of formal pre-war conceptions of organisational arrangements.[7] How did these *ad hoc* and informal organisations work? In asking this question, I'm guided by the methodology proposed by the British scholar, Viscount James Bryce, who, in 1888, published one of the first truly empirical analyses of American government. In *The American Commonwealth*, Bryce wrote, 'My object has been . . . to paint the institutions and people of America as they are. . . . I have striven to avoid the temptations of the deductive method.'[8] The first object is to 'paint' the command relationships as they are – to examine what happened rather than to posit the operation of unemotional and unstressed personnel working in the type of unitary, unambiguous, rational, focused, calculating organisations we imagine, but which never really exist.

The matter of friendship as an informal aspect of command and control doesn't seem to be a matter of widespread examination by analysts of either command and control or the Persian Gulf War.[9] Among senior military officers invited to testify before Congress in April 1991 about the impact of the war, only Adm Elmo Zumwalt remarked that the 'personalities . . . worked well.'[10] Recent testimony before Congress by Adm Edmund P Giambastiani, Jr, commander of US Joint Forces Command and Supreme Allied Commander Transformation (NATO), continues the silence about relationships among commanders in coalition military forces.[11]

Many commentators and military officers have mentioned the critical importance of personality in the effective functioning of their organisations.[12] Post-WW II histories of operational analysis emphasised the importance of personality in recruiting analysts, who, in addition to being smart, had to be able to work with people under stressful conditions.[13] And, who can forget Gen Dwight D Eisenhower's description of WW II staff work? 'War creates such a strain that all the pettiness, jealousy, ambition, greed and selfishness begin to leak out the seams of the average character. On top of this are the problems created by the enemy.'[14] Most of the writers on the *Gulf War Air Power Survey* believed that this war demonstrated the overriding importance of personality in choosing staff officers and senior commanders.[15]

Examining the RAF-USAF relationship in the Persian Gulf War can help us understand the extent to which friendship and personality are important for effective operation of organisations in the kind of unpractised, unrehearsed, complex interactions we see in modern war.

RAF-USAF Co-operation and Co-ordination in the 1990–91 Persian Gulf War Air Campaign

As in the current conflict with Iraq, the warm personal relationship between British and American leaders facilitated the actions to come. Prime Minister Margaret Thatcher, who met and spoke with President George H W Bush several times in the first days after Iraq overran Kuwait, played the critical role in establishing a clear moral understanding of the situation and the needed response. Her resolve ensured that the Western coalition did 'not go wobbly' due to the efforts of Saddam Hussein's government to divide it. After one meeting in early August 1990, Mrs Thatcher recalled, 'For all the friendship and co-operation I had had from President Reagan, I was never taken into the Americans' confidence more than I was during the two hours or so I spent that afternoon at the White House. . . . I had always liked George Bush. Now my respect for him soared.'[16] These feelings were reciprocated – as evidenced by the close working relationship between Bush and Thatcher – until Mrs Thatcher was removed from power. One example of the respect for British leadership occurred on 22 November 1990 at the end of an air force brief. Lt Gen Charles A 'Chuck' Horner announced that he had good and bad news: 'The bad news is that Margaret Thatcher has been forced to resign. The good news is that she's joined the 7th Armoured Brigade.'[17] The personal relationship between Bush and Thatcher set the context for the working relationship among military leaders and their staffs. Sir Peter de la Billière (commander of British forces in Saudi Arabia) noted that, once combat operations had begun, the War Room functioned twenty-four hours a day, and that he always had a seat at Gen H Norman Schwarzkopf's table. British officers also were on duty in the War Room 'all day, every day.'[18]

At the staff level of the USAF, even before the deployments began to Saudi Arabia, it simply was assumed that Great Britain and the RAF would play a central role in planning and executing the air campaign. One wonders whether the paucity of USAF observations,

anecdotes and stories about the relationship with the RAF is simply an indication of the comfort felt by USAF personnel for working with their RAF counterparts. I am reminded of the Sherlock Holmes story, 'Silver Blaze,' and the curious incident of the dog that did not bark.[19] Indeed, working with the RAF was probably a lot easier for CENTAF leaders than working with leaders of the other Central Command components. CENTAF leaders did not have to worry about post-war political battles with the RAF over roles, missions, budget authority and whether the concept of the Joint Force Air Component Commander (JFACC) was a solution to the exercise of command and control.[20]

Then-Lt Col David A Deptula, the chief attack planner in the 'Black Hole', recalled that he reserved key roles for the RAF in the evolving offensive plan known as INSTANT THUNDER in the days before he, Col John A Warden III, and others flew to Saudi Arabia to brief Lt Gen Horner.[21] During Operation DESERT SHIELD, RAF tactical planning, tasking, and execution were integrated into CENTAF's Tactical Air Control Centre, although the RAF retained national control of their forces.

In late August 1990, as the offensive attack plan was being developed in earnest, RAF Wg Cdr Mick Richardson joined the very select and secret group of strategic air campaign planners. As historian Richard G Davis noted, 'the RAF representative almost immediately made one valuable contribution: he corrected the planning staff's outdated maps to show the current 1990 Iraqi-Saudi border.'[22] It also is significant in regard to the primacy of the RAF-USAF relationship, that a Royal Saudi Air Force representative did not join the planning group until October.[23]

The RAF added capabilities to CENTAF that did not exist in other coalition air forces[24] and the variety and scale of the RAF's contribution were second only to those of the US. Indeed, the RAF was assigned the most difficult and hazardous mission – interdiction of Iraqi airfields and runways. The conduct of this mission demonstrated the tremendous skill, toughness and courage of RAF aircrews.

The RAF flew from three bases: Tabuk, near the Red Sea; Muharraq in Oman; and Dahran in Saudi Arabia. The RAF concept of operations for runway attack was a legacy of Cold War operational

Mission Type	Number of Sorties
Interdiction	1,256
Defensive Counter Air	696
Offensive Counter Air	890
Airlift	1,384
Reconnaissance	156
Refuelling	711
Support	40
Electronic Warfare	80
Training	90
Other	114
Total	**5,417**

Table 1. *Total UK Sorties by Mission Type*[27]

planning – high-speed, low altitude attack at night using the JP233 runway cratering munition. In the first four days of the war, 53 low-level Tornado sorties were flown releasing 106 JP233s against Iraqi airfield runways. Reduced airfield activity eliminated the need to continue to deliver JP233s from low-level, and the RAF switched to medium-altitude tactics to fly above the anti-aircraft artillery threat. From medium altitudes, Tornados attacked airfields using UK 1000 lb bombs. The Tornados flew 2,535 sorties in DESERT STORM, mostly in interdiction roles.[25] Tornados also dropped 3,631 unguided bombs and 1,079 LGB versions of the 1000 lb bomb.[26] Table 1 lists RAF sorties by mission type.

By the end of the first week of the war, RAF losses had become a military problem and a political problem in the UK. Several Tornado GR1s had been lost over Iraq with ten crewmen captured or killed. Wg Cdr Nigel Elsdon, the highest ranking allied officer to die in the war, was killed during an attack on Shaibah airfield. Two other RAF aircraft had been damaged heavily.[28] By 22 January, officers in 'Riyadh and at High Wycombe (the British command headquarters in Buckinghamshire) were reassessing their mission.' Then-Air Vice-Marshal William Wratten, the senior RAF officer in Riyadh, told the press, 'We have suffered a high rate of attrition in comparison with the other air forces. There is no denying that. We have also been extremely unlucky. And bad luck doesn't last forever.'[29] Sir Peter de

la Billière recalled that one day, Lt Gen Horner said,

> 'Gee, Peter, I sure admire the courage of your pilots, but I'm a little concerned they ain't achieving much in relation to the risk they're taking and the effort they're putting in.' I made some cautious reply, but from this and other comments I could tell that Chuck considered our method of operation a pretty crazy one in this environment. . . . It was therefore an immense relief to me when, on 23 January, after four aircraft had been lost, Paddy Hine (Air Chief Marshal Sir Patrick Hine) and Bill Wratten decided that low-level attacks should be abandoned for the moment.'[30]

Perhaps remembering the same conversation after the war, Lt Gen Horner noted that he had become increasingly concerned about RAF losses suffered during the low-altitude attacks against Iraqi airfields. In Horner's words, 'I wanted to tell the British not to fly low level, but I wouldn't . . . I just suggested we have a multinational tactics board.' Horner did not want to assert his formal authority as JFACC to alter RAF tactics, but the brief conversation had a salutary effect.[31]

In retrospect, the only potential problem between the RAF and the USAF occurred in mid-December 1990, when RAF Wg Cdr David Farquhar's laptop computer containing detailed war plans used to brief Prime Minister John Major was stolen in London. Planners in Riyadh decided that the coalition offensive air attack plan had not been compromised.[32] Although RAF officers may have been embarrassed by the incident, it had no lasting effect on RAF-USAF co-operation, co-ordination or collaboration.

Informal and Ad Hoc Organisation in Modern War

Formal organisation is the set of abstract, but stable relations that govern the behaviour of each member of an organisation. The organisational structure, illustrated by an organisational chart and encoded in authority relationships (eg, hierarchy, division of work, lines of communication, rules, regulations and standard operating procedures) provides an inadequate description of what an organisation does and of how it conducts its tasks. The actual organisation will operate through interpersonal relationships that are not specified by the formal organisation. Informal organisation develops around the formal structure and entails the partially directed

or undirected communications that develop between people and organisational components. Informal organisation is essential to the effective operation of formal organisation, as it compensates for 'rigidities' and situations unanticipated by the organisation's hierarchy, division of work, lines of communication and so on.[33] Long-time Bureau of Budget (now the Office of Management and Budget) official, Harold Seidman, noted that without informal organisation, 'the government probably would grind to a halt.'[34]

Ad hoc organisation is the creation of entirely new authority relationships, hierarchy, division of work, lines of communication, rules, regulations and standard operating procedures. While informal organisation strengthens and supports existing formal organisation, *ad hoc* organisations are created to accomplish tasks that existing formal, and associated informal, organisations do not or have not performed. On this matter, Seidman remarked that *ad hoc* organisations become necessary 'when co-ordination cannot be achieved by sound organisation, good management, and informal co-operation among agencies in related and mutually supporting activities.'[35]

It appears that, with the increase in difficulty of co-ordinating activities across many offices, senior civilian and military leaders resort increasingly to *ad hoc* organisation. This tendency may increase the likelihood of unexpected and unhappy outcomes. *Ad hoc* organisations are vulnerable to generic errors that occur because neither new roles nor new routines have been learned, and interpersonal relations (eg, friendship and trust between persons exchanging sensitive information) have not yet been established. *Ad hoc* military organisations often must rely on relations among relative strangers – people who may not be acquainted, but who share knowledge about how particular military organisations conduct their work. As a result, relations of trust are more unstable and uncertain. *Ad hoc* organisations lack one of the main resources of established organisations: a set of stable personal relationships within the organisation and between the organisation and those who use the organisation,[36] and the knowledge people have in applying organisational routines in response to situations and circumstances.[37]

The introduction of the planning, programming, budgeting system (PPBS) in 1961 into the Department of Defense by Secretary Robert Strange McNamara illustrates the difficulties that attend creating new

organisations and disrupting established informal organisational relationships. PPBS drastically changed the organisational arrangements for budgeting and planning. An informal pattern of communication and organisation had developed around the previous planning and budget process; the staffs in the various offices knew the people and offices they needed to contact to advance their packages of equipment, services and activities. The new PPBS shattered those relationships, and there commenced a period of trial and error – extending over several years[38] – to reinstate a new informal organisation. RAND analyst William R Jones observed the introduction of PPBS and noted that the process gained efficiency as new informal organisational relationships were established.[39] Indeed, Jones's description should not be surprising. Virtually all of the detailed examinations of administrative life captured in the Inter-University Case Program 'point up the intricate process of negotiation, mutual accommodation, and reconciliation of competing values from which policy decisions emerge.'[40]

The Role of Friendship Among Commanders (and Political Leaders) in Coalition Warfare

Ad hoc organisational arrangements were a prominent feature in planning during the 1990-91 Persian Gulf War. Consequently, particular roles assumed by individuals, and organisational missions, processes and procedures were largely new and untried. In other words, co-ordination of the various responsibilities and actions of planners relied upon self-initiative and time to work out new roles as Saddam Hussein failed to press his military advantage in August 1990. Friendship and trust among personnel were necessary prerequisites to achieving goals.

Friendship is a short-hand term that directs us to study the relationships among people within organisations, and between organisations, which facilitate the accomplishment of tasks. There are examples in which friendship appears to have played little or no role in the accomplishment of quite impressive tasks. When the US Navy was developing carrier-based aviation during the period between the world wars, for instance, the relationships between Rear Adm William S Sims (Commander of the Naval War College), Rear Adm William A Moffett (Commander of the Bureau of Aeronautics), Rear Adm

Joseph M Reeves (Commander of the US Fleet's air squadrons) and various admirals on the Navy's General Board were marked by professional courtesy rather than friendship.[41] The luxury of time to build stable personal relationships among people thrown together under stressful and dire circumstances is lacking in modern war, which makes the accomplished successes in multi-service and multi-national coalitions all the more impressive.

Political life is a succession of making and breaking friendships and alliances. Friendship between government leaders facilitates co-operation, ameliorates potential misunderstandings and miscommunication, and may very well play a large role in the formation of multi-national coalitions. For instance, Russian President Vladimir Putin admitted that Russia might have opposed the US-led war against the Taliban regime in Afghanistan, if he had not already developed a strong friendship with President Bush. As Putin put it: 'I have never said this in public; I'm going to do it today. When the counter-terrorist operations began in Afghanistan, we were approached by people through several channels.….who intended to fight against Americans in Afghanistan. And if, by that time, President Bush and I had not formed (an) appropriate relationship, as we have.... no one knows what turn would the developments in Afghanistan (have) taken. (The friendship) helped, to a great extent, to achieve further results that we have achieved in Afghanistan, and was for a very good purpose.' Of course, friendship only goes so far in international relations: the Bush-Putin friendship has not prevented serious policy disagreements over Iraq or the sale of a nuclear power plant to Iran.[42]

As we turn to British-American relations, the friendship of the British and American leaders and peoples was not predestined. In an 1816 letter to Thomas Jefferson, John Adams complained that the British 'have been taught from their Cradles to despize (*sic*), scorn, insult, and abuse Us. They hate Us more Vigorously than they do the French. They would sooner adopt the simple monarchy of France than our republican Institutions.'[43] Happily, the passage of time ameliorated the memory of the War of 1812. We return to eminent scholar, James Bryce, who observed, Great Britain 'is the only European country in which the American people can be said to feel any personal interest, or towards an alliance with which they are

drawn by any sentiment.'[44]

The current friendship between British Prime Minister Tony Blair and President George W Bush has eased some political difficulties resulting from the current war against Iraq. Because of Blair's close friendship with Bush, many Britons looked at the fate of Guantanamo Bay, Cuba, detainees as a test of the prime minister's influence.[45] On 17 July, Mr Blair entered the US House chamber to a standing ovation by lawmakers. Several lawmakers said it had been one of the best speeches, and one of the warmest receptions for a foreign leader, they had ever seen. Earlier, Congress had voted to award Mr Blair the Congressional Gold Medal, making him the second British prime minister, after Winston S Churchill, to be bestowed the honour.[46] The day after Blair's address to Congress, US officials announced that the US had agreed to suspend legal proceedings against British terrorist suspects at Guantanamo Bay until US and British officials had discussed their cases. [47] Needless to say, Prime Minister Blair's steadfast support for the current war in Iraq has been a significant source of comfort to President Bush and the Defense Department.

The converse of these examples is the relationship between American Gen Wesley K Clark, Supreme Allied Commander Europe, and British Lt Gen Michael Jackson, Commander Allied Command Europe Rapid Reaction Corps, in Bosnia. Clark's memoir describes polite, but not friendly, relations. The relationship shattered in an angry confrontation under the stresses and strains of fatigue, frustration, the absence of clear and stable political guidance, Russian political challenges and Serbian intrigues. Resolution of the immediate disagreement between Clark and Jackson required high-level intervention,[48] and some hard feelings against Clark persisted.[49]

Final Thoughts

Zhou En-Lai's celebrated caution is not necessary when reviewing the importance of friendship and personality factors between RAF and USAF personnel during the Persian Gulf War. This experience illustrates that friendship and trust among personnel at all levels ensured that the *ad hoc* military organisation created to expel Saddam Hussein's army from Kuwait worked. Reflections on the RAF-USAF relationship also bears on a few topics concerning current military operations in Iraq.

1. Organisations or People? The critical role key individuals played in the air campaign stimulated numerous debates in the course of the Gulf War Air Power Survey (GWAPS). The central issue frequently was posed as a choice for senior commanders: In a crisis, should the commander prefer good people or an effective organisation? Many GWAPS staff, especially those who served in the Guidance, Apportionment, and Targeting cell (the successor to the 'Black Hole' strategic air campaign planning group) during the war, answered 'good people.' Only a few opted for organisation, taking the position, as senior congressional analyst John M Collins once put it, that 'wartime arrangements should be established during peacetime. At the very least, peacetime and wartime set-ups should correlate closely.'[50] (Collins' position assumes that the peacetime arrangements were not flawed.) Fewer still argued that the choice itself was inappropriate. While working at GWAPS, I argued that good people working in effective organisations should be the goal.[51] Nevertheless. the Persian Gulf War illustrates the importance of some aspects of personality as selection criteria for senior leadership positions.

2. Importance of *ad hoc* and informal organisations. Although I may have undervalued the role of friendship and personality in providing resilience to military organisations conducting hazardous operations under stressful political and operational conditions, I still believe that effective organisational design is key to successful performance. The more integrated, complex and interdependent the human-organisation-machine system, the greater the probability of organisational impairment or failure. At some point, the organisation of people, agencies and weapon systems may become so complicated that hastily grown informal organisation and the kind of *ad hoc* organisational solutions and fixes that typified Gulf War command and control may not suffice against a tougher and more aggressive enemy.[52]

3. Time, practice and an enduring relationship. The RAF-USAF co-operation during the Persian Gulf War was an outgrowth of the political and military success in NATO. One key difference between NATO and the Warsaw Pact was that the former was indeed an alliance of 'equals', while the latter was not. NATO-generated co-operation carried over into Operation DESERT SHIELD and

Operation DESERT STORM. There was no surprise that British and American pilots and planners found themselves working together harmoniously. They had been doing it for years.

The Persian Gulf War also illustrates a positive effect of regularly scheduled training events (such as GREEN FLAG, BLUE FLAG and RED FLAG) with representation of international partners, such as the RAF. In such events, USAF personnel meet and collaborate with their RAF peers. The familiarity people gain in learning about each other and national routines, procedures and organisation are critical to future multi-national operational success.

Time to practice planning and tactics is critical to operational success during the period between commitment of forces and the onset of combat. The informal organisation of an *ad hoc* planning organisation is being created during this period; people are identifying trustworthy contacts and determining how the hierarchy, division of labour, communications pathways and organisational routines will operate.

Vice Adm Stanley R Arthur's, Central Command's commander of naval forces, summary of the situation applies equally well to the relationship between the RAF and USAF. Arthur said:

> 'Much will be said about the success of joint operations during DESERT SHIELD and DESERT STORM.…what carried the day was that we, the component commanders, shook hands and said, 'we're not going to screw this up, we're going to make it work.' And it did.'[53]

Acknowledgement: I thank Thomas C Hone, Col Daniel Jacobowitz (USAF Retd), Jacob Neufeld and Laura L Mandeles, who endeavoured heroically to expunge errors and mistakes from this essay. The remaining faults are mine.

Notes:

[1] Sir John Slessor, *Strategy for the West*, (New York, NY: 1954), p2.

[2] As Basil Liddell Hart noted, 'Friendly relations contribute a lot to diminish the friction of war. Comradeship is the oil in the machine.' *Thoughts on War* (1944), cited in Peter G Tsouras, ed, *The Greenhill Dictionary of Military Quotations,* (London: 2000), p213.

[3] Charles S Ascher, 'Trends of a Decade in Administrative Practices,' *Public Administration Review* 10 (Autumn 1950), p235.

[4] Cal von Clausewitz, *On War,* Ed and trans by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), p119.

[5] Mark D Mandeles, Thomas C Hone and Sanford S Terry, *Managing 'Command and Control' in the Persian Gulf War*, (Westport, CT: Praeger, 1996), Chapter 2, 'The Black Hole and Its Impact in Desert Shield.' See also Richard T Reynolds, *Heart of the Storm: The Genesis of the Air Campaign Against Iraq*, (Maxwell AFB, AL: 1995).
[6] Mandeles, Hone, and Terry, *Managing 'Command and Control' in the Persian Gulf War*, pp94-97.
[7] Mandeles, Hone, and Terry, *Managing 'Command and Control' in the Persian Gulf War*, pp22-23, 77-79, 149-150 & 155.
[8] James Bryce, *The American Commonwealth* Vol I *The National Government, The State Governments, The Party System*, (London: 1889), p4. In 1908, Viscount Bryce delivered the presidential lecture at a joint meeting of the American Historical Association and the American Political Science Association. He is probably the only person, and certainly the only British scholar, to have done so.
[9] G Kenneth Allard, *Command, Control, and the Common Defense*, (New Haven, CT: Yale University Press, 1990); Martin Blumenson and James L Stokesbury, *Masters of the Art of Command*, (Boston, Mass: Houghton Mifflin Company, 1975); Thomas P Coakley, *Command and Control for War and Peace*, (Washington, DC: 1992); Thomas P Coakley, *C^3I: Issues of Command and Control*, (Washington, DC: 1991); Rick Atkinson, *Crusade: The Untold Story of the Persian Gulf War*, (Boston, Mass: 1993); Peter de la Billière, *Looking for Trouble: SAS to Gulf Command*, (New York, NY: 1994); Richard G Davis, *On Target: Organizing and Executing the Strategic Air Campaign Against Iraq*, (Washington, DC: 2002); Michael R Gordon and Bernard E Trainor, *The Generals' War: The Inside Story of the Conflict in the Gulf*, (Boston, Mass: 1995); Thomas A Keaney and Eliot A Cohen, *Gulf War Air Power Survey Summary Report*, (Washington, DC: 1993); Khaled bin Sultan, *Desert Warrior: A Personal View of the Gulf War by the Joint Forces Commander*, (New York, NY: 1995).
[10] Other senior officers or officials testifying included Gen William C Westmoreland (USA Retd), Gen John W Vogt (USAF Retd), Harold Brown (former Secretary of Defense), Gen David Jones (USAF Retd), Adm Harry Train (USN Retd), Gen Robert Herres (USAF Retd), Lt Gen Thomas W Kelly (USA Retd), former Joint Staff Director of Planning during the Persian Gulf War. See US Congress. House. Committee on Armed Services. *Hearings: The Impact of the Persian Gulf War and the Decline of the Soviet Union on How the United States Does Its Defense Business*. 102nd Congress, 1st session, 1991. HASC No 102-17.
[11] US Congress. House. Committee on Armed Services. 'Statement by Adm Edmund P Giambastiani, Jr,' 108th Congress, 1st session, 2 October 2003.
[12] For example, Maj Gen Aubrey 'Red' Newman, *Follow Me I: The Human Element in Leadership*, (Novato, CA: Presidio Press, 1997), p140.
[13] Philip M Morse and George E Kimball, *Methods of Operations Research*, first edition revised (New York, NY: 1951), p10a. Morse was Director, Research Weapons System Evaluation Group, OSD. Kimball was Deputy Director, Operations Evaluation Group, USN. See also, Lincoln Thiesmeyer and John E Burchard, *Combat Scientists*, (Boston, Mass: Little, Brown and Co, 1947), p68.

[14] General Dwight D Eisenhower, letter to his wife, Mamie, 16 December 1942, quoted in *Letters to Mamie* (1978). Cited in Jay M Shafritz, *Words on War*, (New York, NY: 1990), p450.
[15] Mandeles, Hone, and Terry, *Managing 'Command and Control' in the Persian Gulf War*, pp155–56.
[16] Margaret Thatcher, *The Downing Street Years*, (New York, NY: 1993), p820.
[17] General Sir Peter de la Billière, *Storm Command: A Personal Account of the Gulf War*, (Suffolk: Motivate Publishing, 1992), p119.
[18] De la Billière, *Storm Command*, p210.
[19] The complete text of 'Silver Blaze' is on-line at http://www.geocities.com/fa1931/british/conandoy/blaze/html.
[20] Mandeles, Hone and Terry, *Managing 'Command and Control' in the Persian Gulf War*, pp129–134.
[21] Diane T Putney, *Airpower Advantage: Planning the Gulf War Air Campaign*, (Washington, DC: forthcoming). I thank Dr Putney for describing this incident to me in advance of her book's publication.
[22] Davis, *On Target*, pp93–94.
[23] Mandeles, Hone and Terry, *Managing 'Command and Control' in the Persian Gulf War*, pp157-158.
[24] Technically, the Royal Saudi Air Force flew more missions than the RAF, 6,852 to 5,417. *Gulf War Air Power Survey* Vol V, *A Statistical Compendium and Chronology,* (Washington, DC: 1993), Table 81, pp316-317.
[25] *Gulf War Air Power Survey* Vol. V, *A Statistical Compendium and Chronology*, see tables 104, 106 & 107.
[26] Atkinson, 1993, 153; John F. Guilmartin, Jr, et al., *Weapons, Tactics, and Training* Vol IV, Part I *Gulf War Air Power Survey*, (Washington, DC: 1993), pp63–64.
[27] *Gulf War Air Power Survey* Vol. V, *A Statistical Compendium and Chronology*, Table 64, pp232-233.
[28] Atkinson, *Crusade,* p152.
[29] Atkinson, *Crusade*, p154.
[30] De la Billière, *Storm Command*, pp226–227.
[31] Mandeles, Hone and Terry, *Managing 'Command and Control' in the Persian Gulf War*, p127.
[32] Atkinson, *Crusade*, p153.
[33] Herbert A Simon, *Administrative Behavior*, 3rd Edition, (New York, NY: 1976), pp147-149; William M. Jones, 'On Decisionmaking in Large Organizations,' Memorandum RM-3968-PR (Santa Monica, CA: 1964), pp4-6.
[34] Harold Seidman, *Politics, Position & Power: The Dynamics of Federal Organization*, second edition, (New York, NY: 1975), p175.
[35] Seidman, *Politics, Position & Power*, p175.
[36] Arthur L Stinchcombe, 'Social Structure and Organizations,' in James G March, ed, *Handbook of Organisations*, (Chicago, Il: 1965), pp148-149.
[37] Martha S Feldman and Anat Rafaeli, 'Organizational Routines as Sources of Connections and Understandings,' *Journal of Management Studies* 39, (May 2002), pp309-331.

[38] For example, Air Force General Benjamin O Davis, Jr observed that it was 'difficult to ascertain' the intentions of people in Robert S McNamara's Office of the Secretary of Defense. With hindsight, Davis recognised that, over a three year period, he failed to convince the Defense Department that the Air Force had a 'valid method of computing' a basic requirement for personnel grades. Gen Benjamin O Davis, Jr, *An Autobiography Benjamin O Davis, Jr, American*, (Washington, DC: 1991), p264.
[39] Jones, 'On Decisionmaking in Large Organizations', p7.
[40] Herbert Kaufman, 'The Next Step in Case Studies,' *Public Administration Review* 18 (Winter 1958), p55. See also Herbert Stein, ed, *Public Administration and Policy Development: A Case Book*, (New York, NY: 1952).
[41] Thomas C Hone, Norman Friedman and Mark D Mandeles, *American and British Aircraft Carrier Development, 1919–1941*, (Annapolis, MD: 1999).
[42] Bill Sammon, 'Putin Almost Defied Bush,' *The Washington Times* (28 September 2003), p1.
[43] Lester J Cappon, ed, *The Adams-Jefferson Letters: The Complete Correspondence Between Thomas Jefferson and Abigail and John Adams*, Vol II, *1812–1826* (Chapel Hill, NC: University of North Carolina Press, 1959), pp501-502. The letter was dated 16 December 1816.
[44] James Bryce, *The American Commonwealth* Vol II *The Party System, Public Opinion, Illustrations and Reflections, Social Institutions*, (London: 1889), p638.
[45] Glenn Frankel, 'Allies Didn't Share All Intelligence on Iraq**,'** *The Washington Post* (17 July 2003), p14.
[46] Steven Dinan, 'Blair says 'Destiny' is Calling US to be a Global Leader,' *The Washington Times* (18 July 2003), p1.
[47] Ed Johnson, 'US Suspends Legal Proceedings of British Prisoners,' *The Washington Post* (18 July 2003).
[48] Wesley K Clark, *Waging Modern War: Bosnia, Kosovo, and the Future of Combat*, (New York, NY: 2001), pp394-395.
[49] On 12 September 2003, Gen Hugh Shelton (USArmy Retd), Chairman of the Joint Chiefs of Staff during the period, stated that he would not support Clark's candidacy for president due to 'integrity and character issues.' Joan Garvin, 'Gen Shelton Shocks Celebrity Forum, Says He Won't Support Clark For President,' *Los Altos Town Crier* (23 September 2003), www.losaltosonline.com/articles/2003/09/23/news/community/news01.txt.
[50] John M Collins, 'High Command Arrangements Early in the Persian Gulf Crisis,' Congressional Research Service Report for Congress, 90-453 RCO, 21 September 1990.
[51] Mandeles, Hone and Terry, *Managing 'Command and Control' in the Persian Gulf War*, pp155-156.
[52] Mandeles, Hone and Terry, *Managing 'Command and Control' in the Persian Gulf War*.
[53] Tsouras, ed, *The Greenhill Dictionary of Military Quotations*, p115.

AN RAF COMMANDER'S VIEW OF CO-OPERATION IN THE 1990-91 GULF WAR

Air Chf Mshl Sir William Wratten

A fighter pilot by trade, Sir William Wratten has flown more than twenty types of high performance aircraft and displayed Hurricanes and Spitfires with the BBMF. During his forty years of service he commanded at all levels, notably in 1982 when, in the Falklands, he was responsible for establishing the post-hostilities air defence system for the islands, and in 1990-91, when he commanded all RAF aircraft involved in the Gulf War. His final appointment, as AOCinC Strike Command, made him a full member of the Air Board of the Defence Council.

I leave my notes at my desk because the two previous presentations have rendered them somewhat superfluous. I must therefore ask you to make allowances for my ad-libbing.

In spite of General Smith's complimentary introduction regarding my time in Riyadh, I think that I can usefully begin by saying that one should not assume that, simply because I was there, I had a unique insight into operations. There were definitely times when I don't think that I had any idea of what was going on!

I arrived in Riyadh in November 1990, by which time Peter de la Billière had already been there for a few weeks. General 'Chuck' Horner, COMCENTAF and Air Component Commander, had been there since August and General Schwarzkopf arrived some time after that.

In the discussion that has already taken place today, there has been a lot of reference to personal relationships at the high command level and I would endorse everything that has been said. Putting this into the context of the Gulf War of 1991, the Royal Air Force is small enough for many of those few who reach air rank all to know each other fairly well, so there were no 'internal' relationships to be established; they already existed. For example, I had served twice before under Air Chief Marshal Sir Patrick Hine, the UK's Joint

Commander, and had completed the RCDS course with Sir Peter de la Billière. That is not to say, however, that these bonds and friendships were not tested anew under the unique pressures of combat operations. On the other hand, I was introduced to senior USAF commanders for the first time and one had to work hard, and quickly, to foster the mutual trust and rapport essential to successful coalition operations. This needed to be done as a matter of some urgency, of course, as we did not know how much time was available to us. We should not forget how uncertain the political situation was in the summer, autumn and winter of 1990. You will recall the feverish efforts of those attempting to find a diplomatic solution as the United Nation's deadline drew inexorably closer against a background of more and more military assets being brought into theatre. It was a very tense period, albeit a fairly short one, and it made considerable demands on all of the air forces that had been committed, not least on their commanders and, in particular, on those in Riyadh.

I met General Horner for the first time when I had been in theatre for about a week. He is not an easy man to get to know. I had been briefed to expect a man of few words, every other one a blasphemy! Looking back, however (and this has been well-described in a book by Colonel Reynolds, *The Genesis of the Air Campaign*)[1] it is clear that Chuck Horner had been sent out as Schwarzkopf's front man. His initial task in Riyadh had been to establish a working relationship with the Saudis in order to find out what in-theatre resources would be available to him: which bases he could use; where they were; what facilities they offered, and so on – and on. Throughout this period the Pentagon and, in particular, the Checkmate Division and TAC Headquarters, were all working on what was going to be *his*, Horner's, Air Campaign Plan but he did not actually get to see it until it had been tacitly approved by the Chairman of the Joint Chiefs, General Powell (a soldier) and by CINC CENTCOM, General Schwarzkopf (*another* soldier). Horner, being the man he is, was not at all happy at having had his plan concocted elsewhere and then being expected to accept it at face value without having had any personal involvement himself in its drafting, so he was something of a bear with a sore head when I first met him and it was not until much later that I discovered the reason why. While this might seem not to have made for a very promising start, it actually turned out to be to my advantage because,

whenever I experienced difficulties of that kind later on, which I shall talk about in a minute or so, Chuck Horner was immediately able to grasp the nature of my problem and sympathise. As many of you will know, sympathy from a three-star can be very useful.

There were other key players on the USAF side in Riyadh, of course. One was, the then, Brigadier General Glosson, the man who actually oversaw the conduct of the air campaign as it unfolded. As such, it was he who kept a tight grip on the planning staffs in the so-called 'Black Hole', the chaps who built the Air Tasking Order (ATO) on a daily basis. Every 24 hours an ATO would be published which would cover the next 36 hours. It was 'Buster' Glosson who briefed me on the Air Campaign Plan in a detail far greater than that which was available to our staffs in the UK. All of this, inevitably, involved a very complex and apparently unwieldy international command and control structure which brought with it its own special challenges.

Then there was General Schwarzkopf's personal challenge of establishing his own relationships with the Saudis. You will all appreciate the importance that the Saudis place on 'face' and dealing with all of the implications that that demanded was very much Schwarzkopf's call, because nothing could be done unless the Saudis were fully on side so that was a major pre-occupation for the CINC.

Meanwhile, the Commanders of the various national contingents were working on their own specific areas of responsibility while Chuck Horner, of course, was deeply immersed in the detail of the Air Campaign Plan, supervising the preparation of the training ATOs and finding ramp space for the ever-increasing numbers of combat aircraft arriving in theatre.

Perhaps this would be a good time to remind ourselves of the assets that Horner had under his command. The United States Air Force alone had aircraft committed to the operation based in an arc from the UK in the north west, through Turkey, Saudi Arabia and the Gulf down to Diego Garcia in the south east. The numbers were *very* impressive – for instance, no fewer than 256 KC-135s were assigned to DESERT STORM, the largest concentration of tankers ever assembled outside the USA. In sharp contrast to these veterans, the campaign saw the first employment of stealth technology in aerial warfare, with some forty-two F-117s being available at Khamis Mushait. This meant that their pilots had to accommodate something

like a 2,000-mile round trip to Baghdad, but this was considered to be an acceptable price to pay for the relative security afforded these very high value assets by basing them in the deep south west of Saudi Arabia.

The United States Navy fielded six carrier battle groups: three in the Gulf; three in the Red Sea. In all, that meant more than 100 F-14s, almost as many F/A-18s and not far short of 100 A-6s, not including the twenty-seven EA-6s that were available for electronic warfare support and SEAD (Suppression of Enemy Air Defences).

Then there was the US Marine Corps with another eighty-odd F/A-18s, sixty AV-8 Harriers and scores of helicopters in addition to the US Army's in-theatre ORBAT of a remarkable 1,587 rotary winged aircraft of a variety of types. As if that were not enough, there was the Royal Saudi Air Force and those elements of the Kuwaiti Air Force that had managed to escape the Iraqi invasion – yet more substantial numbers. And then there were the contributions made by coalition air forces, other than the Royal Air Force. Not so many in numerical terms, but each contingent tending to bring with it its own crop of problems arising from particular national political sensitivities, all of which had to be taken into account by the planners whose task it was to find space for all of these units and then deconflict and co-ordinate their activities while observing any constraints that had been imposed upon their use.

And then there was our own, Royal Air Force, contribution which was spearheaded by 62 Tornado GR 1/1As and 12 Jaguars, 18 Tornado F.3s and, eventually, a dozen Buccaneers. While these fighters and fighter-bombers tended to attract most of the publicity, I should perhaps highlight the efforts of the RAF's Victor and VC10 tankers which operated from Muharraq and King Khalid International respectively. They were particularly valuable in the context of a combined operation because, oddly enough, the refuelling techniques used by the USAF and USN are incompatible, obliging the navy to rely largely on the relatively small fuel offload offered by its own buddy-buddy probe and drogue tankers. Fortunately, the RAF was able to overcome this limitation by offering its comparatively large capacity tankers to support the US Navy's effort, as well as sustaining the RAF's own operations.

So the initial challenge faced by General Horner was how to draw

all of these disparate forces together and efficiently prosecute the strategic and tactical goals of the Air Campaign Plan. In essence, there were five aims under which targets were grouped. All were reasonably predictable and, in no particular order, they were roughly as follows:

- Establish air superiority.
- Destroy Iraqi NBC facilities.
- Dismantle the Iraqi military machine by interdicting supply lines.
- Destroy the Republican Guard.
- Prepare the Battlefield for the Land Campaign.

The tool which Horner had to use to achieve all of this was the ATO. Nobody flew a combat mission unless he was on the ATO. Drafting this multi-force, multi-national daily Operation Order, covering a huge geographical area, was an enormously complex task, utilising extensive computerisation and sophisticated software. It was put together by a single planning cell, exclusively manned by Americans with the sole exception of a Tornado-experienced RAF wing commander. As I have already said, the cell worked incessantly, updating the ATO every 24 hours to cover the next 36 hours – it was a rolling process – and covered everything from direct attack through post-strike recce to electronic surveillance and SEAD via an equally detailed Airspace Control Plan.

Once an ATO had been finalised it had to be distributed to everyone involved in executing it, that is to say all of the squadrons on in-theatre bases, those at more remote stations and the air and missile units on all of the ships, including submarines, that were committed to the operation. That meant transmitting the Order – all of it, and it ran to scores, if not hundreds, of pages – to just about everyone, using any means available – electronic, signal, e-mail, communications aircraft, man-with-cleft-stick, whatever.

An ATO was a terse, no-frills, almost skeletal, tabulation, providing such key information as: time on target (which might be specific but was more often a ‘window’ of perhaps ten or twenty minute’s duration); a Mission Number; a BEN,[2] the target allocations and then the functions of the various elements constituting the particular force ‘package’. A typical, notional, package might involve

a number of RAF Tornados attacking a runway while Marine Corps F/A-18s struck other facilities on the same airfield with direct support being providing by US Navy A-7s and A-6s in the SEAD role and USAF EF-111s acting as stand-off jammers, all operating under an umbrella of F-14s flying force protection; the whole package, which would commonly involve well over fifty aircraft, being supported by an appropriate selection of tankers and monitored by the ubiquitous AWACS.[3] There might be three equally complex missions, 150 or more aeroplanes, to a page – and there were lots of pages.

Once complete, the entire ATO would be passed to the Combined Air Operations Centre at Riyadh where each aircraft type had its own 'desk', its own specialist, who would then dissect the Order, extract the relevant content, carry out all of the necessary co-ordination and ensure that the right people within his field of interest were being tasked, that everybody knew who the element leader was and so on. In effect, he assumed tactical direction of the mission. It worked remarkably well and, to pick up on what Air Vice-Marshal Peach has already suggested, it did so largely because of the FLAG training programme. Everybody taking part understood what a Force Package was; they *knew* the basic principles of flying such a complex mixed-force mission; they *knew* that the TOT was sacrosanct; if there was a note at the bottom of the page of the ATO saying that the tanker support was to be shared with another package, they *knew* exactly what that implied; and so on. At the height of the operation the coalition was flying over 2,000 sorties every 24 hours, day and night, around the clock. It really was a quite phenomenal effort and it just went on and on, and, to my knowledge, there was not one mid-air collision, which was quite staggering.

The risk of collisions had actually been one of our greatest concerns, but there were other uncertainties too, not least the sort of reaction that might be expected from the Iraqi Air Force. We had, of course, been closely monitoring Iraqi air activity in the days and weeks prior to January 1991 and it became obvious that they were hardly flying at all. In view of this, I endorsed the American line, which was that we should not even try to close the Iraqi airfields, which is, of course, the primary mission of the Tornado/JP233 combination, but to harass any airfield activity. In point of fact, with the Tornado/JP233 assets available in theatre, we could realistically

have actually shut down very few Iraqi airfields which, in comparison to NATO military airfields, were huge. Since we were fairly sure, as sure as one can be of anything, that the Iraqi Air Force was not going to pose much of a threat, we concluded that the best option would be to allow it to get airborne and let the F-14s, -15s and -18s sort it out.

It was this decision that provoked the first serious difference of opinion with the Ministry of Defence. Clearly, we, in-theatre, were departing from a fundamental aspect of UK doctrine; the use of the Tornado/JP233 combination to close airfields, which was, after all, why we had procured this weapon system. But it had been envisaged for use against relatively small and compact European airfields, including those of NATO, in order to deny their use to an advancing Soviet force. Iraqi airfields were built on a relatively heroic scale and thus posed a problem of a far greater magnitude than that which JP233 was supposed to solve. While this in-house national dispute rumbled on, its reverberations obviously were unsettling for the Brits in Riyadh.

Another problem area was that of co-ordinating and aligning Rules of Engagement (ROE). Air Marshal Kemball will remember these difficulties only too well, because, in collaboration with the Ministry of Defence, he was masterminding them from the Joint Headquarters at Strike Command on behalf of the Joint Commander. It soon became quite clear to those of us operating in the field, and I was far from being alone in reaching this conclusion, that we were working to a quite different timescale from the staffs in the MOD. In theatre, it is necessary to have differences in ROE ironed out immediately if there is a problem which is jeopardising the effective conduct of a mission. Unfortunately, that sense of urgency was simply lacking in the corridors of Whitehall, or rather it certainly appeared to be. To give just one example of the sort of problems that misalignment could present, even *before* the war had begun, the ATO would provide combat aircraft to 'fly shotgun' on so-called high value assets (HVA), AWACS and RIVET JOINT[4] aircraft in particular. Thus, a pair of F-14s, for example, might be tasked to escort an AWACS. American F-14s were cleared to declare hostile and engage any single aircraft they contacted approaching the HVA at high speed. The Brits, on the other hand, required at least *two* aircraft to be approaching at high speed before they could be regarded as hostile. You can see the

problem; if the ATO tasked a pair of RAF Tornado F3s to relieve the Tomcats, it automatically degraded the level of protection being afforded, simply because we were working to different Rules of Engagement. Horner was fully aware of the dilemma and he accepted the implicit risk that it involved, which was, I think, indicative of the degree of co-operation and mutual confidence that prevailed – and perhaps a reliable intelligence assessment that indicated, with a high degree of confidence, that Saddam was not actually about to try to take out our AWACS anyway…

If I might take you on a brief diversion, this ROE business is, I think, particularly relevant in the context of current discussions on the concept of a European Union Defence Force. During the run-up to the launch of DESERT STORM, while our ROE were still misaligned we were visited in theatre by the Chief of the Air Staff, Air Chief Marshall Sir Peter Harding. Sir Peter was not actually in the chain of command, of course; that went straight from Sir Paddy Hine to the Chief of Defence Staff. Nevertheless, Sir Peter was CAS and he had decided to pay us a visit, which included calling on the Air Commander, Chuck Horner. I was present at their meeting, just listening to what was being said and trying to be as inconspicuous as possible. Both of these very senior officers were very polite and sociable, and eventually Sir Peter got around to ROE. He said that we were working on it in London, that we were doing our best and that were almost there, to which 'Chuck's' response was a cool, 'Well, OK. But if you're not ready, we'll go without you.' Now, I put it to you that only the United States can afford to take a stand like that. I just wonder how long it would take for contributors to a multi-national European Defence Force to align their ROE in circumstances where decisions might be required in a matter of minutes or hours, not days, with no one force having the resources or confidence to go it alone unilaterally.

Another serious bone of contention, one which has already been alluded to, was the low level versus medium level debate. Ever since the 1960s, the RAF had, of course, been committed to flying its attack missions predominantly at low level. Our training philosophy, our aircraft, avionics systems, weapons systems, indeed our whole procurement programme had been tailored to the pursuit of the goal of perfecting low level tactics. It was our chosen style of operations and

we were very good at it. I would suggest that it was because we were so good at it, and because low level is the most difficult operating regime of all, that our crews were able to adapt so readily to less demanding ways of waging war. We did not abandon low level without a thought, of course, but because the Iraqi Air Force had failed to put in an appearance and because air superiority had been established within a matter of days. Thereafter the only remaining hazard was AAA/LLAD SAM which was only a threat at low level and, since we were still sustaining losses at low level it made no sense to cling dogmatically to a plainly inappropriate operating mode.

Indeed to have done so would have been irresponsible. As a commander one does not risk life unnecessarily, so, up we came to medium level, but there was an associated friction back at home, particularly within the MOD who had difficulty accepting this shift in tactics. We had not abandoned the low-level idea, of course; although the Cold War had only just ground to a halt, the Warsaw Pact was still arguably a threat, and there was therefore still a persuasive case for operating at low level in the face of a sophisticated, cohesive layered defence. Although that was plainly not the case in Iraq, however, some people found it very hard to realign the mindset to which they had been loyal throughout their careers. That led to some pretty heated discussions, with relief not appearing for the week or so it took for the laser-designating Buccaneers to arrive in theatre

That leads me to the last point that I will make. Before the conflict began, I was continually discussing basing options with Horner and Glosson with a view to relieving congestion. Most airfields were very overcrowded, with some, such as Bahrain, particularly so. But we wanted to introduce the Buccaneer into theatre to provide ourselves with a laser target marking capability. This led to a spirited debate in which Horner made his position quite clear – the Brits simply did not need to import any more aeroplanes because the USAF could provide all the designation that might be needed. There the matter rested until Saddam aimed a couple of Scud missiles at Riyadh and Tel Aviv. That put Horner, in particular, under enormous pressure to be seen to be doing something to neutralise this new threat. The upshot was that a significant proportion of the available capacity for laser-designating was diverted to the Scud hunt. That left the RAF with its Tornados up at 20,000 feet or so armed with dumb bombs. Hence the brief hiatus

until the Buccs arrived. At about the same time we were able to introduce the Thermal Imaging and Laser Designating (TIALD) pod (then still under development) which gave us a night marking capability as well. The hiatus in RAF operations had lasted just seven days but, because the eyes of the world were upon us, and because the Royal Air Force, and its Tornados in particular, was largely ineffective for that period, it provoked significant and justifiable concern.

And that really does bring me to my *last* last point – mass communications – the media. It made an enormous impact on all of us, both in-theatre and elsewhere. Wherever we were operating, there was CNN pumping pictures of what was going on into everybody's parlour, and often in real time. While we, who were supposed to be running the war, were trying to decipher what our Intelligence Reports really indicated and what the SITREPs were telling us, there was CNN telling the world what was actually happening. On one occasion, General Schwarzkopf was on the secure phone to his Chairman, General Powell, who was watching CNN while they were speaking. Schwarzkopf simply couldn't understand how his Boss was able to ask such pointedly focused questions! I recall another instance, albeit in a slightly different context, when I was listening to Kate Adie relive a moment when she was on board one of the ships involved in the Balkans Campaign. The ship launched a cruise missile. One of her American colleagues took a photograph of it and promptly started to play with his various pieces of IT kit, forecasting that his newspaper would have the picture on the front page before the missile hit its target.

That is the environment in which commanders now have to work. There is an absolute whirlwind of information and it all needs to be filtered, assessed and, ideally, controlled, although the latter is no longer even a realistic option. Somehow, we have to embrace this situation and make it work to our advantage. It brings serious challenges because every young soldier has his (or her) mobile phone and, like it or not, they are going to be used to tell Mum: 'We lost a couple of aircrew today.' As a result of such a message, the families, not the families of the *deceased* aircrew, but the families of those aircrew who have come back, will know that one of their buddies has gone down before the chain of command has even begun to initiate the

formal casualty reporting procedures.

The complexity of modern warfare represents an enormous challenge. The Gulf War of 1991 was the first such campaign and we managed to make it all work. It worked, I think, because of the people who were involved. It would be almost impossible to try to construct a wiring diagram to establish who said what to whom, but that hardly matters. What does matter is that we spoke to each other frankly, regularly and face-to-face. This fostered the trust and confidence essential to coalition operations.

We must not forget that at the head of it all there was this enormous military machine of the United States. While the British committed a significant portion of its military resources to the campaign, we, the RAF, provided less than 4% of all in-theatre fixed wing aircraft. There is a phrase that describes this situation rather well, and which has gained some currency in Whitehall of late – 'living with the elephant'. I put it to you that the influence that we were able to, or perhaps allowed to, exert on the conduct of the Gulf War was out of all proportion to the material contribution that we were actually able to make. That represented, I believe, a great compliment by the United States to the UK, and specifically to the Royal Air Force.

Notes:

[1] Richard T Reynolds, *Heart of the Storm: The Genesis of the Air Campaign Against Iraq*, (Maxwell AFB, AL: Air University Press, 1994).

[2] BEN – Base Encyclopædia Number; a code that identifies a specific potential target contained in a book that covers the whole world.

[3] AWACS – Airborne Warning and Control System; the Boeing E-3 Sentry.

[4] RIVET JOINT aircraft are Boeing RC-135s configured to operate in the electronic intelligence (ELINT) gathering role, primarily the monitoring of communications traffic.

AFTERNOON DISCUSSION

Gen Bill Smith. What has impressed me most this afternoon is that the conduct of coalition warfare is not easy. It is not something you can take for granted. One of the strengths that showed up in the 1991 Gulf War is that we had learned a lot through membership of NATO which meant that there was a lot of commonality in our procedures. The French and some others may have had to adapt a little bit, but at least the British and Americans already knew how to work together.

Wg Cdr Colin Cummings. I would like to offer a comment on what Dr Neufeld said about the withdrawal of Thor in 1963. From the British perspective the reasons were slightly different. The United States Government had underwritten a very significant element of the costs and they had made it clear to the British Government that they had no intention of continuing to sustain the programme. The British could not afford to do it by themselves, but not for financial reasons alone; we had also recently stopped conscription and our all-regular air force simply would not have had the manpower that would have been required to keep the system running. From the American point of view, Thor had never been more than an interim solution and once they had been able to deploy ICBMs on their own territory it had become unnecessary for them to continue to maintain a force of IRBMs based overseas. I believe that the British would have liked to keep Thor but that they simply could not afford it.

Dr Jacob Neufeld. There is certainly some truth in that. The costs of the programme were substantial, and not only to the US; the British investment was also significant. But, if you examine the chronology of the programme, you will find that the United States announced that they were going to stop supporting Thor after the British had asked that it be withdrawn. One has to weigh all of these issues and form a judgement as to which had the greater impact. I rather left it open because I really don't know the answer, and I am not sure that there is a single definitive answer.

Smith. What bothers me about Thor, *and* Jupiter, is that they spent all that money to buy missiles that they knew were going to last only four or five years. Can you imagine doing that today? It is an interesting comment on the enormous impact that Sputnik had on the United

States. It induced a kind of panic at a time when the strength of the Soviet Union was thought to be at its peak. Even so, it is still surprising that so much money could be spent on a system that was expected to have such a short life.

Tony Page. I have few qualifications for speaking today – my wife says that I was Britain's secret weapon because I arrived in the Italian theatre on the day the war ended! That said, I would like to highlight a little known facet of Anglo-American co-operation. The RAF was flying B-24s from one side of the aerodrome at Foggia with the Americans operating B-17s on the other side. They had too much beer and we had too much Scotch so we were able to sustain a wonderful trade the whole time we were there. On a more serious note, I would draw attention to a subject which has not been mentioned today – the Falklands campaign. Perhaps it cannot yet be said but I am sure that we owe the Americans a great debt of gratitude for the help that they provided at that time.

Smith. The Falklands presented the United States with some difficulties but, in the end, we said that we would do whatever we could. It may not have been everything the British wanted but it was, I think, a satisfactory outcome.

(**Note.** This brief exchange took place before the publication of Journal 30 which reproduced the papers read at a seminar dedicated to the Falklands campaign, including a particularly informative contribution from AVM Ron Dick who was 'our man in Washington' at the time. **Ed**)

Gp Capt Richard Bates. I would like to offer comments on three aspects of RAF/USAF co-operation which have not been mentioned thus far. First, there is the exchange programme. Many of us have been privileged to take part in an exchange and, for my part, I regard it as having been an extremely valuable and enjoyable experience and one which established friendships that have lasted for many years. Only recently I spoke to OC 617 Sqn who has just completed an exchange tour and tomorrow I am visiting Brize Norton where I know that several of the C-17 pilots have done exchanges. Beyond that I think that the programme has involved dentists – and even an RC chaplain.

My second point is to acknowledge the value of the RAF/USAF co-operation that arose from our mutual experience of working within NATO, from SHAPE on down. Finally, I would note the activities of the British and American airmen on the staffs of the Allied Missions in Berlin who kept the Soviet forces in East Germany under surveillance throughout the long Cold War.

Air Mshl Sir John Kemball. I have two points to make, but I would also like to endorse what has been said about the value of the exchange programme and military co-operation in general. These things will always get us out of trouble in the end – but there may be pitfalls along the way.

My first point concerns Rules of Engagement. As Air Chf Mshl Wratten pointed out, I was dealing with this during the Gulf War but I have not been involved for the last ten years and when I left the Service the British MOD still had a totally different approach to ROE from that of the American Department of Defense. Within the DOD Rules of Engagement were put forward *by* military officers *to* military officers and, with the sort of mutual understanding that that suggests, were quickly established. Within our MOD decisions on ROE are made by Ministers in response to presentations made by civil servants which is why there is a lack of the necessary immediacy and why you finish up, as we have heard, with remarks like, 'Well if you haven't got it sorted out we will go without you.' I don't think that anything has changed since I left.

My second point arises from my current experience as co-ordinator of British-American community relations for the MOD. There is an element of the British community, particularly around the main American bases, which is extremely antagonistic towards the American presence in the UK. This will have started, I suppose, back in WW II with the arrival of American troops having far more disposable income, but since then the problem has been exacerbated by the fact that American demands for housing have totally distorted the local market. This means that a manual labourer in East Anglia cannot afford to rent a house which means that he is obliged to continue living with his parents with all that that implies in terms of constraining his freedom to marry and raise a family. This resentment has been there for fifty years and it is now entrenched in that section

of the population. Politically, this is irrelevant because these people have no leverage, no power. Sadly, I see no solution to the problem because it is fundamentally rooted in the economic circumstances of the region. Nevertheless, it is a very real problem and I simply wish to bring it to the attention of anyone who may be involved with American forces stationed in the UK.

Smith. It is, of course, undeniable that we do, as a matter of policy, try to enable our people to live overseas as comfortably as they do at home and I suppose that this may have had some adverse effects. I think that the problem will be eased in the future, however, because the United States is drastically changing its approach to the overseas deployment of its forces. We are moving towards the employment of Expeditionary Forces which will operate for relatively brief periods, often from bases offering only minimum facilities, perhaps in Eastern Europe. It will be a 'bare bones' concept; families would not be involved and a lot of people on the civilian side of the DOD, and elsewhere, think that this is a wonderful idea because it is going to save money. Whether it will or not remains to be seen but it will certainly reduce the permanent American presence overseas. While this may relieve some local tensions, it will, I think, also have some negative consequences because it will weaken the mutual understanding that is so essential between allies.

Turning to ROE, I think that Air Mshl Kemball was only partly correct in his impression of how we handle this. The US military certainly has a voice at the initial stages, in that they say what they think the rules ought to be, but the civilians definitely have the last word. In practice, of course, ROE are fairly straightforward in a major war, but they can be difficult in ambiguous or politically sensitive situations. Perhaps someone else would like to comment.

Air Chf Mshl Sir William Wratten. Well, we are familiar with ROE because we play them all the time in exercises but they do take on an entirely different significance in wartime. Based on the Gulf War experience, my personal view is that, no matter what they are, provided a coalition's members are all working to the same set of ROE, there is no problem. It is when the rules differ that the problems arise and it is then that time becomes important because the rules have to be re-aligned as quickly as possible. Imagine the confusion that

could occur if you had four or five coalition members with four or five different interpretations of ROE.

The crucial point about ROE is that they are needed by our airmen, soldiers and sailors when they are having to work under the most demanding circumstance; when they have very little time to think. Their reactions have to be almost instinctive and they must know that what they are going to do will be legal, because we have all seen the increasing tendency to resort to litigation in the context of military action, with both the nation and the individual at risk. I am not hopeful that we will ever manage to educate Ministers and civilian officials to think along the same lines, and with the same sense of urgency, as the military and one has enormous sympathy for the staff officers whose task it is to try to get across the paramount need for speed. For future reference, the most impressive argument may be to explain that if the ROE are not sorted out, and very quickly, any kudos that may have been gained from deploying British troops will be wasted, because they simply will not be used.

A failure to provide comprehensive and realistic ROE in a timely fashion can lead to a mistrust of the chain of command, right up to Ministers. Nevertheless, I think it wise to remind ourselves, and our successors who are going to find themselves in positions of responsibility, with the spotlight upon them, that politicians will probably continue to think like politicians. That may even be a good thing, of course, but it can certainly be very frustrating.

AVM Stuart Peach. I agree with everything that has been said so far. Perhaps the Permanent Joint Headquarters represents a ray of hope, because we have had a PJHQ running our operations now for eight years and its commander, the Chief of Joint Operations, is the champion that the deployed Theatre Commander has always needed. Furthermore, he has a senior civil servant on his staff who, while he cannot necessarily *direct* other civil servants, should surely be able to influence their thinking. While this has significantly improved communication, the urgency problem is still unsolved.

Perhaps I could contribute some remarks based on my own experience operating at a slightly lower level within the hierarchy, specifically as a Staff Director in the CAOC during the Balkans campaign. My main problem was ‘complexity’ because one had to

know all the ROE for all *ten* participating nations and if the representative of one of those nations felt unable, through a lack of trust, the absence of a satisfactory working relationship or whatever, to share their difficulties with you, then the choices were quite stark. Either that colonel or general sat next to you throughout your entire shift, to provide a national fig leaf in the event that his formation was called upon to execute a particular mission, or, as I had to do on more than one occasion, his forces would simply be deleted from the ATO.

This sort of thing could generate some friction of course and we dealt with this by implementing a very simple, but effective, exercise. We introduced 'ROE quizzes' at our weekly meetings of national representatives. Each one, in turn, was put on the spot by the CAOC Legal Officer who flashed up a slide – 'This is the scenario; you have eight seconds to decide whether your nation can engage or not.' It worked, not least because there was a 'loss of face' issue at stake and it made people go back to their capitals with complaints along the lines of, 'I've been made to look a laughing stock in front of my colleagues over this ROE thing. You really *do* need to do something about it.' Not a very sophisticated approach, perhaps, but it was a very good way of managing that complexity problem.

Lt Gen Mike Nelson. In our case, a lot depends on the nature of the Administration, and on the personality of the Secretary of Defense in particular. In some cases the ROE do go from the Field Headquarters directly through the Joint Staffs to the Secretary of Defense and they can be anointed very quickly because of the philosophy of that Presidency or that Secretary, which may be simply to 'let them do their thing'. The case of the first President Bush is a good example of that, and there have been other Administrations which have been keen to play. The current Secretary of Defense is one of those who likes to be involved but a lot clearly depends on who is at the top of the food chain.

Mike Meech. We have heard a lot about the use of air power today and, after the second Gulf War, I was interested to read in *The Times* that unnamed British Army sources were complaining about the RAF's being controlled centrally and not dedicated to their support, in contrast to the US Marines who had dedicated air power. So is the theory of air power not getting down to the British Army in practice,

and does the US Marine Corps still have its own umbrella?

Peach. That is a very a good question. The first point I would make is that there is a good relationship between the RAF and the US Marine Corp and I will pay particular tribute to the closeness of that relationship earlier this year when there were many examples of close air support being provided to other nations' soldiers, perhaps the most obvious demonstration of mutual trust and confidence.

Secondly the British Army *did* get a lot of close air support but, as I think someone said earlier, 'the dog that didn't bark' in this particular fight was interoperability. At the end of the day, particularly for close air support, arguably the most difficult and dangerous of all air missions, if your frequencies, your radios, your secure comms are not compatible you simply are not 'interoperable'. In short, the Army has to move towards us if it wants us to provide close air support, which means that it has to take the provision of equipment and so on more seriously, but I can assure you that there is no slackening of effort within the Royal Air Force in this context.

I would also make the point that, just like the US, we have our own post-conflict debates about future roles, missions – and budgets. It is almost inevitable that there will be a degree of friction in any combat situation, of course, and in the post-event analysis some units are bound to feel that they did not get their fair share of something – including air support. If you go three echelons up, however, you will find that, even in the 21st Century, there is not always enough to go round. Apportionment of effort then becomes a question of priorities and, in the final analysis, the effort has to be exerted where the decision-making General considers that it will do most good.

John Davis. If the French had as many aircraft in the 1991 Gulf War as did the RAF, is there any reason why they were not involved in the leadership and did that offend them?

Dr Mark Mandeles. I don't believe that the French did actually have as many aircraft in the Gulf as the British and they certainly had a different set of Rules of Engagement. Furthermore, their senior political relationships with the US and, I suspect, with the UK were also quite different. There is certainly anecdotal evidence to the effect that, while French military officers were very keen to work more closely with us, their Foreign Ministry declined.

Wratten. The French definitely had significantly fewer aircraft in theatre than the Royal Air Force, and they didn't begin flying until some time after the Operation had actually begun. General Horner would have his twice-daily 'O groups', involving all the senior national representatives plus his senior staff from the CAOC and the Planning Cell. They would review what had happened in the last twelve hours, what the forecast was for the next twelve and then the huddle would begin – the Canadians, the Italians, the French, the Royal Air Force, we were all sitting there together. The main debate was always between the British and the Americans. The Chief of the Saudi Air Force was present as well, of course, as was the senior Frenchman who was very impatient with his people because he was not enjoying the same degree of involvement as the rest of us. You could often sense the political pressure that he was under.

Sebastian Cox. I have a brief point on ROE and then a question for Air Chf Mshl Wratten. ROE is a problem area that has clearly intensified over the years which is, I think, not unconnected to what the air marshal was saying about instant media communications. The politicians are now paranoid about the media because they are worried that they are going to be 'bounced' by a question to which they will not know the answer. Their concern is that they will then be criticised for having allowed the military to operate, to some degree, outside their political control. That, in the end, is what ROE are *really* all about. The problem is that it is the military who actually have their fingers on the button, whereas it is the politicians who are supposed to be making the decisions. With the ever-decreasing time factor in modern warfare, the idea underpinning ROE is to provide a system which is responsive enough to permit the in-theatre Commander to make a decision, governed by an established set of political paradigms – without getting killed first. That may not even be possible today and I think we may have to accept that the guy on the spot will probably have to make his decision and then see whether he gets court martialled afterwards or not.

My question arises from an incident involving ROE shortly before the war started in 1991. It has been said that there was an apparent conflict between British and US ROE which London could not understand when it was referred back to them. Whitehall said that they

had talked to Washington and that Washington had agreed that the UK and US ROE were congruent, so there was clearly no problem. The problem persisted, however, and when it was examined more closely it transpired that CENTCOM was offering one set of ROE to the RAF in theatre, whereas Washington was providing London with a different version. The problem was that CENTCOM and Washington were out of step. Perhaps you would like to comment on that.

Wratten. I wasn't aware of it! But I would certainly not say that it was impossible.

Smith. That would be one of those ambiguous situations that I spoke of…...

Gp Capt Jock Heron. General, could I just make a final point as an ex-exchange officer, I had the privilege of being at Nellis AFB in 1965-67. When I left the squadron and was dined out, I made three points. One was that I had learned a huge amount in my short time there; secondly, I hoped that I had also contributed something; and, thirdly, that I had developed a great affection for the US Air Force and that I hoped that the US Air Force had gained just a little bit of respect for us. Perhaps that is why we are here today.

CLOSING REMARKS

General W Y Smith

Today, we have heard about and discussed air power during critical periods in the history of our two countries. The presenters have stimulated us to think more deeply about air power and our discussions have further enriched our understanding. I thank the RAF Historical Society for arranging this seminar, and thank my American counterparts for the hard work from our side.

The United Kingdom and the United States are blessed with a friendship that has withstood many challenges and emerged from each of them with bonds stronger and more enduring. That is a remarkable achievement and it comes, primarily I believe, from four central aspects of our relationship.

First, we trust one another. We know each of us will live up to our word. We don't have to worry about whether the other partner 'means what he says and says what he means.' Next, we have great respect for one another. We in the United States hold you British in high regard for the manner in which you led and fought in WW II, and for the way we have worked together during the Cold War and the post -Cold War period. Thirdly, and I just alluded to this element of our friendship, we have many shared experiences in helping shape a better world. Those trials and, in most cases, triumphs, have added an important dimension to our common history. Finally, and most important, are our shared values. We in the United States inherited from you most of the values that shape our government and our lives. We will always be grateful.

Still other bonds link the RAF and the US Air Force. We share an emphasis on advanced air power technology to make our countries more secure and more influential in world affairs. This has been showcased during our meetings this week. Again, the Air Force Historical Foundation thanks the RAF Historical Society for a stimulating and rewarding seminar that has further illuminated our relationship.

CLOSING REMARKS

Air Vice-Marshal N B Baldwin

Because of the uniqueness of this occasion I suspect, had he been here, our President Sir Michael Beetham, would have wanted to close off the day. Unfortunately, he is in hospital but you will be pleased to know that he is due out shortly and Lady Beetham tells me that he is recovering well. He would, I am sure, have talked about the natural relationship between our two organisations.

For me that relationship is epitomised by an event that occurs on a late spring day every year. For several years now, on US Memorial Day, as Chairman of our Society, I have had the privilege of laying a wreath, on the Air Force Historical Foundation's behalf, at the American Cemetery at Maddingley near Cambridge. As you stand there, surrounded by thousands of white crosses, looking out over the flat Cambridgeshire fields, it is not difficult to imagine fleets of B-l7s and B-24s, escorted by Rolls-Royce engined Mustangs, filling the sky. It brings home the fact that the close relationship between our two air forces was honed in blood during both World Wars, of course, but especially during the second of them.

When we began planning today's event, we decided that we would look at areas of historical co-operation other than the WW II strategic bombing offensive. We had already mined that rich seam comprehensively in a dedicated seminar held ten years ago, the proceedings of which were published in a stand-alone volume called *Reaping the Whirlwind*. Instead we elected to explore other avenues and, as we have seen today, there was a wide range of activity that deserved our attention.

My own thanks to all of the speakers, from both sides of the Atlantic, who have made this event possible. We will record your papers and the discussion periods in the usual way. And the journal will be sent to members in the fullness of time.

SUPPLEMENTARY PAPERS

THE JOINT COMMANDER'S OVERVIEW OF RAF/USAF OPERATIONS IN THE 1991 GULF WAR

Air Chief Marshal Sir Patrick Hine

I much regret not being able to attend the RAF Historical Society's recent seminar on the Gulf War of 1991, because it is always preferable to fit an account of air operations into a perspective that includes broader strategic and political considerations. However, having read Air Chf Mshl Sir William Wratten's excellent and detailed account of RAF/US air operations at the time, I would like to make a few general points as well as some specific comments from my standpoint as the Joint Commander for Operation GRANBY (the UK's equivalent of DESERT SHIELD/DESERT STORM).

First, it is important to outline the higher military C2 structure (below MOD level) for the 1991 Gulf crisis and war. Since the late 1970s, the British have appointed a 4-star Joint Commander, with his HQ in the UK (in this case High Wycombe), for all major 'out of area' (non-NATO) operations, and to whom reports a 2- or 3-star Joint Force Commander (JFC) in theatre. This structure worked well in the Falklands War of 1982 but had to be adapted for the coalition formed in 1990 to deal with Saddam. While it was clear from the outset that the Americans under General Norman Schwarzkopf would lead any military operations in the Gulf, Saudi sensitivities had to be observed, and so the British Ambassador, (now Sir) Alan Munro, and I negotiated a position in Riyadh whereby all British forces in Saudi Arabia would be placed for war under the tactical control of CINC CENTCOM whilst remaining under national operational control and being 'subject to the overall strategic guidance of the Keeper of the two Holy Mosques', ie King Fahd! Effectively, my opposite number was General Schwarzkopf and from September 1990 Lt Gen Sir Peter de la Billière was my subordinate commander in theatre. I retained operational command; he was delegated operational control. Under him were the British component force commanders, with AVM Wratten (as he was then) being our Air Commander and working very closely with General 'Chuck' Horner, the overall Air Component Commander under Schwarzkopf. This C2 arrangement may seem somewhat complicated but it worked well, largely because of good

personal relationships, not least my own with Norman Schwarzkopf.

In the lengthy run-up to war, I used to visit the Gulf every three weeks or so and, *inter alia*, always met with Schwarzkopf and the Saudi CinC, Prince Khalid. At my first meeting with CINC CENTCOM around the end of August 1990, he stressed the importance of air power in any operation to expel Saddam from Kuwait. To minimise the risk of heavy (American) casualties, he would require the coalition air forces to reduce the combat effectiveness of the Iraqi Army in the Kuwait Theatre of Operations (KTO) by at least 50%, principally in terms of armour and artillery. While that, for him, was a pre-condition for any major ground offensive, Schwarzkopf was clearly attracted by an initial air campaign plan put together by USAF Colonel John Warden, Head of a small strategy and planning unit in the Pentagon known as the 'Checkmate Division'. This plan argued that, given the new precision and lethality of modem air weapons and the optimum selection of strategic targets, the Iraqi national leadership could be effectively 'incapacitated', with such paralysing results that there would be no need for any major ground operations to secure Saddam's withdrawal from Kuwait. This strategic emphasis was consistent with the USAF's slogan 'Global Reach – Global Power' which was being championed at the time by the then Secretary of the Air Force, Donald Rice (an ex-Head of the RAND Corporation) and the USAF's Chief of Staff, General Mike Dugan, their aim being to position the USAF favourably in the post-Cold War downsizing review that was then gathering momentum in Washington.

The USAF's Tactical Air Commanders, and notably 'Chuck' Horner, were very sceptical about Warden's claims, and Bill Wratten has alluded to the friction that resulted from Horner having an air campaign plan drawn up by others and thrust upon him. However, while the plan was modified and expanded in theatre over the following months, there remained a strong focus in Phase 1 (I suspect with 'encouragement' from the Air Force HQ in the Pentagon) on strategic air operations which were principally designed to precipitate the collapse of the Iraqi leadership. While Phase 1 clearly failed to achieve its primary aim, it succeeded spectacularly in obtaining rapid air superiority and then air supremacy – a vital prerequisite for the success of our wider coalition air operations and the safe build-up and

deployment of the ground forces to their forward positions.

Schwarzkopf wanted two capabilities from the British: the Tornado GR1s with their JP233 airfield denial weapons – a capability lacked by the Americans – and an armoured brigade with Challenger tanks to add fire power to the US Marine Corps' ground forces. Once HMG had agreed to this request, I was authorised to advise Schwarzkopf that all British forces in theatre would be placed under his tactical control once I was satisfied that the tasks envisaged for them were consistent with my Directive from CDS. Schwarzkopf was grateful for this commitment and in turn agreed to my request that our JFC should be included at his daily meetings with his national subordinate commanders and that British officers should join his operational planning teams.

At a later meeting I had with Schwarzkopf towards the end of October 1990, which effectively coincided with the transition from DESERT SHIELD (the defence of Saudi Arabia) to DESERT STORM (the recapture of Kuwait), he told me of an ongoing battle in Washington over the further build-up of American forces in theatre above the authorised 230,000. He said that the 'air heads' (but not Horner) were telling the President that the air campaign should be so effective that there would only be the need for mop-up operations by the ground forces. He and the Chairman of the Joint Chiefs of Staff, General Colin Powell, were very nervous about this line because the Coalition was currently outnumbered on the ground by about 3 to 1 (a reverse Clausewitz ratio!) and thus very vulnerable to flank attack during offensive operations. I agreed with him that it was far safer, notwithstanding the anticipated high effectiveness of allied air power, to build up the ground forces to approaching parity. In the end, he and Powell won the day and a further US corps, plus additional air wings, aircraft carriers and marines were deployed to the Gulf. I mention all this because it further illustrates the inter-service politics that influenced events leading up to the First Gulf War.

At this same meeting, Schwarzkopf asked for more Tornado GR1s and additional UK armoured forces. Our War Cabinet agreed and as a result we formed a UK division in theatre and deployed altogether over sixty Tornado GR1s/lAs to Muharraq, Dahran and Tabuk.

There were also 'political' considerations affecting the RAF's contribution to the 1991 Gulf War. Following the *de facto* ending of

the Cold War in 1989, HMG embarked on a defence review (in all but name) known as 'Options for Change' with the aim of securing a substantial peace dividend. This review had virtually been completed by July 1990 but was put on hold when the Gulf crisis broke only a week or so later. The MOD mandarins were advocating the disbandment of several Tornado GR1 squadrons, mainly on the basis that they were the most costly to run. Unarguably, however, the Tornado GR1 (with JP233) was then the RAF's most capable ground attack aircraft, and it was realised that a good showing by its crews in the Gulf could only be helpful to the RAF's cause when the war lessons subsequently came to be drawn in Whitehall and before final decisions were taken on the 'Options for Change' review.

Against this politico-strategic backdrop, let me now comment on some of the more difficult issues affecting the RAF's contribution in the First Gulf War.

Air Mshl Wratten recounts how, and why, the Tornado GR1/JP233 combination was used more to harass Iraqi air activity than to seek to close some of the enemy's main airfields. In the process the RAF crews dropped their weapons with commendable courage and accuracy but the damage done was considerably less than expected because the shock waves created by JP 233 were attenuated by the largely sandy soil upon which the Iraqi runways and other operating surfaces were built. The damage would therefore be repaired relatively quickly. Moreover, the Iraqi Air Force, apart from a few brave fighter pilots, made no attempt to join combat or to carry out ground attack missions of their own. The conclusion I drew was that Saddam was husbanding his air resources until the Coalition began its ground operations to reoccupy Kuwait. Given this scenario, and knowing that our ground offensive was not planned to start for some weeks, it would have been pointless to continue then with attacks against airfield surfaces. The Tornados were therefore switched to medium level.

There was no difference of view between the Air Commander and myself on this issue, but as it became increasingly clear from battle damage assessments that medium-level bombing and shallow dive bombing using free fall 1,000 lb bombs were having little impact (US fighter bombers dropping 'dumb' bombs from the same height were faring no better incidentally), MOD asked me to consider using the

A Tornado GR 1 of No 15 (Composite) Sqn at Muharraq during the 1991 Gulf War.

Tornado GR1s with JP233 at low level against targets other than airfields, one example being oil storage tanks against which some weapons effects experts believed JP233 would be particularly effective. Given that the RAF's flagship aircraft was being shown to be near impotent, this concern of MOD was to be expected. It was my responsibility as Joint Commander to consider other options objectively with the Air Commander and our respective staffs and then together decide what change to make. We could not have gone on as we were.

While this process put a little strain on our relationship, Bill Wratten and I had been close friends for twenty years and we worked our way through it on the basis of a common recognition of the urgent need for a step-change in targeting accuracy whilst retaining the confidence of the Tornado aircrew. In the end we rejected the alternative low-level options and agreed that the best solution lay in providing our own national 'smart' bombing capability from medium level.

Ironically, I had concluded as early as October 1990 that our Tornado GR1s needed an alternative viable attack option to the low-level delivery of JP233 or 1,000 lb retard bombs. We did have one in the form of Pave Way II 1,000 lb PGMs which could be guided by laser designation from RAF Buccaneers, and several of these weapons had been deployed to the Gulf. I therefore asked the then Air Commander, AVM Sandy Wilson, to seek General Horner's

agreement for the basing of eight Buccaneers, ideally at Muharraq, but Horner's response was that all the Gulf airfields were over-congested and that if the need arose, he would provide airborne laser designation for our Tornados. I was uncomfortable with this reaction and thus, when AVM Wratten replaced Wilson the following month, I asked him to re-open the matter with Horner. We got the same response, and I blame myself now for not pressing Horner harder, if necessary through Schwarzkopf, to get the Buccaneers into theatre. We did, however, work up some of the Buccaneer crews in the UK in the laser designation role but that was a poor second best.

Anyway, when it became clear that given his priorities on Scud hunting and 'preparing the battlefield' through precision attack on Republican Guard tanks, Horner would not be able to provide any laser designation for RAF Tornados, I insisted that the Buccaneers be deployed. They were in theatre within a few days and began successful operations almost immediately. They provided a shot in the arm for our Tornado GR1 force which then remained really effective (within the constraints imposed by the unusual extent of cloud cover over Iraq for the time of year) for the rest of the war.

Because the perceived risks of ultra low-level operations over Iraq in 1991 became such a controversial and emotional issue, there is the need to put them in perspective. As Air Mshl Wratten has said, the principal threat posed at low level after the first few days of war was from AAA and LLAD SAM. The RAF lost four Tornado GR1s during the first week of operations: two were known to have been hit by SAM, one in daylight and the other during a night pop-up attack, while the other two were lost to unknown causes but quite likely because they were flown into the ground in pitch black conditions at very low level. The crews were certainly very concerned about the density of Iraqi AAA around key targets such as airfields (tracer shells were almost invariably used with predictably off-putting effects), and yet there was no reported damage as I recall from AAA on aircraft returning from low-level missions. Historically, one would have expected such damage to be sustained by four or five aircraft for every one lost. I mention these points not because I disagreed with the Air Commander's decision in the circumstances to switch from low to medium level but because it would be all too easy to conclude that low-level operations by that time had become unacceptably risky. I do

not believe there is sufficient hard evidence to support that view. In this context, it is noteworthy that the Tornado GR1A recce aircraft continued to operate throughout the war at low level and without loss or damage from AAA or SAM.

The Air Commander has quite rightly drawn attention to the difficulty encountered in obtaining national ROE clearances. It was a much wider problem than the one he describes, and it took me several weeks to obtain MOD agreement to a set of ROE for our forces both for war and in response to a possible pre-emptive attack by Saddam. In the case of ROE for our air defence Tornado F3s, I was assured for days by MOD that the ROE issued to me and the RAF in theatre had been harmonised with the Pentagon and that thus there should be no interoperability problem. Eventually, I discovered that, unbeknown to Washington, Horner had moved from 'tension' to 'war' ROE. The ROE were then brought quickly into line.

My overall assessment is that RAF/US air operations in the 1991 Gulf War, across a wide range of roles, were highly successful. While the so-called strategic air operations with precision attack on targets in downtown Baghdad and elsewhere caught the public's imagination through regular TV coverage, it was essentially the rapid neutralisation of Iraq's Air Force, the progressive interdiction of the battlefield and the relentless attrition of the Iraqi army in the KTO, especially when the 'smart bomb' capable aircraft, notably the F-lllFs and F-l5Es, were switched there, that paved the way for a quick victory on the ground. Air power had proved near decisive and set a precedent for other conflicts of the 1990s, notably those in the Balkans. With technology moving rapidly on, especially in all-weather precision attack and timely responsiveness to changing tactical requirements, we have recently witnessed in Gulf War II a significant further extension of air power's effectiveness which if optimally used in combination with ground forces, as it was then, can provide a really decisive war winning capability. I do not expect that to change in the foreseeable future.

Finally, I was privileged to have a very experienced and able team of senior commanders and staff officers working for me in Gulf War I, both at High Wycombe in the JHQ and in theatre. They and all our armed forces performed magnificently and did our nation proud; I was equally proud of them.

ON EXCHANGE WITH THE UNITED STATES AIR FORCE - A 1970s PERSPECTIVE

by Group Captain Richard Bates

After two years as a Hercules squadron commander, a staff appointment seemed on the cards. News of a move to the United States Air Force (USAF) 'on exchange' first came by telephone, prompting a search on the nearest available map for the American locations mentioned by my poster and soon confirmed in a cryptic signal:- After AFSC, Norfolk Va, report 443 MAW TTU, Altus AFB, Ok, then to HQ MAC/DOVA, Scott AFB, Ill. In plain English this meant completing the US Armed Forces Staff College course at Norfolk, Virginia before conversion flying on the C-141 Starlifter at the Transitional Training Unit, the 443rd Military Airlift Wing at Altus Air Force Base, Oklahoma, thence to the Aircrew Standardisation and Evaluation Directorate, HQ Military Airlift Command, Scott AFB, Illinois.

Delight at this news prevailed over the Jeremiah views of some, that an exchange job meant being forgotten by the home-based RAF. It is, of course, a privilege to be selected for an exchange appointment. The RAF and the USAF have long enjoyed exchanging officers of comparable skills and the benefits devolving to the individual and the air forces of both nations. The programme has roots going back to WW II and has mostly involved the bomber, fighter, helicopter and transport disciplines, together with test flying and intelligence. The British Defence Liaison Staff (BDLS) in Washington DC maintains an overarching monitoring role and we spent time at the British Embassy for familiarisation briefings – important for both the officer and his family.

The US Armed Forces Staff College equates to a joint services staff course at home and introduces US military staff procedures, while giving the foreign student some appreciation of world affairs as seen by the United States. 'Seminars' of eighteen students were made up from the US Navy, US Army, USAF, Coastguard Service and Defence Department, with one overseas member, usually from the UK, Australia or Canada. As the one British representative in my otherwise all-US group, my colleagues expected views on all things British and European – from the Common Market to the Royal Family

An A-model C-141 Starlifter of the 62nd MAW based at McChord, Washington in 1975. (MAP)

and Northern Ireland. They were also amazed at my briefings during the Watergate episode – detail gleaned from the BBC World Service broadcasting news of events in the US capital in greater depth than was available in nearby Virginia. This was a rewarding period which cemented friendships, before a move west to Scott AFB and the cornfields of southern Illinois.

An onward 600-mile drive from Scott to the remote Oklahoma/Texas border allowed me to meet my fellow C-141 student pilots at Altus AFB. They would leave Altus and spend some two years as co-pilots operating the ubiquitous C-141, then the backbone of the Military Airlift Command. For me, the terms of my exchange meant qualifying as a co-pilot, then aircraft captain and progressing to Instructor Pilot (IP) and Flight Examiner (FE), as rapidly as possible – a daunting task eventually completed in eight months at various MAC bases, including McGuire AFB, Philadelphia. At the same time I was absorbing USAF and MAC procedures and regulations, while getting to know my HQMAC colleagues. They were doubtless observing me very carefully. Once established and qualified in the Aircrew Standardisation Office, a warm bond of confidence and trust flowed to me from my superiors and was readily reciprocated.

The MAC strategic fleet is concentrated at main locations on the east and west coasts of the Continental US (CONUS) controlled by two Air Force Headquarters subordinate to HQMAC: 21st Air Force faced east across the Atlantic to Europe and the Middle East, while

22nd Air Force controlled operations west to the Pacific and SE Asia. There were no C-141s based at Scott itself and this meant frequent 'commutes' on the regular C-141 courier which criss-crossed the CONUS. The C-141 is a robust four-jet transporter, designed to carry a Minuteman missile and straightforward to fly, while being equally demanding to operate in the highly regulated and controlled environment of Military Airlift Command – a command larger and more diverse than any other western air force, or airline. There seemed to be a MAC regulation for just about everything – from wake-up calls to sandwich fillings, from aircraft minimum-equipment lists to aircrew currency and weather minima; necessary volumes of procedures to operate a safe and standardised world-wide military airlift system. Indeed, the command had formerly been known as the Military Airlift Transport System (MATS) and has evolved and expanded to become today's Air Mobility Command. The operation was so standardised that it was possible, and sometimes necessary, to mix aircrew members from, for example, McChord AFB in the far north west, with others from Charleston AFB 3,000 miles to the south east, to produce a qualified crew. It was even mandatory to file a formal flight plan for a local session of visual circuits and to satisfy the flight plan computer, a circuit was defined as a 'Closed-pattern VFR'.

A 'MAC Waiver' could always be authorised to overrule or modify any of these regulations, where circumstances so justified. For some months during my time, political considerations meant no exchange officers travelling outside the CONUS. A ban on RAF exchange officers flying to Vietnam, or USAF officers to Northern Ireland was understandable, if sometimes given the 'Nelson' touch. But to be barred from the UK seemed a bit much. On pointing out that I would not be able to fly to RAF Mildenhall to conduct a route check, an instant 'MAC Waiver' overcame this particularly illogical ruling. Endeavouring to keep a straight face, I then asked my authorising despatcher if it would be in order for me to have MAC clearance to telephone my relatives when in England. He was about to consult a MAC manual for guidance, but appreciated in time that some perverse British sense of humour was at work.

Another feature of my role at HQMAC was working as a staff officer, while maintaining full flying currency, and indeed FE status, on an operational aircraft. However, I was never in any doubt as to

who was really being checked out whenever I was on a MAC aircraft – it was me and the RAF who were under the eagle eye of the USAF. On one memorable occasion a C-141 arrived at Scott captained by a fellow RAF exchange officer from the west coast, accompanied by a Canadian co-pilot. My appearance as a route checker was greeted with curiosity by the remaining USAF aircrew. Could this justify a re-run of the historical warning: 'The British are coming'? In fact, every detailed MAC requirement was satisfied.

Unlike the five aircrew categories from 'A' to 'E', familiar to RAF transport operators, in MAC in my time, there were just three: Qualified (Q), Qualified/Training (QT) and Unqualified (UQ). QT usually meant an observation arising during an evaluation flight requiring training to bring an individual back to full standard. Other regulations prevented officers of star rank from flying without the supervision of an IP. The absolute baseline minimum to maintain currency was two circuits and landings in a month, known in MAC as '2 and 2'. Operational missions demanded currency in every respect for all crew members, with valid evaluations, simulator checks and, of course, a full medical, including theatre immunisation requirements.

Paratroop and supply dropping sorties were also undertaken by the C-141 fleet, known as Combat Airlift Missions. Instrument procedures were practised and evaluated as routinely as in the RAF and included at the time, the relatively new All-Weather Landing System for the C-141. This would produce a safe, if firm, touch-down on more occasions than the human pilot could guarantee, but was not cleared for a blind landing in conditions of zero cloud ceiling and visibility. The one instrument approach common in the USAF, but less familiar to me, was flying a Tactical Air Navigation (TACAN) Arc. This meant holding a specified range from a TACAN ground station by maintaining a shallow rate of turn to make good an arc or curved approach, until a defined track had been reached. I also had to master the vertical tape instruments on the C-141 flight deck and soon recognised their superiority over conventional round dials. With Lockheed parentage, the Starlifter and the Hercules shared many characteristics and in the early 1970s the voluminous C-5A Galaxy, from the same stable, was joining the MAC fleet.

The command had a good safety record. There were accidents, which HQMAC took extremely seriously. I recall two involving

controlled flight into terrain, which were examined with surgical detail. The first occurred on the approach to Torrejon near Madrid where a C-141 flew into high ground resulting in a total loss. The second was similar in nature and involved a C-141 descending into La Paz, Bolivia when the aircraft struck a mountain peak. This prompted a forensic review of all South American airfields used by the USAF. The report was completed expeditiously with the co-operation of the countries involved. The result was a comprehensive evaluation of all approach and departure procedures. Although not involved in the review itself, I was asked to edit the report with the aim of producing a reasonable level of international English. Once edited, the document was promptly graded 'NOFORN' (No Foreign Eyes) and technically, I could not then see my own re-drafting – an illogical situation, readily appreciated by my American colleagues and promptly overlooked.

On another occasion during the 1973 Arab/Israeli war, I was asked not to attend the routine morning briefing. I agreed, and set about other tasks. On their return, one of my colleagues explained that this had included a report on the war and I was excluded in deference to the principle of protecting intelligence sources. When he went on to explain that the source had been the British Embassy in Beirut, the irony of the situation was soon apparent. It was during this episode that HQMAC began planning to avoid the delay of trans-Atlantic refuellings at Lajes AFB in the Azores, always subject to diplomatic clearance. It was decided to 'stretch' the A-model C-141 to produce a longer-range aircraft, with increased payload and an in-flight refuelling capability: the C-141B.

There was a tendency, well understood by the BDLS in Washington, for exchange officers to be at risk of considerable over-assessment on their confidential reports. It was even suggested that one USAF superior had been so impressed with his RAF exchange officer that he intended to modify the reporting form to make a grading of '10' available, instead of the normal '9' maximum. We endeavoured to standardise reporting levels, once portraying Winston Churchill as being hard pressed to earn an '8' for 'power of verbal expression', even on a good day.

I have alluded to the trust and confidence enjoyed by many exchange officers, once they had become established in their new working environments. During my time, the Vietnam war ended and

former prisoners of war were returning home. One of the first ex-POW pilots to join MAC and convert to the C-141 was assigned to me as his instructor for training at Altus. This was a privilege for me, and I recall our mutual rapport as he progressed to a high standard and went onto join his squadron in California.

Off-duty, there were many social and sporting activities, cricket not being among them. We did introduce darts and Boxing Day, and held a Burns Nights, complete with a piper and a haggis produced by a local butcher, apparently using a recipe enjoying a 'MAC Waiver'. I recall being asked for comments after one formal dinner night. 'Absolutely splendid,' I replied, as indeed it had been. 'But you must have some comment,' I was pressed. I offered the suggestion that the Heads of State represented by exchange officers could be recognised in a toast, as we did at home. 'Even better, why not ask the senior foreigner present to propose the toast of the President of the United States?' Both suggestions were accepted with alacrity and introduced on all future occasions.

A memorable three-and-a-half years with the USAF was drawing to a close. I have an enduring respect for my American colleagues for their professionalism, enormous assistance, great friendship and ever-generous hospitality. All too soon my poster was on the telephone once again, announcing I was to return home, to take command of RAF Brize Norton – evidently not entirely forgotten.

A Charleston, SC-based C-141A of the 437th MAW on the ramp at an airfield in the UK, probably Mildenhall, in the mid-1970s. (MAP)

OPERATION TORCH – A SPECIFIC INSTANCE OF RAF/USAAF CO-OPERATION

I was recently privileged to have sight of the privately published autobiography of AVM Sir Laurence Sinclair. His experiences in North Africa in 1942-43 provide an interesting insight into the way in which informal RAF/USAAF collaboration in the field worked to the mutual and immediate benefit of both air forces, leaving the short-circuited military bureaucracy to paper over the cracks in arrears. As such, the following condensed and edited extract is relevant to the overall theme of our seminar and provides an interesting footnote to Dan Mortensen's paper. That said, it is evident that Sir Laurence's recollections were largely based on his memories of the events of half-a-century before and, as such, there are some inevitable deviations from contemporary records. Nevertheless, they do provide a personal perspective and thus, I believe, add some colour to our discussions.

Gp Capt Sinclair was OC 326 Wg which had been formed to participate in Operation TORCH, the invasion of North-West Africa. His command comprised Nos 13, 18, 114 and 614 Sqns which were equipped with obsolescent Blenheim V light bombers. Sinclair was aware that there were stocks of Bostons available in the UK and, prior to the wing's deployment, he had requested that these be broken out of store to replace the inadequate aeroplanes that he had been allocated. His request was denied on the grounds that the Boston lacked the necessary range. Within six weeks of its arrival in Algeria the wing had lost almost fifty aircraft, No 18 Sqn having been virtually wiped out when none of the eleven aircraft despatched, unescorted, to attack a German fighter airfield on 4 December 1942 completed the mission. **Ed**

….we continued flying by night but the weather got worse and enemy defences stronger and my casualties mounted. Things became so bad that they milked the Blenheim OTUs and sent their aircraft out to bolster my numbers. When they arrived I managed to keep some of the instructors as well. This gave me a few more crews than aircraft, which was a good thing as it meant that they were not all on permanent standby.

We were lucky to receive these reinforcements as, in mid-February, the *Afrika Korps* launched an offensive at the Kasserine

An A-20B of the 47th BG over the Mediterranean.

Pass, which was on the dividing line between the 1st and 8th Armies.[1] The Americans took the brunt of the attack and retreated in disorder. We were asked to provide maximum support, which was a nightmare as the weather was dreadful but we managed to keep flying.

The American A-20 group on a neighbouring airfield was having a rough time as they had been trained to bomb from low level and trying to do this in daylight against experienced German ground forces was creating heavy casualties without inflicting much damage on the enemy. Their CO, Col Tyrell (*sic*[2]), whom I had never met, rang me late in the evening and asked if had any suggestions as to how they might improve their performance. I told him to fly in box formation at 4,000 feet and to insist on fighter cover whilst I would supply the navigator/bomb-aimers. Since my wing now had more crews than aircraft, volunteers were readily forthcoming. By morning all of the American lead ships had been fitted with British bomb sights and off they went, attacking with great effect and no casualties.[3] On one sortie, one of our navigators was very badly wounded in the leg and, as his release of bombs was the signal for the others to drop theirs, he grimly hung on until they reached the target without telling his pilot. This really captivated the Americans, and also won him the DSO.[4]

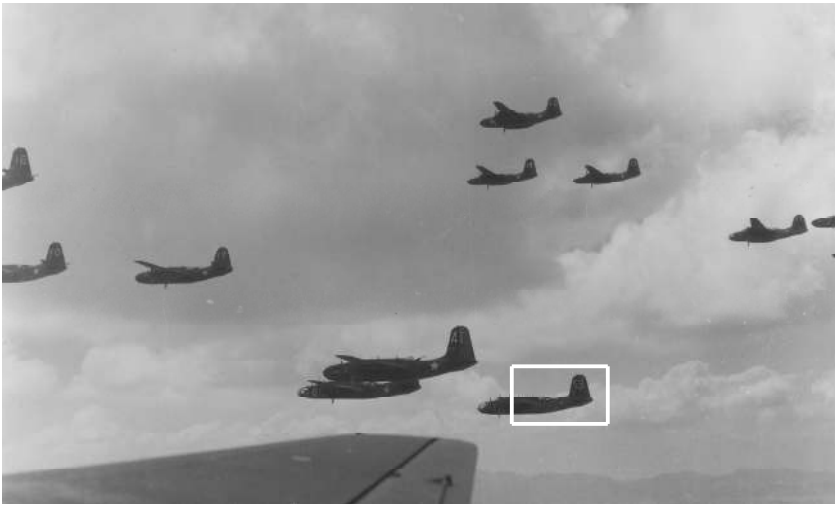
After the Germans had been driven back and the battle front had stabilised, I was told to report to Air Mshl Coningham who had recently been appointed to command the newly created Northwest African Tactical Air Force. I thought I was in for real trouble as, in

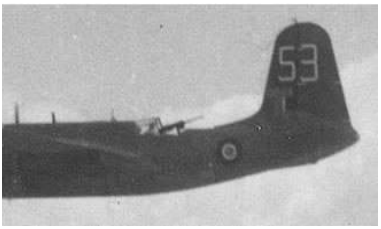
loaning my navigators to Col Terrell, I had by-passed my AOC[5] and acted entirely on my own initiative. My worst fears materialised when I was ushered into his office and saw that he had General Cuter (*sic*[6]), whose command included Terrell's A-20 group, with him. I expected the worst, but instead 'Mary' asked me if I could convert my pilots onto A-20s (Bostons) in order to take over all the American aircraft and, if so, how long would it take me. I took a deep breath and asked if I could have the whole lot, man and boy. There was a dead silence and then Kuter said he would agree.

Then I asked Kuter if all of the Americans, aircrew and ground crews, could be provided with tents, permitting them to live in the same way as we did. At the time they were in 'foxholes', badly made dug-outs, some with tin roofs and other material that they had scrounged. They had not been trained to look after themselves like soldiers and consequently they all looked very scruffy and self-conscious. When the tents arrived there was an immediate and very obvious improvement in morale.

Bringing the Blenheim Vs and A-20s together effectively created the Tactical Bomber Force (TBF) which was to be formally established on 20 March with myself, promoted to air commodore, in command with Fred Terrell as my SASO. I was told to train up the Americans for the forthcoming push on Tunis. They were charming chaps and all very experienced pilots. When they had to fly with British navigators, they thought it just fine because that meant that they could even find their way about! Nothing breeds success better than success and the word soon spread so that before long the American B-25 squadrons were also transferred to the TBF and I flew regularly with their crews in order to get to know them and to be able to talk the same language.

One evening General Spaatz, overall commander of Northwest African Air Forces and the senior American airman in the theatre, landed at Canrobert with Col Larry Norstead (*sic*[7]). Spaatz had come to see how I was getting on. We had a mess in the local village so I was able to put them up for the night which provided me with the opportunity to tell him about our worn out Blenheim Vs and the Bostons sitting at home doing nothing. After supper he looked at our dartboard and asked what on earth it was. On being told, he said he would like to have a game – and could one gamble on it? When told





Our facilities may not support this, but if they do, you will be able to see that, as this interesting enlargement shows, one of the aeroplanes in this formation of A-20s of the 47th BG, 'battle number 53', was sporting RAF roundels and a fin flash.

that this was only too easy, he said 'I will put three A-20s on the table. What will you bet?' I replied that he could have my Bofors guns and, unlike most fairy stories, this one came true. He lost the game and three days later three brand new A-20s arrived.[8]

I gave one of the Bostons to each of the ex-bomber squadrons and told them to convert all their pilots as quickly as possible.[9] I then went to see 'Mary' Coningham and asked him if he would press the Air Ministry to release the Bostons in the UK, pointing out that, since there were large numbers of American A-20s operating in the theatre, the 'limited range' argument was clearly invalid.

'Mary' said that that was all very well but I could hardly expect the Americans to train my crews to fly them. I told him of General Spaatz's gift of three Bostons, as a result of which all of the pilots on two of my squadrons could fly them already. He signalled home and

almost the next day transport aircraft collected all of the pilots and flew them back to England.[10] The Bostons duly arrived, but I was told to operate only one squadron as there were no spares. Fred Terrell laughed at this and said his old group had recently been re-equipped with a later variant of the A-20 than the ones that were now being flown out to us from England. The Americans held masses of spares and still had some of their old-model Bostons sitting around doing nothing. Would I like some these?

In no time his old ones were sprayed in RAF colours. We now had bags of aircraft and masses of spares, so I started flying a second squadron. It took HQ a day or two to spot this and then the engineering staff took off. When they had calmed down a bit, I said I thought there must be a mistake somewhere as their figures did not agree with mine and asked them to come and have a look. Their head chap arrived and saw the joke. We all had a drink and the blessing to fly as much as we liked. 'Mary' thought this was just fine and decided, as we now had this extra punch, that the Blenheim Vs could go, and not long afterwards, away they went to coastal duties.[11]

A very smart American officer drove up to my caravan one morning to tell me that General Eisenhower, who was the Supreme Commander in North Africa, was on his way to visit the Kasserine Pass and would shortly be dropping in to see me as he had heard so much about the Blenheim Vs and wanted to see what one looked like. Eisenhower could not have been more friendly or more complimentary about my aircrew. Kay, his most elegant English chauffeur, then drove us round the airfield while he looked at the depleted number of antiquated Blenheims. In bothering to do this, I felt that he had paid us all a great compliment and it was a tremendous boost to the morale of all air- and ground crews, and I was most grateful.[12]

Note. *No 326 Wg was not alone in being provided with under-the-counter American hardware in the Mediterranean theatre. At much the same time No 225 Sqn acquired a pair of F-6As (reconnaissance variants of the Allison-engined Mustang). This initial quasi-official 'gift' was followed by two more, plus another four which were taken on charge by No 14 Sqn; all of these airframes retained their USAAF identities. Later in 1943 No 1437 Flt operated six A-36As (the dive-*

bomber version of the Allison-Mustang) which it adapted for use as reconnaissance aircraft; in August 1943, by which time the unit was based in Sicily, this arrangement was regularised when the four survivors were assigned RAF serials. These were not the only such instances, of course, and there similar cases of quasi-official acquisitions of US aeroplanes in the UK (and vice versa). **Ed**

Notes:

[1] Eighth Army did not participate in the actions in the vicinity of Kasserine which focused on the front held by the 2nd US Corps and the adjacent 19th French Corps, with elements of 5th British Corps being redeployed from further north to bolster the line. All of these formations were subordinated to Gen Anderson's 1st Army.

[2] Lt Col (later Col) Frederick R Terrell, was CO of the 47th Bomb Group (Light) which was flying its A-20Bs from Youks-les-Bains and Thelepte.

[3] The US official history (Craven and Cate) acknowledges that the 47th BG had to be retrained using British techniques, and that its A-20s were equipped with the Mark IX bomb sight. Similar confirmation is provided by No 114 Sqn's ORB, which also notes that several of its navigators (and air gunners) flew with the Americans.

[4] This incident almost certainly refers to FSgt R D Cooper of No 114 Sqn, but a DSO would not have been appropriate for an NCO; nor did he receive a DFM, although he may have been awarded a US decoration.

[5] Air Cdre G M Lawson, AOC 242 Gp.

[6] Brig-Gen Laurence S Kuter had recently arrived in North Africa to command, *inter alia*, the USAAF's XII Air Support Command, which included the 47th BG(L), but under the major reorganisation of local command arrangements he soon became deputy to Coningham.

[7] Col Lauris Norstad, who would eventually rise to become SACEUR, November 1956-January 1963.

[8] No 326 Wg's ORB records this visit as having been on 4 February and notes the subsequent loan of three A-20s. No 18 Sqn appears to have taken delivery of the first on 9 February and they started to fly it five days later. There was some juggling of airframes thereafter but by the time that the first Boston arrived from the UK the unit was operating five USAAF aeroplanes.

[9] Of the four units comprising No 326 Wg, only two, Nos 18 and 114 Sqns, were experienced in the bomber role, Nos 13 and 614 Sqns having previously been assigned to army co-operation duties, and it is evident from Sinclair's memoirs that he perceived there to be a distinct difference in their relative levels of expertise.

[10] Sixteen of No 114 Sqn's pilots and gunners left for the UK on 2 March. The first six Bostons arrived from England on 30 March.

[11] Nos 18 and 114 Sqns were re-mounted on Bostons in March/April 1943; Nos 13 and 614 Sqns, the ex-army co-op units, retained their Blenheim Vs until both were re-assigned to work with the Northwest African Coastal Air Force in May.

[12] No 326 Wg's ORB records this visit as having been on 13 February.

JOHN TERRAINE – AN OBITUARY

In 1996 the Journal of the Western Front Association published a special tribute to its Honorary President, John Terraine, to mark his 75th Birthday. Air Cdre Henry Probert had been invited to contribute to this on behalf of our Society. John died on 23 December 2003 and members may be interested to read what Henry wrote.

I first met John sixteen years ago when Lord Trenchard, the son of 'Boom', was seeking to persuade him to write a new history of Bomber Command's work in the Second World War. As Head of the Air Historical Branch and guardian of many of the documents, I had been invited to join the discussions. While John was reluctant to tackle Bomber Command on its own, he subsequently told me that he was attracted towards a wider book about the RAF's overall contribution to victory in Europe. To me, this concept made good sense; not since the three-volume history written jointly by Denis Richards and Hilary Saunders just after the war had anyone tackled this subject as a whole, and there was now far more documentary material and independent research available. And who better than John to attempt it, bringing to bear his great skills as a military historian and also the perspectives of the First World War, so essential to comprehension of the Second.

So for the next few years John became an honorary member of my Branch as he beavered away on his research, and in 1985 appeared one of the finest books ever written about the history of the Royal Air Force, *The Right of the Line.* Here the RAF's role in the Second World War was placed in the broadest context, described with deep understanding and perceptively analysed, and John drew many lessons of permanent value to students of military history. Just as important – in his own inimitable way – John paid high tribute to the airmen who stood at the right of the line – a term whose significance was sadly not appreciated on the other side of the Atlantic where his history was uncomprehendingly retitled *A Time for Greatness.*

His book has not only been widely read and used as a source of reference ever since but it was the catalyst for a major innovation in the world of RAF history. When John addressed RUSI on the theme of his work in 1985, the interest shown prompted the first moves towards the formation of the RAF Historical Society, which has grown from strength to strength and now has a world wide reputation.

John, a founder member, has himself lectured to the Society and contributed to a number of its seminars and, as one who has helped guide the Society's fortunes since its inception, I rate his contribution as one of the key factors in our success. I am both honoured and delighted to have been given the opportunity to join in paying tribute to one of our finest military historians and a good friend.

FEEDBACK

The last word on 'A Supply Aspect of the Falklands Campaign'

Derek Waller is, of course, correct in what he has to say about the supply of Conway engines. Although engine reserves were considered adequate to cope with anticipated operations and the normal flying programme, the Conway position was less sanguine.

The increase in defect rate since early 1981 had led to the robbing of in-use aircraft. Rolls-Royce were pressed, therefore, to accelerate their output to match arisings in excess of the normal 3-4 per month.

By early May, the position was already improving with a net 3 reserve engines. It was anticipated (correctly) that Rolls-Royce would continue to raise output to ensure a satisfactory position by June.

My only other comment would be to observe that the spirit of co-operation and close engagement between the RAF and industry demonstrated during Op CORPORATE presaged an even closer relationship during Op GRANBY.

Air Cdre Peter Dye
Innsworth

BOOK REVIEWS

Frank Whittle – Invention of the Jet by Andrew Nahum. Icon Books (Grange Road, Duxford, CB2 4QF); 2004. £9.99.

Whittle would figure amongst most people's lists of Great National Inventors, and this tactful and perceptive study of the jet pioneer and his colleagues is far from the technical account one would expect from the Senior Curator of Aeronautics at the Science Museum.

In March 1936, when Whittle accepted the offer from a newly formed private company, Power Jets, to develop his invention, he was still a postgraduate student at Cambridge, and the Air Ministry agreed to second him to work for it, on full pay.

Tizard, the scientific adviser to the RAF and AVM Freeman, who was to become the Air Member for Research and Development on 1 April 1936, understood the potential importance of a new form of aero-engine, but Freeman was already planning that half the most powerful engines needed for re-equipping the Royal Air Force would be made by Rolls-Royce and the other half by Bristol. There were hopes of new engines from Napier, and even from Fairey, but the low-key policy adopted for the Whittle engine would not distract attention from urgent existing contracts.

Whittle got independence, and adequate backing during this initial stage, and readily agreed to subcontract manufacture to the British Thomson Houston Co (BTH) since he undoubtedly shared the 1930s layman's distrust of the possible motives of the established aero-engine firms.

By 1940, Power Jets was almost wholly dependant on Government support, and, having chosen the Rover Company to make their new engines, in a new factory financed by the Ministry, Power Jets and Rover were forced into a close association.

The confidence of Whittle and his colleagues in both Rover and the Air Ministry policy, cooled rapidly as they became worried that hypothetical patent rights might be jeopardised by working with Rover, and this abraded their relationships. Pre-eminent as a mathematician and inventive engineer, the distractions of production and managerial responsibilities exposed Whittle's limitations.

A 'Gas Turbine Collaboration Committee' had been formed in 1940 under Roxbee Cox, and Power Jets, the RAE, Metro-Vick and de

Havilland, all benefited from the exchange of information. Neither Metro-Vick, nor de Havilland, had major engine contracts, and soon, both were working on new jet engine designs

The W1 engine made for Power Jets by BTH, gave only 1,000lbs thrust when it powered the first flight of the Gloster E28/39 in May 1941, but, eighteen months later, the newer designs made by Rover, were still giving only 1,600-1,800 lbs, experimentally. The new de Havilland jet engine, designed by Halford, and made at de Havilland, produced 3,000lb thrust as early as June 1942. As ever, the need for greater reliable power was paramount.

Power Jets had thus lost their decisive lead by the time that Freeman was reinstated as Chief Executive of MAP in October 1942. Since Whittle disliked his suggestion that R-R should take over PJ, they took over the Rover Jet factory instead, with Lombard, its brilliant manager. Developing existing Whittle designs with the full weight of the Rolls-Royce precision engineering resources behind him, Lombard produced two viable jet engines, the Welland, with some 1,600lbs thrust and the Derwent 1, which gave 2,000lbs, and in October 1944, their own development of the Whittle/Rover 'straight through' design, the Nene, gave 4,000 lb thrust when first tested. Rolls-Royce did not need Power Jets to design their future jet engines

The tale, and glimpses of the people involved, is told with sympathy and discretion.

Anthony Furse

Flying Guns – World War I and **Flying Guns – The Modern Era** both by Anthony G Williams and Dr Emmanuel Gustin. Both were published in 2004, the first by Airlife at £30.00, the second by Crowood at £29.95.

In *Journal 29* I reviewed *Flying Guns – World War II* by the same authors. The content of their latest titles follows the pattern established by the original volume but bracket it in time. Each one opens with an essay which explains the workings of contemporary gun mechanisms, so the WW I volume is largely to do with rifle calibre machine-guns whereas the later one has to deal with single-chamber versus the complexities of revolver and rotary cannon. Thereafter, some chapters concentrate on the evolution of aircraft guns while others focus on the applications found for these weapons, so that, in addition to fixed

installations, turrets, pods and pintle-mounted guns are all covered, with a whole chapter of the post-war book being dedicated to the helicopter. Finally, there are appendices which: provide the key data for each type of gun and each type of cartridge; tabulate the gun armament carried by just about every aeroplane that saw service, and some which did not; and present comparative line drawings of the most common weapons to a constant scale. Both books are copiously illustrated with photographs.

As with the WW II book, I do not consider myself competent to question the authors' evident expertise when it comes to their consideration of the pros and cons of different weapons. In the specific context of the armament of the aeroplanes of 1914-18, however, the man one has to impress is the very hard to please Mr Harry Woodman and in a recent review, he gave the first volume his enthusiastic endorsement, which is good enough for me.

That said, while the authors' command of their subject is impressive when they are dealing with their stock in trade of calibres, harmonisation, recoil, synchronisation and the like, when they stray into more general fields of aviation their grasp is less secure. This was particularly apparent in the WW I volume (which actually covers the period up to the mid-1930s) which contains a fair amount of incidental duff gen. For instance: Louis Strange's Martinsyde belonged to No 6 (not 1) Sqn (p51); the Curtiss F8C was a two- (not three-) seater (p107) whereas the Fairey IIID was three- (not two-) seater (p119); and we are told that the first aeroplane to bomb London was an LVG C.II on 28 November 1915 (p67) and an LVG C.IV in November 1916 (p73) – it was the latter, on the 28th; the German airships L3 and L4 were built by Zeppelin, not Schütte-Lanz (p74); and the first Lysander to be sent out to India went in 1938, not 1936 (p112). Of rather more significance, we are told that when it was married to the RFC, the RNAS's dowry included 'eleven airships, of which eight were rigids' (p80); the actual figures were sixty-six (of which fifty were immediately available) and four. Even more curious is the contention that No 80 Sqn lost 168 officers between March and November 1918 (p80) and that it suffered a 75% loss rate *each month* throughout that period (p105). These figures are grossly in error; No 80 Sqn's actual losses amounted to thirty-seven men killed from all causes (some died in accidents as distinct from combat), eleven

taken prisoner and thirteen wounded. One can perhaps quibble over the significance of various wounds but the fatalities are an absolute and, while No 80 Sqn did suffer more than most single-seater outfits, the difference was not that great; Nos 3, 54 and 65 Sqns all sustained thirty-four fatalities during the same ten months. The authors seem to be far more at home with the post-WW II era, although there are still a few errors, eg the Brigand operated over Malaya, not Burma (p82); the RAF's Washingtons were B-29s, not B-50s (p86), and there are some dodgy conversions of metric to Imperial measures, eg on p118.

The adverse comments I made on the 'readability' of the original book are equally applicable to the two additions. It is not that any of them are badly written. Quite the contrary, I find no fault with the grammar, vocabulary or style (although I do find the use of 'planes', instead of aeroplanes or aircraft, jarring – or is that just me?); it is simply that the nature of the material, especially in the *Modern Era* volume (endless acronyms and abbreviated designations – ADEN, DEFA, GIAT, RCMG, SUU-23, GSh-30K, RMK30-1, M61A2, SPPU-687, 9A-4273 – laced with numerical data – weights, dimensions, rates of fire, calibres and so on) makes many passages desperately indigestible. On the other hand, when dealing with less technical aspects, when tracing the evolution of tactics for instance, or when comparing the merits of traditional guns versus the seriously overstated capabilities of early missiles, the text flows freely and the arguments are both easy to follow and convincing. The book that deals with the last half-century is particularly interesting towards the end where the writers debate the case for the retention of guns for both air-to-air and air-to-ground work, consider the weapons that are actually available and speculate on the future. A particularly valuable appendix sets out to devise a means of making some sort of numerical comparison of the effectiveness of various weapons and installations. The authors recognise that their approach may lack a certain rigour, but it does appear to be objective and seems to produce sensible results.

The degree to which Williams and Gustin are devoted to their work is underlined by the fact that updates to the original volume are published on the web (at http://users.skynet.be/Emmanuel.Gustin click on 'Flying Guns of World War II' and then on 'amendments and additions') and one hopes that this admirable practice will be extended

to cover the two new books.

So, to sum up, the three-volumes in this series tell the whole story of the evolution and employment of aircraft guns in the 20th Century and it seems unlikely that there will be much need to add more than a few footnotes in the future. It does this in sufficient detail to satisfy all but a ballistics expert and in the process makes a sharply focused and very valuable contribution to the annals of air power. Highly recommended.

CGJ

One-Armed Mac by Brian Cull and Roland Symons. Grub Street; 2003. £16.99

Few people with an interest in military aviation of World War II will not know the saga of Douglas Bader and many will be aware of other aircrew, such as Colin Hodgkinson, who were similarly disabled. Indeed, there were a surprising number of amputees serving in the armed forces in one capacity or another. Bader's story, of course, told in the book *Reach For The Sky* and screened in the film of the same name, was a remarkable account of one man's determination to overcome a disability and this Bader did in full measure. Sqn Ldr J A F MacLachlan was also an amputee but, unlike Bader, his injuries were sustained during the war, rather than as the result of a peacetime flying accident.

This book tells the story of a young man, brought up in a large family by a widowed mother, who joined the RAF in the heady days before the war and who, having survived flying Battles in France, moved to fighters and acquitted himself well in the Battle of Britain. He subsequently went to Malta where he was seriously injured in air combat and lost his left arm. Undeterred, he returned to flying duties within a few weeks and after being sent to the USA and other adventures, he joined the Air Fighting Development Unit. At the end of July 1943, when just 24, MacLachlan's aircraft was lost over France and he sustained fatal injuries.

MacLachlan's story; *One-Armed Mac* is told largely through the use of letters and personal accounts, rather than in the form of an abstract biography, and this does make for a more readable account with the reader seemingly much closer to the book's subject. Brian Cull and Roland Symons have produced an excellent book and, as

with anything with which Cull is involved, it is well researched.

This is an engaging and ultimately tragic story but it is well worth the read and it throws the spotlight on a young officer whose career is not generally known.

Wg Cdr Colin Cummings

The Last Generation by Alan Roberston. Sha-a-lan Publications (online at www.thelastgeneration.ca/pages/main.html or via PO Box 8712, Victoria BC, V8W 3S3, Canada); 2000. $12.50 plus p&p.

This book has been written for the benefit of the author's family, 'until the last generation' – an intention that is implicit in his title which fails to convey any message about the contents to potential readers outside that circle. This is a pity because there is much in the book to interest a reader with a completely different set of genes. It is the story of a man who became the captain of a Coastal Command Catalina, seeing service in the Atlantic theatre and also in India. It is written in a lively and engaging style and is the first book I have reviewed for the Society which contains the 'F word'! The author is clearly very fond of flying boats and writes about them and their characteristics in a way which enables the reader to see why they have inspired such enthusiasm in him.

He received his flying training in America under a lend-lease agreement before the US had entered the war. That meant that he and his British colleagues were required to wear civvies whenever they left base and US Navy outfits, with an allowance made for RAF headgear, when on it. His training took place at the US Naval Air Station at Pensacola, a place devoted to the peacetime production of career officers in the Cranwell mode. His account of his training in the American style makes interesting reading for the lay reader and should certainly interest anyone who passed through the British system. It culminated in the Big Boat Squadron where he flew the Consolidated P2Y-2 and the PBY-5, known to the British as the Catalina. The experience convinced him that 'it was the life of a flying boat skipper for me.' On his return to the UK he was posted to No 202 Sqn at Gibraltar where he was able to resume what I think might fairly be described as his love affair with the Catalina, which had begun with their short acquaintance at Pensacola. His period at the Rock was spent gaining experience of operations as 'second dickey' before he

was sent to Coastal Command's No 131 OTU at RAF Killadeas for a course which would fit him to take command of a crew of his own.

He became, of course, the captain of a Catalina which he and his crew were required to fly out to India where they were to be replacements for No 240 Sqn at Redhills Lake (Madras). Their journey – well detailed in the text – began in February 1944 and ended when they arrived in Madras in July. It was a trip full of incident, at least so far as the Catalina was concerned, since it required a lot of attention en route, including two periods when the mainplane had to be removed and repaired whilst its crew languished for weeks on end in Cairo and Karachi. On arrival, the author expressed his wish to take his Catalina into active service only to be told that it was going to be cannibalised for spares.

This book is a difficult one to categorise for members of the Society. It adds nothing of great significance to the history of the Service but it is full of interesting things about flying boats and about the cohesion and interdependence of their crews during the lengthy and often monotonous patrols which had to be carried out by Coastal Command. The onerous role of navigators as their aircraft roamed over thousands of miles of ocean, comes in for special praise from the author, and he has plenty for all the members of his crews – not forgetting the one who brought him a delicious fry-up from the Catalina's galley on one occasion. At points in the text the author deals with his private life, both before joining the Service and in leave periods during it. In these he manages to evoke the atmosphere of wartime Britain in a readable way and I enjoyed his stories. I think it is possible that you would enjoy it too and, at the price, it will give you pleasure for longer than the corresponding amount spent at your local Chinese!

Dr Tony Mansell

Beware! Beware! By Aldon Ferguson with John Hamlin. Airfield Publications (18 Ridgeway, Wargrave, Reading, RG10 8AS); 2004. £18.00 plus £4.50 p&p.

Sadly, the market for RAF unit histories seems to be pretty limited. Understandably, therefore, most (but not all) of the usual suspects in the field of aviation publication are reluctant to invest in such projects and when they do they are likely to impose significant limits as to

length and content. One way to complete the task to one's satisfaction (or to avoid the discipline required by commercial considerations) is to make it a DIY job. I have 'been there, done that' myself and Aldon Ferguson is the most recent recruit to the select team of self-publishing unit historians. Written at the instigation of the rapidly dwindling Squadron Association, his account of No 611 Sqn's achievements has been very well produced as a roughly A4-sized, 247-page hardback.

The narrative clearly relies heavily on the F540/541, amplified, during the wartime years, by the reproduction of a generous selection of Combat Reports. This does tend to make the story a little heavy going in places, especially in the post-war era (which is covered in unusual detail), although the mixture is lightened a little by the inclusion of a few recollections contributed by veterans. Of these, I particularly liked the tale of the chap who, having had the wings of the squadron's Magister 'hack' removed and refitted in the course of its recovery from a forced landing, discovered that the controls had been incorrectly rigged. He telephoned to explain the further delay but this elicited little sympathy from an impatient squadron Ops Desk and he was told to fly it back upside down or to sit facing the tail. Most of the contemporary information appears to have been accepted at face value so combat claims are presented as understood at the time, rather than being validated against later information – and why not? – although I would like to know whether the aeroplane shot down by Flt Lt Buys on 28 April 1941 really was a He 118. Similarly, occasional anachronisms or misuses of terminology have been left uncorrected, eg: Scarfe (for Scarff) ring; the CC initials of the eponymous synchronisation gear stood for Constantinescu-Colley (not Count Contintinescu); Leigh-Mallory is presented as 'Sir' Trafford as early as December 1940; there is a stray reference to the USAAC in August 1942; and the post-war DAGGER was an Exercise, not an Operation.

Where the book scores very heavily is in its photographic content, something like 270 images being presented. Inevitably, many of these are fuzzy wartime amateur snapshots but their lack of quality is offset by their intimacy and informality and thus the atmosphere that they convey. Furthermore, they have been treated with the respect that is their due and the use of coated paper throughout (one of the options that DIY publishing confers) means that they have been reproduced

with as much fidelity as is possible. That said, I am not sure that much is gained by the half-a-dozen or more instances where a face in the crowd has been picked out of a group shot and blown up to a size that the original cannot really support so that it can be presented as a 'portrait' of an individual. I spotted a couple of duff captions, eg the 'Harrow' on page 40 is a Bombay and the 'twin Vickers' guns on page 104 are Lewises.

Lest my customary nit-picking has created an adverse impression, I hasten to make it clear that that is not my intention. *Beware! Beware!* is an excellent example of a squadron history. It chronicles the whole of the unit's existence, 1936-57, in substantial depth and includes all the annexes that one expects: COs; bases; individual aircraft on charge; roll of honour; combat claims and so on, plus an index. I do not doubt that the ex-members of No 611 Sqn have always been proud of their record. Now that an account of their exploits on Spitfires, Mustangs and Meteors has been made readily accessible by the publication of this book, we can all see why.

As is so often the case with these 'labour of love' undertakings, the author/publisher does not expect, or even seek, to make a profit. If there is one it will be donated to the RAF Benevolent Fund.

CGJ

The Effect Of Science On The Second World War by Guy Hartcup. Palgrave Macmillan; 2003. £17.99.

To describe and assess the effect of science on the Second World War in a mere 200 pages must be tantamount to an impossibility, I thought, when invited to review Guy Hartcup's revised book – originally published in 2000. How wrong I was. Guy draws on a lifetime of experience in the field, gained not least when he worked many years ago as an historian in the Air Historical Branch, and he is of course one of our members.

As Sir Bernard Lovell points out in his brief Foreword, the scope of Hartcup's work is immense. Not only does it investigate already well-covered topics such as the development and effects of radio and radar on the great campaigns, it goes too into less widely known scientific work in fields such as operational research, signals intelligence, medicine, gas and bacteria, jets, rocketry and even atomic weapons. Nor is it in any way confined to the British scene, for it builds into the

picture the research being undertaken in Allied nations, such as the USA and the USSR, and also by scientists in Germany and Japan. It emphasises contrasts too, not least in the ways in which military leaders used the scientific information available to them. Whereas, for example, the Allied experts were not necessarily better than their German opposite numbers, they were far more integrated at the highest levels of operational decision-making.

There are inevitably dangers in a book of such wide-ranging nature. The attempt to compress into a relatively short space a mass of information and judgements on almost every aspect of a huge subject makes it very hard to offer fully authoritative explanations and at least some of the book's conclusions need to be read with discretion. I personally thought certain of the references to the Bomber Offensive unperceptive, conveying the impression that the author is not exactly a fan of Bomber Command. For example, when he accuses Harris of paying too little attention to ULTRA decrypts in relation to the German oil situation in 1944, he seems unaware that the CinC knew nothing about ENIGMA and could not therefore appreciate ULTRA's full significance. So I do wonder how far we should completely trust what is written on some other subjects with which I am far less conversant.

This observation, however, is not intended to detract from the overall value of Hartcup's book. It is well written, based on extensive study, reflects in-depth knowledge of a host of subjects and is comprehensively referenced. It therefore offers an excellent guide to much of the literature for those wanting to study this most important subject as a whole or to research particular topics in greater depth.

Air Cdre Henry Probert

A Life Relived by Gp Capt Guy Bolland CBE. Blaisdon Publishing (3 Park Close, Hornby, Bedale, N Yorks, DL8 1PR or www.blaisdon.force9.co.uk); 2003. £22.25.

After serving with the Royal Mail Steam Packet Company, Guy Bolland took a Short Service Commission in 1930. He joined No 1 Sqn flying Siskins and then went to Iraq where No 84 Sqn was policing the local tribes with Wapitis. However, he considered the Iraqis he met to be 'splendid folk' and quite unlike the 'fanatical Fundamentalists who cause so much trouble in the Middle East

today'. A session as an instructor at CFS was followed by a transfer to Coastal Command's No 228 Sqn where he operated with flying boats. When war broke out he was commanding RAF Hooton Park, patrolling the Liverpool area in Ansons, and in 1940 was given command of No 217 Sqn at St Eval which was flying Ansons but received Beaufort Is in October 1940. When the author says on page 95, 'In November 1941 we were equipped with Beauforts' he must be referring to the arrival of Beaufort IIs at about that time. In March 1941 (*sic*; I am pretty sure that the actual date was 15 February. **Ed**) he was ordered to carry out a daylight bombing raid on the heavily defended port of Brest where the cruiser *Hipper* was at anchor. He regarded such a mission as suicidal and promptly declared all his aircraft unserviceable but later in the day yielded to pressure from above and dispatched three Beauforts, all of which were lost as he had predicted. It is in the province of professional airmen to argue the pros and cons of Bolland's action but he was such an airman and made his decisions in the light of his knowledge of the Brest defences, the limitations of the aircraft at his disposal and the part played by inter-Service politics, between RAF and Navy, which lay behind the request for the attack. At the least he was prepared to lay his own Service career on the line. He was relieved of his command, but this example of his willingness to stand up to higher authority when he considered that right and the welfare of his men were on his side seems to have been typical of the man.

His loss of command was followed by a posting to the Home Fleet as Fleet Aviation Officer, ending up on the battleship *King George V* – a location which gave him a grandstand view of the sinking of the *Bismarck.* Then came a posting to Gibraltar, first as a Senior Air Staff Officer and later as Officer Commanding RAF Gibraltar. His work in extending the runway of its North Front airfield was a vital contribution to the success of TORCH. His determination to keep that runway open by, for example, simply shunting crashed aircraft into the sea if necessary brought him into conflict with Montgomery but Eisenhower showed better understanding and supported Bolland. His work at Gibraltar earned him a Mention in Despatches and his CBE. He was an eyewitness to the crash of the Liberator carrying General Sikorski in July 1943 and staunchly rebutted the many conspiracy theories which surrounded that event – becoming the target of hate-

mail because of his unshaken belief in the accidental nature of the crash. He returned from Gibraltar to command the Sunderland base at Pembroke Dock and after the war had spells at the Air Ministry, the USAF Air War College and as Chief Intelligence Officer with the British Joint Services Mission in Washington, where he had access to highly sensitive Cold War intelligence. His RAF career ended as Deputy Director of Maritime Operations at the Air Ministry and he retired in 1959.

Clearly Bolland was a very competent and effective officer and this book puts flesh on the skeleton of his career in the Service which I have outlined above. There is plenty of interesting stuff, in particular that concerned with his time at Gibraltar. The sections dealing with his post-war activities are much thinner, largely because of the high security levels he was subject to. He also has interesting things to say about the lore of flying boats, with their demands for a combination of both airmanship and seamanship. This privately published book has been written with Bolland's family in mind and contains material relating to that which will not be of particular interest to a wider readership. Like all autobiographies it provides a single viewpoint on events but one can be confident about the visual acuity of this observer. Should you buy it? The asking price is a bit steep I think, but it's the sort of book which could do well on the shelves of your local library.

Dr Tony Mansell

The Battle for Europe by Roy Conyers Nesbit. Sutton (2004); £25.00.

Roy Nesbit's latest effort is very similar in format to his *Battle of the Atlantic* of a couple of years ago for the same publisher. As a result, it has the same curious page layout which involves a single 5 inch column of text with a 2½ inch outer margin which may be aesthetically pleasing to the designer but seems to me to be a substantial waste of space. Not so the content, however. This is a hefty volume, 312 pages of A4, in which the author succeeds in providing an admirably concise yet comprehensive account of the 'Assault from the West', the book's sub-title.

There are one or two typos and/or anomalies. For instance, I doubt that the Beaufighter ever figured in 2nd TAF's ORBAT (p9); for

gunnery spotting duties on D-Day the USNAF (*sic*, why 'AF'?) certainly operated a squadron of Spitfires which would have had a strength of about fifteen aircraft, but not 'fifteen squadrons of Spitfires' (p44); the Lancaster spread across pp96 and 97 belonged to No 50 (not 51) Sqn; the V-1 was not 'a rocket' (p185); and München-Gladbach is west, not east, of Düsseldorf (p258). But such pinpricks are hardly sufficient to mar an otherwise excellent presentation and, good though the written content is, this book is to do with pictures at least as much as, perhaps more than, it is to do with words. There are over 300 illustrations, mostly photographs drawn from our own National Archives at Kew and an equivalent American institution in Maryland. They are almost all of the highest quality and they have been informatively captioned and well reproduced, often taking full advantage of the large page size (no mega-margins here).

The only point on which I would take serious issue is the use of colour. This is confined to an eight-page insert featuring reproductions of two contemporary posters and a selection of paintings, several of which are of relatively recent vintage. The choice of subject is a little odd in a couple of cases, both by the war artist William Oliphant. One shows parachutists landing in mountainous terrain, which does not really seem to fit the bill, while the other is a rather Boys-Own-Paper impression of a British soldier clad in tropical kit leaping out of a Horsa-like glider while firing a Tommy gun from the hip, and shorts and berets would hardly seem the appropriate rig for Pegasus Bridge. Where the colour should have been employed was on the many maps that are used to show the progress of the campaign. Rather than being specifically prepared for the book, these have been drawn from official sources which used colour to differentiate between the symbols used to identify allied and enemy formations, the locations of the front line on various dates and so on. Here they have been printed in monotone so that all colours are grey, making most maps difficult, and one or two almost impossible, to decipher.

Nevertheless, despite my minor misgivings, this is a handsomely produced, extremely well-illustrated volume which does exactly what it set out to do which was to provide a graphic impression of the last year of the war in north-west Europe. Recommended.

CGJ

ROYAL AIR FORCE HISTORICAL SOCIETY

The Royal Air Force has been in existence for over 80 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 inter-war period, and in the era of Cold War tension. Material dealing with post-war history is now becoming available under the 30-year rule. 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 three 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 free of charge 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 £15 per annum and further details may be obtained from the Membership Secretary, Dr Jack Dunham, Silverhill House, Coombe, Wotton-under-Edge, Gloucestershire. GLI2 7ND. (Tel 01453-843362)

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 officer or airman. The RAF 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

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

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Gp Capt K J Dearman
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MEMBERSHIP SECRETARY
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