

**ROYAL AIR FORCE
HISTORICAL SOCIETY**



JOURNAL

25

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**Ex Officio*

ABBREVIATIONS

ACE	Allied Command Europe
AFD	Air Force Department (of the MOD)
AFTS	Advanced Flying Training School
AGL	Above Ground Level
AHB	Air Historical Branch
AMF(L)	ACE Mobile Force (Land)
AMSL	Above Mean Sea Level
AOG	Aircraft on the Ground (through lack of spares)
AOP	Air Observation Post
ARCC	Aeronautical Rescue Co-ordination Centre
ASOC(SH)	Air Support Operations Centre (Support Helicopters)
ASOC(OS)	Air Support Operations Centre (Offensive Support)
ASR	Air Staff Requirement
AST	Air Staff Target
ASWDU	Air-Sea Warfare Development Unit
ATOC	Air Transport Operations Centre
BASO	Battlefield Air Support Operations
BR	British (as in 1(BR) Corps – the NATO designation for BAOR)
COMTWOATAF	Commander Second Allied Tactical Air Force (A NATO appointment embracing the RAF in Germany)
CSDE	Central Servicing Development Establishment
DACOS	Deputy Assistant Chief of Staff
DHFS	Defence Helicopter Flying School
DME	Distance Measuring Equipment
ETPS	Empire Test Pilots School
GPMG	General Purpose Machine-Gun
MOD(PE)	Ministry Of Defence (Procurement Executive)
NVG	Night Vision Goggles
JHQ	Joint Headquarters
LTC	Long Term Costings
OR	Operational Requirement(s)
OTU	Operational Training Unit
PAR	Precision Approach Radar
QHI	Qualified Helicopter Instructor
SACEUR	Supreme Allied Commander Europe

SAR	Search and Rescue
SARAH	Search And Rescue And Homing (beacon)
SARBE	Search And Rescue Beacon Equipment (successor to SARAH)
SARSAT	Search And Rescue Satellite (system)
SARTU	Search and Rescue Training Unit
SH	Support Helicopter(s)
TOW	Tube-launched, Optically-tracked, Wire-guided anti-tank missile manufactured by Hughes
UAV	Unmanned Air Vehicle(s)
VCC	Vibration Control Cell
VOR	VHF Omni-Range (a radio beacon)



Pumas of No 33 Sqn.

HELICOPTERS IN THE ROYAL AIR FORCE
RAF MUSEUM, HENDON, 18th OCTOBER 2000
WELCOME ADDRESS BY THE SOCIETY'S CHAIRMAN
Air Vice-Marshal Nigel Baldwin CB CBE FRAeS

My usual thanks to Dr Michael Fopp and his staff at the Museum - as always, as a Society we are most grateful for the use of the facilities here and their ever ready help. I am equally grateful to Air Vice-Marshal John Price who has put together a wide ranging programme for today.

Our Chairman for the event, Air Marshal Sir Timothy Garden, was a latecomer to the helicopter world. We first met when, as a wing commander, he took over command of No 50 Sqn at Waddington from me. But that was a Vulcan squadron - his conversion to the rotary world came later when he commanded RAF Odiham. His other experiences, not least as Director of Defence Studies and running Chatham House, will keep us on track today.

Sir Tim - we are most grateful to you: over to you.

INTRODUCTION BY SEMINAR CHAIRMAN

Air Marshal Sir Timothy Garden KCB

Nigel, thank you very much indeed. I always seem to be taking over things from you and this morning it is as the Chairman for the day. Today we shall be looking at the range of uses of helicopters, in both operational and other roles. We have a tightly packed programme so I will apologise ahead of time to all of our speakers, as I shall be keeping them very much to their allotted times. The system, for those who have not been here before, is that we have the presentations one after another followed, at the end of the morning, by a discussion session with the speakers and then repeat the exercise in the afternoon.

It's a fascinating topic, as we can see from the numbers that have come to the Museum today to talk about Helicopters in the Royal Air Force; remember, of course, that we are the *RAF* Historical Society. The trouble with helicopters is that, in air force circles, they have always been a topic which can stir great emotions and a deal of discussion, but we are not really going to talk about the problems of today; we are going to look at the history of helicopters within the *RAF*. The *RAF*'s interest in rotary winged aeroplanes stretches back almost to its beginnings and we can now look back on nearly sixty years of helicopter operations. We shall, I am sure, hear about many of the lessons that we have learned and I hope that we will come to appreciate the increasing awareness within the air force of the major role that helicopters have to play in all aspects of operations and the growing understanding of that reality within the Service. It is a great delight to me that I finally discovered helicopters myself, albeit late in my career, but I was then at least able to spend the rest of my time in the Ministry of Defence making sure that they got a fair hearing and that we managed to increase significantly the size of the helicopter fleet and to enhance its capability. We even managed to get a few helicopter people into positions of sufficient influence to enable us to keep the message going into the future.

Today we shall be looking at the range of uses of helicopters, in both operational roles. We are now using them extensively in disaster relief, but we have, of course, long been aware of their use in humanitarian operations in terms of search and rescue; we shall also be dealing with that aspect. Nevertheless, when you look at your

programme you may feel that there are some holes in it. That is not because we are unaware of the importance of, for instance, the helicopter operations carried out in Aden, Malaya, Borneo, the Falklands and the Gulf, but because the Society has already dealt with some of these campaigns and will ultimately deal with others; they will not, therefore, be addressed specifically today, but if anyone wishes to highlight any particular campaign, any points that need to be made can be drawn out during the discussion periods.

We should remember, I think, that we are missing today one participant who would have added immeasurably to our discussions. That would have been John Dowling, of course, a great prophet of the helicopter, who very sadly died earlier this year. He always made sure that his voice was heard, that the message came across, and I believe that he did a great deal to ensure that the RAF's use of helicopters was not lost in the noise generated by the helicopter lobbies of the other two Services. So I just ask you to remember that we would have benefited greatly from his presence. Indeed, I suspect that, in effect, we may find that he will still make a contribution to the day.

SETTING THE SCENE

Wing Commander Colin Cummings



Colin Cummings is a former supplier who was bitten by the helicopter bug while serving with the SH Force during the 1960s. Besides Supply Branch appointments, he helped to develop a number of computer systems across all disciplines, including the first version of PANDORA, the flight safety management system. Colin is the author of four books, including a review of airborne forces at the Battle of Arnhem.

Leonardo da Vinci's sketches of a corkscrew aerofoil, produced in 1485, are accepted generally as the first attempt to design a rotary winged aircraft. In the four-and-a-half centuries which followed, there were many other offerings but none were truly successful. Our seminar will not concern itself with this pre-history, however, and this initial presentation reviews the first thirty or so years of the RAF's involvement with rotary wings and thereby sets the scene for the presentations of substance which follow.

I shall look at four topics:

1. The Air Ministry's initiatives and the pre-war developments which resulted.
2. Joint Anglo-American work during World War II, which led to the procurement of the first helicopters for all three British services.
3. The immediate post-war years.
4. A review of the first deployment of helicopters to Malaya, a topic already covered in detail by Sqn Ldr Tom Browning in his contribution to the seminar on post-war operations and published in *Journal 21*.

Inevitably, it will be necessary to ignore most of what happened on the wider stage and to gloss over the involvement of the other services and industry. The story starts, therefore, in 1923 when the RAF was

struggling to survive as an independent force, as the khaki, dark blue and Treasury-grey vultures circled to pick off what might be for the taking. The more cynical reader might ask, 'What's changed?'

Nonetheless, despite the machinations over the very survival of its Service, the Air Ministry offered a prize of £50,000 for a helicopter or equivalent flying machine. This offer at once drew criticism from the Royal Aeronautical Society, who observed that 'such an offer gives entirely the wrong view of the relative values of serious work along established lines and such highly speculative constructions as the helicopter.'

The competition provided a much needed stimulus amongst inventors and engineers, and numerous proposals were made in response. Many were completely impractical; others were clearly the work of some tormented genius, a few bearing all of the hallmarks of W Heath-Robinson! The development of rotary winged aircraft of any sort had always lagged behind that of fixed wing machines because of the significant technical problems and complexity involved in designing a rotating wing which would be capable of performing adequately and safely throughout the intended flight envelope. By the same token, the rotary wing required by a gyroplane, was somewhat less demanding to design and develop than that of a pure helicopter, their similarities notwithstanding. So it was that a gyroplane design found favour initially.

For those who view all rotary winged aircraft as instruments of the devil, it is worth noting the main differences between a gyroplane and a helicopter. The gyroplane, derives most or all of its lift from a freewheeling rotor and has a separate means of propulsion. The helicopter, on the other hand, uses a powered rotor as its principal source of lift, directional control *and* propulsion. It ought also to be said that 'gyroplane' is the correct generic term, 'autogyro' and 'autogyro' being trade names.

In the UK, the main force behind the development and construction of gyroplanes was a Spanish engineer and inventor, Juan de la Cierva. From his arrival in the UK in 1925, de la Cierva built a number of gyroplanes of ever increasing sophistication. His early models were based on the fuselage of an Avro 504K, the wings of the donor aircraft being replaced by a rotor system mounted over the front cockpit to provide lift. Later machines addressed, stage by stage, the many



After some ten years of progressive development, Cierva's first really practical design was the C.30 which was ordered for the RAF as the Rota.

problems of rotor technology and by 1932 these had evolved sufficiently to allow cyclic movement of the rotor to provide directional control as well as lift.

The Air Ministry obtained modest numbers of Cierva autogiros during the early 1930s and used these for experimental and low key trials work. It was not until 1935 that production orders for gyroplanes – the Cierva C.30 and C.40 - were placed. Most of these aircraft were allotted to the School of Army Co-operation where they were used for artillery spotting and liaison work. Production was undertaken by Avro, the RAF's designation for these machines being Rota I and II.

de la Cierva was killed in an airliner crash at Croydon in 1936 and with his demise the driving force behind the gyroplane as a serious commercial proposition began to evaporate. Nonetheless, Cierva autogiros continued to be built and used throughout Europe and in the US and by the outbreak of war more than 350 people had qualified for gyroplane flying licences.

The RAF's interest in rotary winged aircraft had waned during the late 1930s, however, and its autogiros had been withdrawn from use before the outbreak of hostilities, most of them being sold off. This is

perhaps understandable, as emphasis had to be placed on mainstream aircraft during the frantic efforts to rearm. On the outbreak of war, autogiros were reintroduced and those which had previously been sold were requisitioned, along with a number of civilian machines. Several autogiros went to France for gunfire support duties with the BEF, the remainder being allocated to radar calibration, a role in which they served admirably throughout the war until No 529 Sqn, to which they had been assigned, disbanded in 1945.

Our story now takes a new turn, courtesy of the Royal Navy. In 1941, the navy was anxious to work jointly with the US authorities on developing gyroplanes for anti-submarine and convoy protection work, operating off the decks of ships. This idea had already been demonstrated successfully by de la Cierva's chief test pilot, Reginald Brie, flying from the British carrier HMS *Furious* and the Italian cruiser *Fiume*. As the RN had no suitably qualified rotary wing pilots, they sought the help of the RAF. Assistance was forthcoming in the form of the ex-CO of the gyroplane unit, none other than Reginald Brie, now an RAF wing commander.

Using a licence-built Rota autogiro and a platform installed on a British merchant ship, Brie demonstrated the autogiro's capabilities to the joint Anglo/US team. Amongst those involved with the team was Igor Sikorsky and he and Brie soon developed a mutual respect. This led Sikorsky to invite Brie to see his own offering, the VS300, and, after some persuasion, he even allowed Brie to fly it.

The main advantage of the helicopter over the gyroplane, was the former's ability to hover and to make vertical landings and take offs, the latter only possible to a limited extent in a gyroplane by a 'jump take off'. These factors, coupled with other features, made Brie realise that the true helicopter, with its powered rotor for propulsion, lift and directional control was a more realistic option and had greater development potential than the gyroplane. Brie approached Air Mshl Sir Roderick Hill, Head of Procurement in the USA, and impressed upon him the essential superiority of the helicopter over the gyroplane and an order for three versions of Sikorsky's helicopters, the R-4, R-5 and R-6, swiftly followed.

For those who are aware of recent manifestations of American misrepresentation of history, it is worth noting that the RAF team was able to help Sikorsky formulate many operating concepts and to deal

with some of the ergonomic issues which arose. For example, in the R-5, the cockpit and crew positions were designated because of advice from 'the Brits' and an experimental winch was also installed at their behest.

Training in the USA for the initial group of British helicopter pilots, drawn from all three Services, was arranged alongside the US Coastguard Service. As you might imagine, it did not take long for the young students to realise that the ability to hover, allowed them a bird's eye view of the local beauties sunbathing on apartment roofs. Complaints swiftly ensued, not from the aforementioned local beauties you understand, but from a householder, annoyed that vibration from the helicopter rotors had dislodged the soot in his chimney!

The first British R-4 helicopters were assembled and brought home on a merchant ship sailing in convoy. The aim was to use the opportunity to put the new helicopter through its paces. Unfortunately, the weather conspired against the trial and few sorties were flown during the sixteen-day crossing.

In the last year of the war in Europe, supplies of the Sikorsky R-4 and R-6 began to arrive in UK where they became the Hoverfly I and II respectively. Unfortunately, their appearance coincided with a cooling in the Royal Navy's interest in employing helicopters in the anti-submarine role because the U-boat threat was being contained by other means. A consequence of this change in requirement was cancellation of the naval order for the R-5.

At about this stage, with the European war fast approaching its end, the navy and air force went their separate ways with helicopters. The RAF, for its part, had relatively few pilots qualified on the Hoverfly and there was little enthusiasm for the technology, particularly when the experts returned to civilian life at the war's end.

On arrival in UK the RAF aircraft were reassembled at Hanworth, an old de la Cierva site, and eventually an OTU was set up at Andover to train pilots from the autogiro squadron and Army AOP pilots from Germany. This unit was also tasked with training maintenance personnel.

In the immediate post-war years, the RAF's Hoverflies were employed in a variety of roles but it must be said that it was an aircraft looking for a purpose, rather than an answer to a clear operational need. Some examples of the uses to which they were put included the



A Hoverfly II (KN843) of No 657 Sqn in 1947. (MAP)

following.

- a. Support for airborne forces.
- b. Radar calibration, a role, it will be recalled, previously carried out by using autogiros to fly in circles over a known point, using their own radar signature to calibrate the ground radars. By contrast, the Hoverfly carried a two-foot circumference metal ball of a given radar response, suspended from a 1,400 feet long cable and flown at heights of up to 6,000 feet.
- c. Simulating radio sonde balloons.
- d. Very elementary search and rescue trials at St Mawgan, using a net and a strop.

One other short-lived task involved Brian Trubshaw, later of Concorde test pilot fame, delivering mail from Aberdeen to Balmoral whilst the Royal Family was in residence.

During 1946-47, the helicopter fleet was rationalised with the RAF and Army standardising on the Hoverfly II and the RN having the Hoverfly I. Although the Mk IIs were more powerful (all things being relative in this regard!), it suffered from serious oil leaks which tended to deposit oil onto the magneto, with predictable results. It is generally agreed that the navy had the better part of this exchange. The army, for its part, persevered with the Hoverfly and a separate squadron was formed which eventually became a flight of No 657 Sqn. This unit

continued to operate the Hoverfly until 1951, when Sycamores were provided.

To understand the outcome of the next phase in the acceptance of the helicopter as a serious military aircraft, it is necessary to look briefly at the industrial picture in UK. There were four home-grown types under development and one US import in production.

The first pair of British offerings were the Fairey Gyrodyne, a hybrid aircraft, and the Skeeter, originally developed as the Cierva Sceptre and about to begin a long and complex gestation. Meanwhile, at Bristols, Raoul Hafner, the Austrian designer and engineer, was working on the Types 171 and 173 which would, in the fullness of time eventually become the Sycamore and Belvedere.

The imported offering owed much to Westland Aircraft, who post-war turned to helicopters. They obtained licences permitting the manufacture and marketing world-wide (except North America) of the Sikorsky S.51, an iteration of the R-5 which had been rejected by the RN in 1944. As part of the deal, Westlands received several pattern aircraft to reverse engineer the helicopter and reduce the lead time for first deliveries. This approach was not entirely successful, as it failed to allow for the procurement of long production time items and with the economy unable to stump up the necessary dollars to buy a stock of these assemblies, delays in deliveries persisted. Westlands made a few changes to the S.51, which it eventually produced as the Dragonfly. An initial modest order came from the Royal Navy but nothing from the RAF.

By the end of the 1940s, the RN and RAF had both concluded that there was no really substantive role for helicopters and whilst each Service had a handful of prophets keeping the concept alive with trials and demonstrations, the aircraft themselves were a dwindling asset, on which ever increasing restrictions were placed, as they became older and less reliable.

The catalyst for a helicopter to address a real operational requirement was provided by the Malayan Emergency. In March 1949, the Chiefs of Staffs were advised to expect an increase in Communist banditry which would demand a counter-terrorist response. Despite their being supplied by air, allowing troops to go further and remain 'on station' longer, deep patrolling in the jungles of Malaya had a significant drawback. If casualties were suffered, the

entire effort of a patrol would inevitably be diverted into evacuating the victims. Such evacuation would take many days with the chances of the casualty's surviving reducing accordingly. Prompt evacuation by helicopter, would allow offensive action to continue, improve the casualty's prospects and boost morale all round.

Unfortunately, the RAF had two problems in responding immediately to this requirement: First, it had no viable aircraft to deploy; the old Hoverfly was simply not a contender, for the reasons outlined above. Secondly, the RAF had very few helicopter pilots. The aircraft would need to come from industry and, having immediately ruled out the Bristol 173, which was still on the drawing board, there remained the four possible choices outlined above: the Skeeter, the Bristol 171, the Gyrodyne and the Dragonfly.

Despite an early view, that the Skeeter might be a serious contender, it was quickly ruled out on delivery time, range and payload constraints, whilst neither the Gyrodyne nor the Type 171 would be available in time. By default, therefore, the choice fell on the Dragonfly, although it was accepted that it was far from ideal because of its 'hot and high' performance, its load carrying capacity and several other factors. The initial aircraft required for the RAF were taken from the Royal Navy's Dragonfly order, but only after some high level arm twisting, with the navy insisting that their first six examples must be supplied without interference.

Pilot training was also a problem and again the RN was persuaded to help. The arrival of the first RAF students for training at Gosport, however, coincided precisely with the first Dragonfly landing on its side next to the training school. Whilst a replacement was awaited, basic hovering practice was provided in Hoverfly Is, with their ceiling limited to six feet AGL! Nonetheless, the aircraft eventually materialised; the personnel were trained and the whole lot was shipped to Singapore in early 1950; operations began in June.

As mentioned in the introduction, Sqn Ldr Tom Browning dealt with helicopters in Malaya during the post-war operations seminar. Suffice to record here, therefore, that the first three Dragonflies in theatre were initially operated by the Casualty Evacuation Flight which was reorganised to become No 194 Sqn in 1953, this unit flying later versions of the Dragonfly alongside the superior Sycamore. It was soon joined by No 155 Sqn, flying the Whirlwind HAR 4. In the



The first practical British helicopter to enter production was the Sycamore. This one is an HR 14 (XG510) of No 103 Sqn in 1961. (MAP)

closing days of Operation FIREDOG, the two units were merged to create No 110 Sqn. During the ten years during which they had been committed to FIREDOG, RAF helicopters had carried 4000 casualties, lifted 100 000 troops and other passengers and shifted 1000 tons of freight.

By the end of the 1950s, therefore, helicopters had established themselves as an essential component of air power but they were, like a decent claret, always in short supply.

PERSONAL RECOLLECTIONS OF TEST FLYING AND RAF HELICOPTER OPERATIONS, 1954-79

Group Captain John L Price



Four years after graduating from Cranwell, John Price was selected for ETPS, where he first flew helicopters in 1954. During a wide range of subsequent flying appointments he commanded a helicopter squadron in Cyprus and RAF Odiham. Many of his staff appointments were also concerned with helicopters, their performance, operational procedures and the selection and training of helicopter aircrew. He joined Westlands in 1980. He has flown eighty types of aircraft,

thirty-three of them being helicopters.

In this paper I will follow the framework of *RAF Helicopters - The First Twenty Years*, published by HMSO for the Air Historical Branch (AHB). I should add that, before being asked to come to this seminar, I had not read this book and I find myself in a position of some difficulty as there were occasions where I viewed matters differently. In the interests of brevity and convenience, when mentioning this document during my presentation I shall refer to it as 'AHB records' or simply 'AHB'. I have original material relating to the period 1952 to 1964. My brief included the selection and quality of aircrew, and the development of performance planning. As far as selection goes I will start with myself.

Cranwell.

Studies at Cranwell included fighter operations, transport operations, such as air supply in the Far East and the assaults on D-Day and at Arnhem, the European bomber offensive and the effects of nuclear weapons. We touched on the war in the Atlantic, and our summer tour was to the Berlin Airlift. Flying went well. When given a choice of posting I selected transport, bomber and maritime in that order. My preference was viewed with astonishment. I was interviewed by my flying instructor and Squadron Commander, and my College Squadron Commander. It was as if it were improper to choose

something other than fighters. It should be noted that the great majority of instructional staff were fighter pilots. I have never understood why they were against the other commands. I went on fighters.

Fighters.

As you know, accidents and engine failures on the early jets were commonplace; I was not excluded but fortunately I was always lucky. Many accidents seemed to me to be avoidable and a waste. For example, at the OCU, a pilot crashed on his second ground attack sortie because his aircraft was overloaded with a full external fuel tank and full ammunition. I had only just missed the sea wall at the end of the range by the narrowest of margins. A pale-faced instructor confirmed that the exercise was dangerous and the external tanks were taken off. Apparently no one had thought of the problem, or carried out a pre-instructional test.

My operational tour was on Meteors at Waterbeach. I enjoyed it very much, and was even allowed to fly the Hurricane once. During the tour I was required to conduct an enquiry into why a pilot abandoned a take off, resulting in his aircraft being badly damaged. It was, so far as one could see, an obvious case of pilot error. The enquiry was extended when a second pilot did the same thing. I was unable to reach a conclusion because I could not obtain weight and centre of gravity information on the station. The staff at HQ Fighter Command found that both aircraft had been operating outside the aft C of G limit, which changes the handling characteristics. I was to learn later, at Boscombe Down, that this was due to the fixed wing equivalent of overpitching, but during take off rather than landing.

OC Flying Wing, Wg Cdr Barthrop, who had been on No 1 Course at the Empire Test Pilots School, encouraged me to apply for the test pilots course. I went to Farnborough in 1954.

Farnborough.

The course concentrated on fixed wing flying. Helicopters were neglected except for flights in a Hiller. It seemed to me to be an interesting field, so I applied for D Squadron at Boscombe. I was 25 years old. The minimum age for helicopter pilots in the RAF at that time was nominally 35. No preparation had been made for a helicopter course. An early Sycamore was found; there was no ground

instruction and no Pilots Notes. Neither of the two Royal Navy instructors who were brought in, one after the other, had flown the Sycamore before. After 18 hours I misjudged an autorotative overshoot asked for by the second instructor who had arrived that day, and touched the back end on the runway. The instructor immediately lowered the collective fully, and I switched off the engine. We kept straight but the undercarriage collapsed and the rotor slowly destroyed itself on the ground. The instructor returned to his base. The Ministry of Supply wrote the matter off by telephone as pilot error and there was no enquiry. A broader flight safety view might have been that a contributing cause was the lack of a proper course.

Boscombe Down.

I went to D Squadron at Boscombe on 8th February 1955. I was checked out on helicopters by Lt Lang (later a Flag Officer at Yeovilton), and Sqn Ldr Gallatly (later Chief Test Pilot at Faireys and Westland). The exercises included engine off landings on both the Whirlwind and the Sycamore. Instrument and night flying, which were regarded as routine, was also checked. Work at Boscombe included handling assessments at different weights and centres of gravity, performance measurements and so on. We had experts such as Dr Cheeseman to explain helicopter aerodynamics.

Our Senior NCO, responsible for maintenance and loading, was FS Moss who had won a DFM on John Dowling's Casevac Flight in Malaya. He was always on hand to give advice on servicing matters and on internal and external load handling. We talked about operations in the Far East. FS Moss was later commissioned, and rather worried if he went to London in uniform in case he was arrested as an ill-disguised member of the KGB in an RAF officer's uniform, sporting a DFM ribbon but no flying badge.

There was a wide range of trials at Boscombe, but I will concentrate on Handling and Performance. My log book shows that I carried out trials on the Skeeter between May 1955 and April 1957. CFS had had one for a twelve-day trial in August 1955 and was moderately enthusiastic; a particular point in its favour being its potential as a basic trainer for the Sycamore and Whirlwind. However, the AHB (page 171) indicates that, while CFS thought that the Skeeter succeeded in imitating the features of both the Whirlwind and the

Sycamore sufficiently to permit instruction in basic techniques, unrealistic throttle collective lever harmonisation was subsequently demanded by a test pilot at Boscombe Down who was inexperienced on helicopters. As a result, the then conventional relationship between throttle and lever became randomly reversed in production Skeeters, and a valuable part of their training value was lost. The loss of training value may be true, but random reversal would never have been cleared by Boscombe. The Skeeter was designed for operational Army duties, and the aim was to try to limit throttle movements additional to the collective synchronisation. This would be important for a low flying observation helicopter, particularly if the pilot had to operate the radio himself. Rotor speed control is, of course, now automatic. There was no direct liaison between CFS and Boscombe Down, and this may have led to a misunderstanding of the requirement against which we tested the Skeeter.

Boscombe also carried out performance tests on all helicopters. AHB records (page 135) that in the 1950s and early 1960s performance data was not available to the operational crews or was so unreliable, owing to the significant differences between the trial aircraft and the operational machine (in this case the Sycamores Mk 3 and 14) or due to the difficulty experienced by the test crews not at that time being experienced helicopter pilots. Also that, consequently, a mainly subjective opinion of the aircraft's performance was used during operational trials to determine the aircraft's capabilities in particular areas. In the jungle-free conditions of the Middle East the stringent 200 feet per minute rate of climb requirement was less significant and consequently the payloads offered at various altitudes were generally considerably higher than those declared in Operating Data issued by the Ministry of Supply.

In fact, by 1956 the staff of Boscombe's D Squadron included an RN lieutenant commander who had completed a full tour with the US Navy and another with the Royal Navy. He later became OC of the Helicopter Test Flight and, as such, considered my flying as a test pilot to be above average. Incidentally he had also flown in the Skeeter. As regards performance testing, the Westland archivist has confirmed by tail number that the Sycamore recorded in my log book for performance testing in 1955 was a Mk 14, ie the operational type. The third edition of Sycamore Mk 14 Pilots Notes was published, with

the appropriate performance charts, in February 1958; a copy is available here, at the Museum. The view that Boscombe's test pilots were not competent appears to have spread to CFS by 1958 and it affected the attitude of some of the 35 plus year-old pilots and QHI's who were then being trained.

This might be an appropriate time to introduce the conclusions of a combined Performance and Handling Trial. If a hovering helicopter has sufficient power to climb at 180 feet per minute vertically, clear of the ground, it is generally considered to be safe, that figure being taken as the power needed to climb out of a clearing. It is also the margin needed to control steep descents in still air, where the power required roughly equals that in a climb. If the margin is not available vortex ring airflows can develop, and recovery in a clearing becomes impossible. The same margin is required to enable the helicopter to lift off the ground immediately if ground resonance develops. It is also needed to avoid problems on sloping ground, especially on a side slope – it is always preferable to land *up* the slope if possible. The same degree of excess power is also necessary when making a shallow approach to a landing point (LP) in order to offset the loss of translational lift caused by decreasing airspeed. If the power reserve is not available the rotor speed will fall, overpitching and further loss of power will occur, particularly in piston-engined helicopters, and the aircraft will crash. There are other combinations, all equally critical and I hope you can see that it is essential that the all up weight of a helicopter is established before arriving or taking off.

Coastal Command Headquarters.

From Boscombe I went to HQ Coastal Command in 1958 to be Flight Safety Officer and Northwood's first helicopter staff officer. I visited No 275 (SAR) Sqn at Leconfield, after the failure of a grabbit hook in a live practice lift, fortunately without injury, and to discuss night and instrument flying which were being carried out with the HQ's knowledge but without a formal test procedure or appropriate Orders published by Command. The grabbit hook turned out to be a locally purchased device rather than a Service item. All hooks in service within the Command were tested; most were found to have incipient cracks. A Command OR was drafted and a new stainless steel hook was rapidly produced. That a prime piece of rescue equipment had

been left to untested local purchase shows the lack of care and attention to detail that characterised helicopter staff work in the 1950s. As to the absence of specific flying regulations, the parameters of an instrument test were laid down along with appropriate orders, although these were full of 'shoulds' and 'woulds' to meet the squadron's request for as much flexibility as possible.

The most serious matter I had to deal with was an accident involving an SAR Whirlwind. The enquiry revealed that the pilot had been sent home from FEAF as unsuitable for operations in that area. He was then posted to an SAR detachment, which had offered few opportunities for close supervision. I could obtain no specific information as to why he had been found unsuitable in FEAF. His training records were scanty except that they did establish that he had been trained by a commercial contractor. The AOCinC interviewed the pilot briefly. I still hold the view that, while all theatres have their problems, if a pilot is not good enough for you, he is not good enough anywhere.

There is one more point that is worth mentioning. On 16th October 1958 I flew to Cranwell as staff pilot to AVM Oulton who had an appointment with the Commandant at which he intended to express his dissatisfaction at the unreasonable proportion of lower ability pilots who were being selected for posting to Coastal Command. As you can see, the bias against anything other than fighter and/or fighter ground attack was still in vogue.

Refresher Course, Central Flying School.

In February 1959 I had a 7-hour refresher course on the Sycamore 14 at CFS. There were no briefing notes, no mountain flying, no winching and no night or instrument flying. Performance was not covered.

Cyprus.

I was posted to No 284 Sqn in Cyprus at the beginning of March 1959.¹ The squadron's task was troop lifting, logistic support and other related Internal Security activities, along with Casevac and Search and Rescue. Since Cyprus was rapidly moving towards Independence there was also a great deal of movement of officials and

¹ No 284 Sqn was renumbered as No 103 Sqn with effect from 1st August 1959.

VIP flying.

I was the youngest-but-one of the aircrew, and by a considerable margin, but other young pilots followed later, including a recent Cranwell graduate. After the usual brief handover and introduction to crews I assumed command of the squadron. I did the usual walk round with the Flight Commander Operations and, as I was in current practice, I flew a short local sortie. The next day I went with the Flight Commander Training for practice landings in the lower Troodos Mountains. The flight was well flown and the procedure used was sound. The Flight Commander's ability to handle the Sycamore was very good, but he did not use the check list published in Pilots Notes, wear a flying suit or carry a first aid kit. Neither did the Flight Commander Operations or some of the other pilots. That was soon grudgingly put right.

After the mountain practice I asked how payloads were calculated. The answer was that I would learn by experience; no other information was available. The subjective opinion of an aircraft's performance that I mentioned earlier, and which is reflected on page 135 of the AHB book, was the order of the day, and that was that. I was also informed by my Flight Commander Operations that I was not allowed to know the detail of any SAS work as it was secret and a leak could not be risked. They clearly felt secure in their posts! I will not bore you with the subsequent in-fighting which extended well beyond the confines of the squadron.

As I had no other basis on which to work, I had to let things run on, but I decided to review all the recent accident reports and recommendations for awards. I found that over a relatively short period in the recent past: a helicopter had crashed, killing its pilot, while practising mountain flying; another had crashed delivering a party, including a senior officer, to a landing point in the Troodos Mountains and a pilot had been given a Queen's Commendation for holding off to reduce his fuel load before picking up a casualty in the mountains, when his initial attempt to land on a small LP had to be aborted because of lack of power. Nowhere in any of the documents relating to these incidents was there any information on the weights of the helicopters or the meteorological conditions. I did not go back any further; if I had done I would have found the accident in which AHB reports (page 141) that the first unit commander in Cyprus had crashed

at 6000 feet, with three passengers, possibly in an overpitched condition (although there could have been other explanations).

To get any value out of all this I needed to know the heights at which the incidents had occurred, the relevant temperatures and humidities, and the weights of the aircraft. I concentrated on the Troodos accident as I had the height. The Met Office quickly came up with the temperature figures. Unfortunately, the station engineers could offer no specific weight figures for any helicopters. Nevertheless, it was possible to estimate the likely weights of the helicopter and its passengers and it was quite clear that the Troodos helicopter had simply not had sufficient power to land safely.

At this stage I found out how the subjective opinion of local aircraft performance had been derived. The Met Officer had provided a world-wide report on weather as well as the figures for Cyprus. The figures are still available from the National Meteorological Library and Archive. Now AHB states (on page 29) that 'there is little difference in Malaya in seasonal weather or temperature throughout the year at the low levels used by helicopters' and (on page 144) that 'Cyprus summer temperatures are only slightly lower than those in Malaya.' In fact, the Met Office data did confirm that there was little variation in weather or temperature in Malaya, but not that temperatures in Cyprus were lower than Malaya. For example the absolute maximum temperature at Kuala Lumpur was 98°F while (on page 30) AHB gives a maximum in the jungle of 100°F. At Nicosia, on the other hand, the mean July maximum temperature is 104°F and the absolute maximum over 116°F, as much as 16° degrees hotter than Malaya. The maximum monthly range in Kuala Lumpur is 34°F; at Nicosia it is 52° in February and 64° in July. The difficulty in Cyprus was the great range of temperatures, making it quite impossible to *guess* at a sensible subjective assessment. It was plain that it was essential to use accurate up-to-date information for each flight if the job was to be done properly.

Now back to planning. I asked the engineers to have the aircraft weighed; this took some time, as the kit had to be brought out from the UK. The Met Officer produced annual statistics on local temperatures. Workshops made crew room charts for performance and C of G, and there were flying-suit-pocket-sized ones for the aircrew. Bathroom scales were provided for weighing troops and loads - not a

unique innovation as the CO of the Pioneer squadron in FEAF was doing the same thing at about that time. Passenger weights continued to be estimated, with a reasonable safety margin, especially as very few of them needed to be flown to high altitudes. We were now able to predict marginal conditions with confidence and the CinC later accepted that, in the summer when visiting Troodos, where the winds and downdraughts could be tricky, it was better to go a short distance by car from a slightly lower LP. This avoided the scenario which had caused the first Sycamore CO in Cyprus to come to grief.

When I had assembled all the information I needed, I provided the Army with charts which enabled them to have a 95% chance of success in planning an operation. They could have had monthly charts but, for ease of planning, they asked for only two, covering winter and summer. If any additional lift was available on the day, or perhaps forecast the day before, it could be added to the planned loads, which is much better than having to reduce loads at the last moment.

I laid out the procedures in a Squadron Flying Order and forwarded a copy to Wing. It was neither endorsed nor forwarded to Command. The two Flight Commanders ignored it. The Training Officer said that it was alright for test pilots, but that they did not have the basic information at squadron level. It had actually been in Pilots Notes for some time. Nevertheless, some of the other pilots soon began to find that the method actually worked after they had been unable to hover on exercises given to them by the Flight Commanders. The forecasts were kept up to date by the SAR crew navigator.

The matter came to a head on one of the hottest days of the year. The CinC visited the station, and was offered a helicopter to take him to a small low level site which was not cleared for use. Without telling me, one of the Flight Commanders authorised the flight in the only available helicopter, which was on Search and Rescue standby and fully loaded. I saw what I thought was a scramble, but soon found out it was for the CinC. As it was extremely hot I had kept a check on the performance forecasts. The helicopter was too heavy for the task, so I delayed it until it was suitably unloaded. By the time the helicopter was ready the CinC had left by car. That evening he asked for an explanation. I provided a copy of the Troodos accident file and the weight and performance summary for the flight that he had been offered. The CinC made a snap visit two days later, went through the



*Troops abseiling from a Sycamore HR 14, XJ385, of No103 Sqn;
Cyprus, 1960.*

planning process with me and promptly endorsed my procedure.

Shortly after that the Flight Commander Operations, who was Duty Flight Commander that day, was off base when the SAR helicopter was scrambled. Because of his absence, the duty crew informed me that a replacement aircraft and crew had not been brought on state so I had to go to the squadron to put things in order. Within an hour the CinC had agreed that the Flight Commander should be immediately suspended. Thereafter I operated under the direct command of the Station Commander.

The problems associated with the weighing of troops and supplies were resolved by Maj-Gen Darling, the Director of Operations. There had been inter-communal tensions, and the general had set up Operation JUMPER to move troops quickly to any trouble spots.

Three helicopters were to be on call within the time it took to brief and arm the troops, and get them to the squadron. I had agreed with his staff that each of the troop sticks should be of three soldiers carrying appropriate kit. As we had to be able to respond anywhere on the island, the helicopters had normal fuel, although this could be jettisoned if necessary.

On the first call-out, a no-notice practice, all the troop sticks were well overweight. They were still repacking their kit to get the weight down when Gen Darling and the Station Commander arrived. The general immediately ordered his troops back to barracks to be retrained, weighed and tested. In the meantime, and to stress the point, they were replaced on the operation by the RAF Regiment, who were in reserve but properly trained.

Although not in sequence, I will touch on two CFS visits. The first was in 1959. The examiner and I agreed on almost every point and no criticism was made of our performance planning. On the other hand, he demonstrated an autorotational technique which I thought was too difficult for our pilots, including me, with our limited training budget; furthermore, it was, in my opinion, too risky. The next day I watched him demonstrate this technique again. His sharp flare and vertical descent ended with the tripping of the inertia switches and damage to the undercarriage. It was fortunate that he did not break the blades as we had only three sets at the time. At the conclusion of the visit I was given a written instruction that we were to use CFS procedures. I wrote on his accident report that 'I told him so'. No CFS written procedures were sent to the squadron. The second CFS visit was made by Sqn Ldr Clark in 1960. Following my check flight we agreed that training demonstrations and operational techniques were different, and that the squadron should use operational techniques on operations. The squadron's engine-off landing technique was approved. It had taken 18 months to get CFS and the squadron aligned.

Turning to some other aspects of training, instrument flying was undertaken using the procedures that I had devised for Coastal Command. A GCA return to base on limited panel was included in the test. Some of the older pilots were a bit reluctant, but we made progress, particularly with new pilots. Night flying also became routine. We used a three-lamp US Army pattern. It was easy to set up, and I used it once with oil lamps. The high lamp was on a packing

case and a soldier held each lamp so that it would not blow away in the downwash. The system was supposed to be constructed using hand torches on blocks and a post, but these were not available everywhere in an emergency.

I did not normally undertake Casevac sorties during normal working hours when other pilots were available. One afternoon in July 1959, however, I was called at home. The SAR aircraft was not used if an alternative could be found so it was my flight. There were no details other than location. The LP was in a bushy field and poorly cleared. I went in nose up the slope and wriggled in among bushes. There was some confusion on the ground and I had to stop the rotor and get out to find out what was going on. Some army vehicles had collided on a narrow mountain road near Vroisha in the Paphos Forest at about 1500 feet. One had rolled down the hillside. They had several casualties, one with very bad head wounds. I had the site cleared to a reasonable size and took the casualty with an attendant to Dhekelia, as Akrotiri, which was nearer, could not accept him. Because of the casualty's condition I could not climb high and I was out of contact with Nicosia for some time. When I could, I called for another helicopter, but still had to fly two more sorties, one to Nicosia, the other leaving Vroisha before last light and coming back via the Dhekelia Base Hospital mainly in the dark, with part of the last leg in broken cloud. It was very useful to be in night and instrument practice! Following that experience I had a combined LP Layout and Night Lighting Guide drawn on a small card and the army printed enough of these for each Section Leader to have a copy when in the field.

At the start of my tour some of the bins in the technical store had been empty while others had been overflowing. Spares were alleged to be in short supply. I spoke to OC Supply Squadron who suggested that we should review our holdings and consumption. A reluctant older pilot, who later became Flight Commander Operations, was given the job, which he did very well indeed. A three-tonner of excess or unsuitable stock, much of it dating back to the Suez Operation, was returned to stores accompanied by our wants list. The MU at Nicosia was about to dispose of stock, which had not been turned over, on the local market. So with OC Supply and our own flight sergeant, we raided the depot. We collected a number of stores including a perspex

nose for a Sycamore which would otherwise have been sold as surplus and taken months to replace from the UK. We also acquired two double stretchers which increased our Casevac capability. The balance of our demand was met from the UK in about two months. Thereafter we maintained proper stock levels. I think we only had one AOG which was difficult to satisfy after that; it was for cement to weld the navigator's boots onto his wet suit!

During an inspection of an airframe we discovered damage to the trailing edges of the rotor blades, which, apart from being structurally unsound, can impair performance. The flight sergeant was very thorough, and quickly devised a substantial repair scheme. It needed a top rate woodworker. The MU had one; he was making packing cases! We arranged for him to be transferred to the station and all our blades were soon brought up to a first class condition, including repainting. We were constantly troubled by separation of the main rotor blade spar and at one time we were reduced to just three sets of serviceable blades, but we were never all grounded as recorded by AHB (page 81). We drew the command reserve Sycamore, which gave us a spare airframe, but our flying hours were still constrained by the SD98 rate for our official establishment.

The flight sergeant organised the unit so that minor servicing could be carried out within the squadron, rather than by the station, and blades were taken off any unserviceable helicopter and put on another. A telephone was put in our airmens' billets to cover scrambles, so we no longer needed a dawn and dusk shift.

Despite occasional serviceability problems, we maintained our VIP service, and covered our SAR and Casevac commitments throughout, including on one occasion a 'Night Stork Flight' (delivering an urgent mum-to-be to the Base Hospital) and a real Army Casevac from a night exercise. Only exceptionally were non-VIP passengers carried, however, this being agreed by HQ NEAF so that we could maintain our flying standards.

There was an early engine failure at the hover before performance planning was introduced. The aircraft was written off, but we used it for troop training. When performance planning was up and running a pilot reported lack of power. A specific performance check was carried out. This confirmed the symptoms and a check of the oil filter showed that it contained metal. The engine was changed. Subsequent

formal performance testing following any reports of apparent lack of power ensured that we never had another airborne engine failure.

We had some problems with a new type of blade sent out from the UK which appeared to result in decreased performance. The engine was changed without improvement. We put on a known set of blades and performance was restored. Subsequent tower tests in the UK confirmed our assessment. The performance check could be carried out at any location, and did not require a special ground rig. Only the helicopter was needed, ballasted to an appropriate weight, plus smoke puffs provided by Air Traffic Control, to provide a datum against which to hover at zero airspeed.

On 16th August 1960 the administration of Cyprus was transferred to a joint Greek and Turkish Government. The day before, Gen Darling wrote that, after twenty-two months in Cyprus, he had no hesitation in saying that of all the units in his command, and these were considerable at one time, the helicopter squadron pulled the greatest weight. I had been there for almost eighteen of the twenty-two months.

AHB records (page 149) that with the arrival of a new Squadron Commander in February 1959 special attention was given to training, safety and, in particular, the question of overloading. Bathroom scales were used to weigh each passenger, and it was discovered that the maximum weight allowance would probably be exceeded when more than two soldiers were carried. In November, however, it was conceded that three could be carried in winter temperatures at low level. Yet none of the accidents which had occurred between 1955 and 1959, ground resonance, blade sailing, rolling on take off, dropped stores hitting the rotor blades, cable strikes, overpitching and engine failure had been attributed to overloading, although the official weight limits must have been exceeded frequently in the earlier days. I will leave you to judge if that is so .

Following the transfer of authority in Cyprus, VIP services, especially authorised passenger flights, and training were maintained, and we kept three helicopters fitted with winches. As an entry to the annual Flight Safety Competition I submitted the squadron's flight planning procedures to the Air Ministry, with various supporting papers, including the comparison of Nicosia's and Kuala Lumpur's temperatures. Some of the original documents were returned with a

polite note which said that it must have been very interesting, but nobody understood it. I often wondered who looked at it.

Operations from El Adem.

The squadron maintained an SAR detachment of two Sycamores at El Adem, just south of Tobruk. The task included desert, as well as sea rescue, and the movement of casualties, or mums-to-be, to the British hospital at Benghazi. The flight remained under the flying supervision of my squadron in Cyprus, but servicing was carried out by El Adem's Station Flight, a sort of mini-centralised servicing; additional engineering assistance was available from Nicosia. On the first occasion that a helicopter was needed for a desert rescue none was available. I arranged for the groundcrew to be transferred back to the flight and visited El Adem to inspect both operational and technical arrangements. The return of the ground staff to the flight was the first of four occasions in which I was involved in either restoring groundcrew to their proper places, *on squadrons*, or preventing their removal. The others were the transfers to Borneo from Transport Command, at Strike Command and at Odiham.

The first Flight Commander at El Adem had been my adjutant at Nicosia, an excellent organiser and a good pilot. His successor was the young Cranwell pilot who was among the new arrivals at Nicosia. He was withdrawn to the UK for a short period in 1961 to become the first Qualified Helicopter Instructor who had not previously been a fixed wing QFI. He later became Chief Helicopter Flying Instructor at CFS.

The *Snjeznik* Rescue.

The final item I want to mention in connection with my time in Cyprus is the *Snjeznik* incident on 7th December 1960. (AHB, page 144B). The ship ran aground at night in a strong gale and, no longer able to use his boats, the captain called for assistance. By first light three helicopters were positioned at Famagusta with fuel, ground crews, a doctor and an ambulance. OC Flying was in charge of the operation,. He also arranged for PR from Nicosia to take pictures.

Harvey Thompson was winched onto the ship to control deck operations. This was useful, because he spoke French, as did the captain. There was a strong wind blowing from the stern which had a very high mast, so Harvey Thompson was winched onto the bow.



XG511, one of three Sycamore HR 14s of No 103 Sqn which came to the aid of the stranded MV Snjeznik on 7th December 1960. Shortly after this picture was taken, the aircraft hit the mast and fell into the sea.

However there was no bow deck, and all the survivors were on the poop. Cables were cut away on the poop to provide a very small winching area. The main problem was that in the only possible winching position in the strong and gusty wind conditions, with the winch cable fully extended to reach the survivors, the rotor had to be over the top of the mast, with only four feet clearance.

During the operation one of the helicopters hit the mast and fell into the sea. The navigator got out quickly, but the helicopter sank immediately. The pilot's dinghy lead caught under the collective, so he went to the bottom. When he eventually got out he was unable to operate the inflation bottle of his Life Saving Jacket. He went under three more times, pushing up from the bottom for his last attempt. As his arm came out of the sea, the third helicopter crew skilfully put the strop over him. It was not possible to get him fully into the helicopter, so he was held in the doorway and flown to a small island, then pulled in and flown directly to the doctor and the ambulance. Had they not been there it is unlikely that he would have survived. It took four days for the Base Hospital to get the last of the water out of the pilot's lungs and he never flew again. My navigator and I rescued the other survivor.

After the accident the handful of sailors still on board the *Snjeznik* decided to stay put, so Harvey Thompson was winched off, but we remained at immediate readiness thereafter until boats were able to get alongside the ship again. AFCs were awarded to Harvey Thompson and to the pilot who had rescued our pilot survivor, and Queens Commendations went to the two navigators who had winched the survivors up. My log book has a Green Endorsement.

I should add that much longer winching cables are now used on rescue helicopters.

Transport Command Headquarters.

In January 1963 I was posted to HQ Transport Command as Helicopter Staff Officer. I seemed to spend an inordinate amount of time staffing MOD letters on sorties flown by a Belvedere to put a spire on Coventry Cathedral!

The principle work was tasking with HQ 38 Gp at Odiham (Sqn Ldr Barnes) and MOD. Policy matters embraced crewmen, radio fits, the standard of engine power on delivery to units and so on, plus the provision of advice to Flight Safety on helicopter matters and keeping track of Belvedere incidents. I was also responsible for co-ordinating the Operation Orders for the transfer of Whirlwinds and Belvederes from El Adem and the UK to the Far East and Aden in 1963-64. An interesting feature of this plan was the organisational arrangements for the ground crew. Odiham had just gone over to centralised servicing,



Belvedere HC 1, XG453, of No 66 Sqn at one of the LZs in Borneo.

but it was clear that this would not work on operations and it was agreed that they should be returned to the squadrons.

As the Inspector of Transport and Helicopters, AOCinC Transport Command was interested in the operations being conducted in Borneo. Sqn Ldr Barnes and I were sent to the Far East. In theatre, the visit was co-ordinated by Wg Cdr John Dowling , then Wg Cdr Admin at Seletar. At Kuching and Labuan we discussed operational and engineering problems with the Squadron Commanders and the ATOC. We were flown to the local operational areas in Belvederes and Whirlwinds. I was pleased to hear that bathroom scales were in use! Performance planning was not mentioned as a particular problem. The use of turbine engines probably helped and the temperature conditions are similar to Malaya. The weather in terms of rain and storms was, of course, often foul. Details of these operations have already been discussed by the Society and reported in its *Proceedings No 13*, so I will not cover them today. Nevertheless, two observations arising from the visit are worth mentioning. The first was that a wing commander was needed to co-ordinate all helicopter activities. The second was that spares were scarce and receipts were absorbed as they

arrived. A draft copy of my report was left with, the then, Gp Capt Freer; this was eventually approved by AOCinC Transport Command.

On returning to the UK I followed up on the problems that Upavon could help with, in particular the need for spares and proper arrangements for aircrewmen . A visit to the Director responsible for spares at Westland showed that replacements were being ordered but at too low a consumption rate and with inadequate lead times. This was taken up with MOD. One of the problems was that the SD98 Forecast Flying Rate, against which spares were ordered, was lower than the Task Rate.² We asked that all Forecast Flying Rates be raised to match the Task Rates. That was not approved but it was agreed, exceptionally, and to reduce the incidence of AOGs, that one month's spares should be added to unit holdings, in addition to normal orders. I would be interested to know whether the spares situation in Borneo did improve in 1965

Radfan.

I went to Aden on 22nd May 1964 to augment the 38 Group BASO team running the offensive side of the Radfan operation. After visiting the Headquarters I went to the Belvedere squadron at Khormaksar where I was briefed on the loads that could be carried in the Radfan. I then went to Thumier where I also agreed payloads with the Royal Navy's Wessex detachment. The area is hot in June, but the temperature variation is small during the operating hours. The temperatures in the middle of the day at Thumier, which is at about 2000 feet AMSL, only once reached 40°C, which was in line with the daily met forecasts, and less than the highest temperature in Cyprus.

I met the Brigade Major with whom I had worked during a Joint Staff College exercise, so we were off to a good start. I was given a desk and a chair alongside the 38 Group team which gave me direct access to a radio operating on air force frequencies. During that day a

² There were two SD98 rates for each helicopter type. Examples, extracted from a notebook that I used as an *aide memoir* at the time, were:

Type	Task Rate	Forecast Flying Rate
Belvedere	40 hrs	36 hrs
Whirlwind (UK)	40 hrs	30 hrs
Whirlwind (FE)	40 hrs	39 hrs

Belvedere flew up to deliver standard loads, but had to return to Khormaksar to refuel before completing the lifts. Before the Brigadier's evening prayers, the Brigade Logistics Officer asked why the Belvederes had to carry such a heavy standard load. His problem was that most mountain pickets had only a few soldiers requiring relatively modest support, and he was having to ballast the loads with water in four gallon flimsies and fuel in jerricans. Both water and the flimsies were scarce; the jerricans were almost impossible to replace. I agreed that only necessary loads should be carried. The mountain detachments were moving on, so Royal Navy Wessex recovered the empty jerricans, all other surplus material being destroyed to avoid leaving it to the rebels.

The Belvederes were asked to come next day with increased fuel loads so that they could stay on task longer, and avoid wasting time going back to base to refuel. Fuel was brought up to Thumier, and also positioned forward in drums at Paddy's Field in the next wadi. A bowser was brought up to Thumier as soon as possible. The Royal Navy had pressure refuelling, which saved time, as they could refuel with rotors running. Loads were arranged to meet Brigade requirements, rather than to boost statistics.

The most serious incident was the loss of a naval Wessex recorded by AHB (page 293). This was part of a major move. I had gone in an Army Air Corps Scout to check the sites and had tasked the Wessex to carry an appropriate weight of troops. Regrettably someone, but not the pilot concerned, had decided to do better and extra troops were taken in the helicopters.

One of the Wessex crashed in a wadi while trying to land. The reason given in the AHB book is that due to an overloaded condition the helicopter had toppled over after suffering ground resonance. When the pilot came in for debriefing I asked what load he had been carrying. It was in excess of that planned. His experience in mountain flying had probably been insufficient for him to register the increase in power that he had needed to come to the hover before the troops jumped out. A lot of helicopter time was wasted recovering the pieces of the Wessex to ensure that no part of it found its way to the Yemen where it could be displayed as a trophy. The loss of one of the four Wessex available for daily tasking, due to an entirely avoidable accident was an unnecessary waste.

Another problem was the variety of radios. The Army had VHF while the RN and RAF had UHF. The guns were on a separate net. On one occasion we learned, through the artillery net, that a Whirlwind was being fired at but, because of the hills, we were unable to contact the pilot, and he could speak to no one else. The aircraft was hit, but fortunately not badly. The need for better communications was clear.

British Guiana and Pilot Quality.

The final matter I wish to touch on was the selection of a squadron leader to command a detachment of Whirlwind 10s in British Guiana. There was some difficulty in finding a suitable officer and I had to write to MOD to ask why. The reply was that only three helicopter-qualified flight lieutenants with Permanent Commissions were available. Two were well past the normal age for promotion and the youngest was not good enough. Subsequent correspondence indicated that it was not MOD policy to put Cranwell graduates on helicopters for their first tour because they would be useless thereafter. That being the case, I asked whether I ought to stop work immediately! I was told instead to draft a letter for the AOCinC to send to the Ministry. AHB records (page 241) that Sir Kenneth Cross observed that posts for test pilots were filled either by less than the best material or by those with greater potential but who lacked helicopter experience. I think that this is unlikely for two reasons. First, because I drafted the letter and I do not remember such a statement in the final version. Secondly, Transport Command did not deal with test pilots. Moreover, the first young officer to come to my squadron from Cranwell had not only become a QHI, but the year before had completed the first Helicopter Test Pilots Course and won the Edwards Trophy. I would hardly have drafted a letter suggesting that he was less than the best material.

Conclusion.

My conclusions are as follows. In 1949, when John Dowling started flying helicopters for the Royal Air Force, it was sensible and inevitable that pilots with wartime experience should be used. It is also understandable that the RAF could not foresee the great operational asset that the helicopter would become. In the Royal Navy the advantages were more obvious, perhaps, as a helicopter can often replace a far more expensive ship.

I have no complaint about the way that the older pilots handled the

helicopter. My concern was that it was all being done by ‘seat of the pants’, when a rapid simple calculation could have prevented many accidents or increased either the payload or the operating range. Proper performance planning was essential, as was instrument and night flying. I can understand the resentment of some at having a young officer put in command of them. They had not been adequately trained in general duties and few had much hope of promotion. Neither, under the system then in force, had they been provided with any proper insight into helicopter performance and related handling. Most got on with the job properly but the attitude of a few was intolerable. A possible part of the problem was that no one at Director level at Air Ministry seems to have been given overall responsibility for helicopters with a brief covering the co-ordination of inputs from the various scientific and test establishments with the training and operational needs, and the experience, of the helicopter units.

The pilot selection problem ran on for a considerable time and a policy of sending to helicopters pilots who could not handle fixed wing aircraft well caused further problems in the later 1970s.

Another problem, caused by the exclusion of most General List officers from helicopters in the early days, was that until about the middle of 1977 there was a shortage of officers above wing commander level who had a sound appreciation of helicopter needs. At CinC level the interest was high, however, certainly from 1959 when I went to Cyprus.

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Mr Andrew Whitmarsh of the Royal Air Force Museum for Pilots Notes for the Sycamore Mk 14 dated February 1958.

LATER SUPPORT HELICOPTER OPERATIONS

Group Captain Peter Wilson



Peter Wilson's service career started in the Army, before joining the Royal Air Force in 1950 and converting to helicopters in 1957. After service with No 217 Sqn on Christmas Island, he became a Queen's Flight pilot and a Flight Commander on No 225 Sqn. Following a QHI tour, he commanded Nos 18 and 72 Sqs and then, in 1977-79, RAF Shawbury. His staff appointments included tours at the Washington Embassy and at MOD, where he was concerned with OR and Admin Plans. He left the Service in 1981 to become Director of the European subsidiary of a US defence and aerospace corporation, a field in which he still operates as a consultant.

We now move on to what became, over the years, the predominant activity for helicopters in the Royal Air Force - Support Helicopter (SH) Operations. The size, scope and flexibility of the SH Force in its heyday, before the contractions of the 1980s and '90s, are impressive to recall. Including Short Range Transport, there was a cumulative total of some twenty squadrons and units located at a similar number of stations and bases world-wide. Their commitments ranged from everyday tasking on innumerable Army exercises at well-remembered places, like Salisbury Plain, Soltau, Otterburn and Ulu Tiram, to operations in full-blown military campaigns in the Middle East and Far East, those conducted in Aden and Borneo being prime examples.

Continuing involvement in NATO exercises (for example with the Allied Command Europe (ACE) Mobile Force in Arctic Norway, Denmark, Greece and Turkey), with United Nations peacekeeping operations (for example the UN Force in Cyprus) and the long haul in Northern Ireland were interlaced with many and frequent minor detachments to locations like the West Indies, the Oman and Belize, and even one to the East River heliport in New York by a Wessex of No 72 Sqn in support of the 1969 Transatlantic Air Race.

Dwelling on No 72 Sqn for just a moment, it is interesting to recall that at that time, and into the 1970s, the squadron's twenty-four

aircraft gave it the largest Unit Establishment in the RAF. During the twelve-month period between mid-1969 and mid-1970 it mounted detachments in eleven different countries, not including the UK. In September of 1970, shortly after returning from a major deployment in the Far East, Exercise BERSATU PADU, the squadron appeared at the Farnborough Air Show using ten of its Wessex to provide a Company lift of 100 troops in a combined Harrier/heliborne assault demonstration. Ah Happy Days!

To return to the broader picture, and in an historical context, it is easy to see how such a wealth of activity, which must also include the more recent campaigns in the South Atlantic and the Gulf, could without difficulty provide more than enough material for a separate SH symposium. For today's meeting, however, we have taken account of the fact that SH operations in Aden and Confrontation in Borneo have already been well covered by the Society in earlier proceedings and we therefore offer three other topics of widely differing interest in the SH field, Operations in Northern Ireland will be presented by Sqn Ldr Tom Porteous; the history of Air Manoeuvre Development involving SH by AVM David Niven; and to begin with, in what is perhaps a lesser known scenario, Hong Kong by Wg Cdr Fred Hoskins.

With acknowledgements to Wing Commander JR Dowling MBE DFC AFC.



Wessex HC 2, XR588, of No 28 Sqn. (MAP)

ASPECTS OF SUPPORT HELICOPTER OPERATIONS IN HONG KONG

Wing Commander Fred Hoskins



Fred Hoskins was an aircraft apprentice before graduating from Cranwell in 1951. He subsequently flew Hornets in the Far East, was a QFI at Cranwell and a Canberra PR pilot before training on helicopters. From 1965 to 1968 he commanded No 103 Sqn, operating Whirlwinds in the Far East. Later on he was OC Flying Wing at Sharjah before, as OC No 33 Sqn, introducing the Puma into service. His staff appointments were concerned with Intelligence, the Army and OR. Prior to his retirement in 1975, he studied to become a solicitor; a profession which he subsequently practised for over twenty years.

In 1967 there were major upheavals on the mainland of China as the 'Cultural Revolution' gathered momentum. The British presence in Hong Kong made it a target for terrorist activity and a desirable destination for a continuous influx of illegal immigrants from the mainland. This was nothing new but the numbers rose alarmingly. Under increasing pressure, the Hong Kong Police required more assistance from the Army. An extra infantry battalion was brought in to reinforce the two resident battalions in the colony but military cover was still sparse and mobility was important.

Air support from the two Alouettes of the Hong Kong Auxiliary Air Force and an Army Air Corps squadron of Scouts and Sioux was not enough so RAF helicopters were sent to assist.

Helicopters soon became a permanent element of the Army's Hong Kong establishment and RN helicopters from the commando carriers also visited from time to time. Apart from some Sycamores of No 194 Sqn which were detached to the colony in the late 1950s, however, RAF helicopters were not based there until September 1967 when four Whirlwind 10s of No 103 Sqn arrived from Seletar. Having been ferried up from Singapore in HMS *Triumph*, a former aircraft carrier which had been converted into a Heavy Repair Ship, this detachment

established what would become a permanent RAF helicopter presence. After a few months of No 103 Sqn's aircrew and groundcrew being rotated from Seletar, No 110 Sqn, also based at Seletar, began to share the commitment. Finally, in 1968, No 28 Sqn, a pre-war army co-operation unit and latterly a Hong Kong-based fighter squadron, was re-formed to take over the Whirlwinds from Seletar. Four year later the squadron was re-equipped with Wessex. It later moved from Kai Tak to Sek Kong where it remained until shortly before the handover to China.

The crews from Nos 103 and 110 Sqns had become accustomed to flying in Malaya and Borneo where they had jungle and mountains to contend with. In Hong Kong there were plenty of mountains but no jungle, indeed, there were hardly any trees at all. On the other hand, there were islands and rugged coast lines and there were strong and tricky winds. There were also densely populated built-up areas. There was a highly sensitive border, but this was treated with due respect and no difficulties were encountered.

The tasking of helicopters was carried out in a cell in POLMIL, the joint Police and Military operations centre in the police headquarters in Arsenal Road. This worked satisfactorily as did working with the Army, once a few staff officers had been reminded of the existence of the JSP (Joint Service Publication) on helicopter operations, thus removing the need to reinvent procedures.

In addition to the usual SH tasks, such as lifting patrols of soldiers in and out of remote areas and resupplying, with and without underslung loads, there were reconnaissance and sorties which were not normally given to support helicopters, for example, flying patrols along the border with China to demonstrate our vigilance.

'Along the border' meant at very low level and within a few yards of the actual fence. It was interesting to see the huge portrait of Chairman Mao facing Hong Kong on the China side of the bridge at the crossing point of Lo Wu. In later days a 'no fly' line, dating from the days of Vampires, was reinstated but it had to be deleted again when it became obvious that the SH job could not be done unless helicopters could go right up to the border.

Occasionally RAF helicopters were tasked to co-operate with police and RN launches spotting small vessels which were approaching in the numerous channels and coves in and around the

coast and islands of the colony. This task became more frequent and more important by the end of the 1970s when, as a result of the land border being by then fairly well sealed, Chinese entrepreneurs began to run illegal immigrants into the colony using speedboats which were much faster than anything in service with the Royal Navy or the police. Once compatible communications equipment had been obtained, a call for assistance would be made to No 28 Sqn and its Wessex were used to spot the speedboats and direct the security forces. When appropriate, by 'buzzing' the boats and the use of 'Nitesun', they could be induced to take evasive action which slowed down their rate of progress which permitted the police or navy to set a precise interception course.

In the late 1960s there were instances of more explosive activity in that the communists would sometimes throw or place a bomb in the city or would booby-trap the flags they liked to plant on the mountainsides. On occasion RAF helicopters were used to airlift bomb disposal teams to a site to remove the flags and bombs. Unrest within the city ebbed and flowed but appeared to be fairly well contained by the police.

As time went by, SH tasks continued as usual, their intensity varying largely in proportion to the rate of influx of illegal immigrants. Shortly after the move to Sek Kong the trickle of 'illegals' increased rapidly. It had never been possible to seal the border completely and, unofficially, a supply of labour suited Hong Kong's booming industries. When the trickle became a flood, however, the Governor called on the garrison to stop it *but* without taking any measures which might upset the good relations between Hong Kong and China upon which the supply of much of the colony's fresh water and food (eg about 2,000 pigs each day) depended.

The first measure taken was to increase the border patrols and establish many more Observation Posts along the border. This led to a doubling of the tasks for No 28 Sqn's eight Wessex and, as there was to be no reinforcement of aircraft or aircrews, the extra effort had to be achieved by reinforcing the groundcrew and providing more spares to enable the SD98 rate to be exceeded, indeed, to be ignored. The squadron's personnel rose to the occasion; a shift system was devised and leave became hard to come by. As the result of all this effort the flood of immigrants was reduced and it was during this period that the

speedboat enterprise that I mentioned earlier became established.

Since the Royal Air Force carried out Support Helicopter operations in Hong Kong for thirty years, it is not possible to cover more than a few aspects of those operations in this seminar but, to conclude, mention must be made of the problems which can arise when balancing peacetime Flight Safety considerations against peacetime operational efficiency and urgency. A particular task for slung loads at the end of 1967 had been to lift coils of barbed wire for the 'Snake Fence' which was being built on the heights overlooking China. This was intended to provide a longstop barrier to catch those 'illegals' who had managed to cross the border itself. There was neither an SOP nor any special equipment for lifting barbed wire which, as you can imagine, was very unpleasant to handle and would have caused significant damage had it been loaded into the cabin. The solution was for workshops to make some strops of wire cable with an eye spliced into each end. The strop was then passed through the coil and the two eyes were engaged on the cargo hook. There were no trials of these strops and no testing of breaking strains. Common sense was enough to convince us that the cable was strong enough for the job. As was often the case in the SH world, decisions had to be made on the spot to get jobs done and without high level approval or reference to a development unit.

As another example, at the same time as operations were intensifying, a Flight Safety conference at HQ Strike Command drew attention to a sharp increase in the number of mid-air accidents and collisions and commanders were instructed to take action to resolve the situation. Air Traffic Control facilities at Sek Kong were minimal and once an aircraft had left the local area 'control' depended entirely on routine 'Ops Normal' transmissions and 'safety' on the pilot's lookout. With operations largely confined to a narrow strip of land along the border, and the camouflage scheme of the Wessex matching the colours of the terrain and vegetation, there was a clear need to make the Wessex more visible. The solution? To apply black and white 'D-Day' stripes which perhaps illustrates the value of a knowledge of history.

The assistance of Air Cdre T A Bennett and Wg Cdr C Cummings in the preparation of this presentation is acknowledged.

SUPPORT HELICOPTER OPERATIONS IN NORTHERN IRELAND, SEP 71 – DEC 73

Squadron Leader Tom Porteous



Tom Porteous graduated from Cranwell in 1959. After a variety of fixed wing flying appointments, he converted to the Wessex in 1970 and flew with No 72 Sqn in Northern Ireland. After retirement in 1975, Tom joined British Airways Helicopters as a North Sea pilot and eventually Operations Director. He was later Aviation Manager for British Gas and is now Director of Operations for an aviation consultancy. He flies vintage aircraft, instructs

on and tests microlights and is a member of the Society of Experimental Test Pilots. His RAF rank aside, he has commanded a TA company of the Black Watch as a major, an Army Cadet Force battalion as a lieutenant-colonel and he is now an honorary colonel in the TA.

Introduction.

I was a Flight Commander on No 72 Sqn from August 1971 until March 1974. During the beginning of that period, we provided the RAF's sole helicopter input to the Province. There was a permanent detachment of about eight Wessex with appropriate numbers of personnel in support. The people and helicopters rotated as required, and it was normal for flight crew and ground staff to spend six weeks on detachment. In the beginning there were only two Flight Commanders who rotated on a regular basis, but there were several ancillary squadron leaders who helped to spread the load. The time I spent in Northern Ireland as Detachment Commander during my tour was pretty typical. I spent about 8½ months all told in the Province out of 2½ years on the squadron. When the Puma force began to make up the numbers, there were more Flight Commanders to fill the slots, permitting more time to be spent at the home base - or on detachments elsewhere.

Tactics.

In preparing for today I analysed my logbook to see if there was a



Although heavily committed to internal security operations in Northern Ireland, No 72 Sqn had many other obligations, exemplified by this Wessex HC 2 (XV719) which was wearing a temporary Arctic colour scheme for an exercise in Norway in 1970. (MAP)

discernible pattern to the tactics of our operations, but there was not. At the beginning of my time there was a spread of single-aircraft operations interspersed with multi-aircraft ops. These ranged from individual sorties in support of ground operations, which might involve troop lifts within an operational area, to tasks requiring all of our helicopters, perhaps to move internees from a holding area to the Maze Prison at Long Kesh or, later, to the prison at Magilligan Point.

‘Holidaymakers’.

During my second stint, we were involved in big lifts of internees to the Maze. These operations were designated ‘Holidaymakers’ and, in December 1971, we were briefed to expect aircraft casualties during one of these lifts. I suggested that it might be safer to conduct the move by road, but was told emphatically that the associated security problems far outweighed the risk to our helicopters. A typical prisoner pick-up site was the sports field of the Crumlin Road Jail, which was big enough for only one helicopter to land and take off at a time. The flight plan called for four lifting helicopters plus one flying ‘top cover’ with a group of soldiers on board. In the event of one of the carrier helicopters being hit by ground fire and having to put down for that, or any other, reason, the escort helicopter would immediately land

alongside. Having deployed its troops to protect the downed aircraft and its crew, it would take on board the prisoners and continue their interrupted flight to the prison. In practice, all of these 'Holidaymaker' flights went off without a major incident.

Clandestine Insertions.

Single-aircraft flights included clandestine insertion of observation patrols where targets, such as terrorist training areas, needed to be observed. Patrols were put in at last light at a site screened by high ground and withdrawn some days later under similar circumstances. It was sometimes difficult to sustain the Army's faith in our capabilities. One such withdrawal was hampered by low cloud which shrouded the hillside pick up point. The troops were contacted by radio and appraised of the situation. Even allowing for the fact that they had been in position, unable to move about freely for two or three days and nights, their plea, that they could see the sky from where *they* were, showed their impatience to go home!

Aircraft Recovery.

The Wessex were used for many different tasks. We recovered unserviceable, and sometimes shot up, Sioux helicopters. One sad example of the latter occurred in 1972 when the Army asked us collect a Sioux which had force landed near Ballykelly and carry it back to Aldergrove. The weather was bad and we had to decline the task. Someone involved in the incident decided that it was necessary to retrieve the helicopter before the weather cleared so it was loaded onto a lorry and began its journey to Aldergrove. Its movements were obviously being observed and the lorry and its escort were ambushed in the Glenshane Pass. One soldier was killed and several more wounded. We recovered the Sioux the next day.

Another retrieval involved a Sioux which had gone too close to a lorry parked exactly on the border. The aircraft was hit by light and heavy machine-gun fire. Although the seats were armoured, one bullet was deflected into the leg of the observer. The pilot managed to land his aircraft in an Army compound, and the observer was last seen hobbling into the secure area muttering darkly. Apparently, he had served with the Australian Army in Vietnam and had joined the British Army for a quieter life! No 72 Sqn subsequently retrieved the Sioux for repairs.



Wessex HC 2, XT674, of No 72 Sqn in 1971. (MAP)

VIP.

The Wessex was also used as a VIP transport. Amongst others, we carried Mr Heath (the then Prime Minister), Mr Whitelaw, Mr Hezeltine and Lord Carrington. Mr Whitelaw's first visit to Portadown coincided with the first terrorist bomb attack on that town. Although the helicopter's arrival was not announced, a hostile crowd met the Secretary of State as he disembarked and a fairly ugly scene developed. He was collected later in the day from a different landing site, but the helicopter was the target of stone and other missile throwing. No hits were recorded.

'Eagle Patrol'.

One of the most frequent operations was called the 'Eagle Patrol'. This involved picking up a group of soldiers and flying along the border area, looking for suspicious road traffic. When a target was identified by the troop commander, a group of soldiers would be set down ahead of the vehicle. The rest of the team would be put down behind it and an interception made. This reduced the open movement of arms around the border region to a minimum.

Joint Operations.

The Wessex were involved in some fairly exciting activities, of

course. I recall one particular operation which was mounted to capture a notorious 'quartermaster', an officer who arranged for the provision of cash to supply the terrorists. This one, who operated mainly in the Republic, would occasionally return to his home near the border to spend the night before returning to work. Intelligence suggested that he would be home on a particular night, and would go drinking with friends before sleeping late the next morning. The plan was to hit his house at first light with many soldiers carried in armoured personnel carriers, but for the 'wake up crew' of assault troops and RUC officers to be taken in by helicopter. Two of our Wessex were assigned this role, the crews positioning the night before to be with the Army personnel for the dawn strike. At first light, the helicopters roared over the hill near the house, triggering the forward movement of the Army vehicles. One helicopter landed in the front of the house and the other at the back. The RUC and Army personnel stormed out of the aircraft and these both took off to wait close by in case of casualties. An Army helicopter circled overhead to control the ground offensive. After waiting for some time, the Wessex commander inquired how things had gone, imagining that the house might be a smouldering wreck by this time, to be told that access to the house had only just been gained. The rules of the game were that only the RUC were empowered to waken the occupants by knocking on the door! It turned out that the target quartermaster was not at home, although two or three other wanted men were picked up, plus a wanted car.

Another exciting incident involving a Wessex was a ration run in the Crossmaglen area which turned into the airborne relief of a patrol which had been pinned down by some terrorists on a hill. The helicopter dumped its load of groceries and picked up some Highland Regiment soldiers. Having spotted the gunmen, they showed a bit of defiance towards the helicopter before running for the border. The helicopter gave chase and the Jocks displayed the persuasive side to their nature by convincing the terrorists that they were actually still in Northern Ireland when they caught up with them and took them into custody.

On another occasion a patrol had been inserted close to the border. After a while they were retrieved. As the troops were running in to board the helicopter, they all flung themselves to the ground. They, and the helicopter, were under fire from the other side of the border.

The helicopter captain called that he was about to lift, but his crewman said that he was not ready as he had some soldiers half in and half out of the cabin. When this was sorted out, he gave the all clear and the helicopter withdrew at ultra low level, keeping trees and terrain between it and the gunmen. The rest of the ground troops withdrew farther from the border behind cover whence they were then collected without further incident.

Operations to capture suspected terrorists were diverse in their execution. One such involved a mixed force of ten Pumas and Wessex plus Army helicopters to control the ground forces which consisted of forty-odd ground parties striking suspects' homes to the north of Lough Neagh at dawn. Twenty-two persons were arrested. Some showed considerable determination. to remain free. One pair tried to escape by rowing into the middle of Lough Neagh. A Sioux helicopter tried to blow them to shore with its downwash, but they managed to resist that by dropping anchor. A Puma joined in, nearly swamping them, and they surrendered.

Conclusion.

These were interesting and sometimes dangerous times. I remember being impatient during my helicopter training in the first half of 1971 that I would be too late to see any of the action. I needn't have worried.

AIR MANOEUVRE DEVELOPMENT

Air Vice-Marshal David Niven



AVM Niven joined the RAF in 1968. His flying appointments, which have all been on helicopters, have included a tour with the RN and command of Nos 18 and 78 Sqns and of RAF Aldergrove. He was Air Advisor to Director SAS during the Falklands campaign and DACOS Plans at the JHQ during the Gulf War. In 1995 he was a member of the team developing the new Permanent Joint Headquarters and later joined its planning staff. He subsequently led the Joint

Helicopter Study and Implementation Team until October 1999 when he became the first Commander of the Joint Helicopter Command.

Introduction

I have been associated with the development of air manoeuvre concepts involving Support Helicopters since my tour with the Royal Navy in 1973. The movement of large numbers of troops direct from ship to shore - and the navy would usually have twenty Wessex Mk 5s in the air in the 1960s and '70s - was, in my view, the genesis of air manoeuvre in the British Services. However, I will focus on the development of air manoeuvre within the RAF and its Support Helicopter operations with the British Army. I will cover four issues: command and control of RAF Support Helicopters (RAF SH); touch on the ownership issue; air mobile 'trials'; and, finally, bring you up to date with the development of an integrated UK air assault capability at the start of the 21st Century.

Command and Control of RAF Support Helicopters

During the Cold War NATO developed command and control states to which all the nations agreed. The definitions and their interpretation were familiar to all and, seen against a background of Article 5¹ operations and contingency plans with associated alert states, appeared to work well. But did they work for the RAF SH Force? As with all

¹ 'Article 5', one of fourteen articles of the North Atlantic Treaty of 4th April 1949, commits signatories to the collective defence of the integrity of NATO territory, as it obliges them to regard an attack on any member as an attack against them all. **Ed**

other UK forces, operational command would transfer to SACEUR at the appropriate alert state. Below SACEUR the delegation of operational control remained within the air chain of command. Many of us, in the 1970s, wondered why. The answer, we thought, was that, for *political* reasons, the UK, if it was to maintain its level of influence within the air corridors of NATO, needed to keep up the numbers of assigned RAF assets. A second order issue was to maintain *RAF* influence within the NATO command chain. There was also the issue of air doctrine: centralised control and decentralised execution. If control was delegated to a UK Army commander, this amounted to de-centralised command. We needed to be able to cope with the unexpected when, in Article 5 operations, RAF SH would need to switch, quickly, from support of a UK Army formation to other tasks whether in support of RAF or other-nations operations.

From the 1960s the RAF SH Force had a presence in Germany with the remainder of the UK-based force planned to reinforce at an appropriate alert measure. COMTWOATAF had operational control with the force assigned 'in direct support' of 1(BR) Corps. There were two problems with this arrangement. First, COMTWOATAF had no effective organisation to delegate command below his level and therefore tactical command went to Commander 1(BR) Corps, exercised through a squadron leader in the Air Support Operations Centre (Support Helicopter) (ASOC(SH)) at Corps Rear HQ. ASOC(SH) was dislocated from ASOC(OS) at Corps Main and therefore did not have ready access to air control orders and, importantly, could not influence the formulation of air control orders. The result was an inability to support 1 (British) Corps effectively due to air control limitations combined with weather constraints.

The second problem was the perceived lack of RAF commitment to 1 (British) Corps who saw contingency planning for employment of RAF SH as a minor task within the Corps planning organisation. The attitude was very much that 'we cannot depend on the RAF SH Force to be there on the day so why should the Army build them into their defence plans?'

This situation was not helped by a debate in 1978-80 when the RAF was discussing the acquisition of the Chinook and the option to support the Germany Harrier Force in the field. Such a discussion only led to an Army 'suspicion' that the Chinook would, 'on the day', not



The Wessex, like this Gütersloh-based HC 2 (XR505) of No 18 Sqn, lacked the capacity to provide the army with a substantial level of support and BAOR was reluctant to rely on helicopters, as it feared that the majority of the RAF's effort might be devoted to sustaining its own Harrier Force. (MAP)

be allocated to 1(BR) Corps operations. Suspicions were reinforced when Boeing, probably in an effort to increase the original Chinook buy, produced a study showing the attributes of a Chinook deployed in support of Harrier field operations.

As an officer based at RAF Gütersloh during the redeployment of the Harrier Force from Wildenrath in 1977 and closely observing its operations during my two tours at Gütersloh, I was envious of the Harrier command and control arrangements based on a group captain who was dual-hatted as Harrier Force Commander and Station Commander. We in the RAF SH Force were not able to persuade our masters of the need to follow the Harrier Force example.

In 1987 a SH Force HQ was established at Gütersloh under a senior wing commander who would plan for operations, command the RAF SH Force on exercises and prepare for the Station Commander Odiham to take command on large operations. This was clearly a better arrangement compared with the previous situation but certainly did not follow the maxim of 'organising for war and adjusting for peace.' Rather the arrangement was one of 'organising for peace and adjusting for war.' Incidentally, the OC SH Force HQ had been promoted to group captain prior to the Gulf War and, on deployment to the Gulf, he was confirmed as the Commander and so he actually

executed his own plan during that operation.

As a result of this perceived lack of commitment, and with a helicopter such as the Wessex (capable of carrying only the light gun, which was not a primary field gun in the Corps, or up to twelve troops), the RAF SH Force was very much relegated to support roles: logistic support, casualty evacuation and liaison. But in the 1970s the threat of Warsaw Pact operations in the Rear Areas of the NATO frontline Corps led to the need to develop a rear area security force able to react quickly to disrupt parachute and heliborne operations. The best way to do this is to insert a counter attack at or near the landing site in time to prevent the enemy from organising his force. I will discuss this issue later.

Ownership

Throughout my career I can recall numerous rumours, and indeed studies, over the ownership of the RAF SH Force. Other countries went through the same traumas and we observed the changes in Australia when the Army took over the RAAF's Support Helicopters. Whenever a study was completed and the debate seemed to be put to bed another debate would be opened from a slightly different angle. This was unsettling and clearly had an adverse affect on morale. I well recall when, the then Air Cdre, John Thompson came to No 18 Sqn in the mid-1980s and asked for a view on whether its personnel would be prepared to transfer to the Army. You can imagine the answer he was given!

As Commander of the Joint Helicopter Command, I now have a much better insight into Army Air Corps fears and concerns during the 1970s and 1980s. Although the Lynx, with its TOW anti-tank missile, had been introduced into Service in the 1970s, they were still a small corps within the Army which was dominated by the infantry and armour. They felt undervalued and were, on occasions, fearful that they would be absorbed into another corps. An alternative was to expand rapidly by absorbing the RAF SH Force. The Army Air Corps, and others, clearly understood that the RAF SH Force was not being effectively utilised due to the command and control muddle.

With the introduction into service of the Chinook, the situation changed. Here was a very capable helicopter in terms of payload, range and weather. Many senior Army officers realised that the

Chinook, operated to its considerable limits, in all weathers and at night, and backed by the RAF's ability to organise the necessary support, offered exciting opportunities. Thus an air mobile force was born.

Air Mobile Trials

The precursor to established trials had started in 1977 with No 18 Sqn and its venerable Wessex working with 5 Field Force based at Osnabrück. Much of the liaison was driven by the need to establish an effective Rear Area Security Force to counter the Warsaw Pact raiding threat. The brigadier (Brig Robert Pascoe) challenged the squadron to match the reaction time of the infantry. We did; in fact we bettered their reactions. We also collocated in the field with the 'supported' infantry units to further reduce reaction times, with the air force crews living alongside their army colleagues. The concept worked well until the weather deteriorated or until night fell. Our *modus operandi* at night required visual flying to relatively brightly lit and pre-reced landing sites. We therefore needed to know where the enemy was going to land! We did start to experiment with the forerunner of Night Vision Goggles - Pilot Night Vision Goggles. This exercise required my wife and I to go for a Sunday walk along our final routing to the landing site (between 2 and 3 kms) marking on a 50 000 map all telephone and electrical cables; no small task in the hills of the Saeurland or the Teutoburger Wald.

With the arrival in Germany of No 230 Sqn's Pumas in 1981 and No 18 Sqn's Chinooks in 1983, coinciding with 6 Bde's having no significant task the 'powers that were' decided that we should trial Air Mobility:

'An operation in which combat forces and their equipment manoeuvre about the battlefield by aircraft to engage in ground combat.'

This was more than 'rear area security'. The entry into Army service of large numbers of MILAN anti-tank missiles, coupled with better intelligence to identify Warsaw Pact main lines of attack, enabled Army commanders to decide the time and place to start 'attriting' a Warsaw Pact armoured thrust. But speed of reaction was the key. MILAN-equipped infantry lifted into position by Chinook,



From 1983 RAFG's Chinooks offered a realistic air mobility capability. This a post-Cold War HC 2 of No 18 Sqn. (MAP)

with positions reconnoitred by teams inserted by Puma, and the flanks protected by Lynx armed with TOW gave 1(BR) Corps an embryo counter-penetration force capable of at least delaying an armoured attack.

The problems were immense: organising such a force without secure communications; arranging access to the airspace with only a few hour's warning and then controlling such a disparate force. Brig Robin Grist, followed by Rupert Smith, became masters of the art by orchestrating the proceedings from a Lynx or Puma airborne command post. We really did develop a realistic capability, only to see our efforts amount to very little as infantry battalions moved after two years as part of the Army's arms plot programme. In 1989, 6 Bde re-equipped as an armoured brigade and air mobility came back to the UK in the form of 24 Bde at Catterick. After our initial success in Germany, because 24 Bde had to compete for helicopter resources, they found it difficult to develop the concept further. Later on they moved to Colchester where they acquired Army Air Corps Lynx, which could operate in the light utility role, but for RAF helicopters the brigade was always in competition with Aldershot's Parachute Brigade who were based right alongside Odiham's Chinooks.

However, the 1998 Strategic Defence Review drew a line under the

ten years of marking time in the air mobile arena. Air Manoeuvre came of age:

‘Operations, primarily within the land scheme of manoeuvre, seeking decisive advantage by the exploitation of the third dimension; by combined arms forces centred around rotary-wing aircraft, within a joint framework.’

Putting this philosophy into effect led to 5 and 24 Bdes being used to create the new 16 (Air Assault) Brigade and the formation of the Joint Helicopter Command. All Battlefield Helicopters of the three Services have been brought together under one commander whose command also includes the new Air Assault Brigade. Operational command is vested in CinC LAND and I exercise it on his behalf. Ownership is not an issue; all of us belong to the one organisation. Command and control is simple. I have day-to-day control and, as for all other front-line forces, the Joint Commander at Northwood assumes operational command of Joint Helicopter Command force elements when CDS allocates them to an operation. Thus, I pass command to the Joint Commander when so directed. The process is well tried and tested and, as you saw recently in Sierra Leone, it can be done in a matter of hours.

My key tasks are to ensure that all my force elements, navy, army and air force, are trained both individually and together for *joint* operations world-wide. Our focus is on expeditionary warfare to manage and, if possible prevent, crises. We need to be at high readiness, typically two to five day’s notice to move, and, most importantly, able to mount operations on a joint basis as soon as we arrive in-theatre. We have no time to work-up.

Conclusion

The RAF SH Force lacked a significant role in Germany from the 1960s to the mid-1980s for NATO Article 5 operations, due to a lack of clarity in command and control arrangements and, until the arrival of the Chinook, a lack of capability. In the post-Cold War period, the advent of expeditionary operations has seen the RAF SH Force play a significant role in most operations. The 1998 Strategic Defence Review has resolved both ownership and command and control issues by establishing the Joint Helicopter Command.

MORNING DISCUSSION PERIOD

(On this occasion, the Chairman elicited a series of questions from the audience before inviting one or more speakers from the morning programme to respond, these comments occasionally stimulating further observations from the floor. While this worked for those of us who were there at the time, a written account of the proceedings makes these exchanges appear somewhat disjointed. In the interests of providing a better reflection of the coherence of the debate, therefore, while retaining the essence of each contribution, many of the questions, answers and comments have been rearranged here to appear sequentially. Ed)

Sebastian Cox (Head of AHB). We heard quite a lot from John Price this morning on the supposed inaccuracies of the published history. I would point out, however, that the book was written, not by some grey-suited historian, such as myself, but by Wg Cdr John Dowling. We are, therefore, faced with the problem of two distinguished gentlemen, both very well respected in the RAF helicopter world, who disagree with each other. Since he is sadly no longer with us, I would say in John Dowling's defence, that his book is not his personal memoir of helicopters, it is fully referenced and where he refers to a letter from Sir Kenneth Cross, he identifies the file on which it can be found. Assuming that the record reviewers have not already destroyed it, I will recall that file from the Public Record Office. If I find that Kenneth Cross did indeed write what John Dowling says he wrote, then I will write to the Society's Journal confirming that that is the case. On the other hand, if I find that he either made a mistake or that the letter is not there, I will buy John Price a pint of beer! I will leave it to his conscience as to whether, if I find the letter, he buys me one! *(Laughter.)*

Gp Capt Price. I'm prepared to withdraw if the letter is there and I am wrong. If I am, I'll stand you a coke! *(Laughter.)*

Wg Cdr 'Jeff' Jefford. For AVM Niven, I think - the ownership debate. I accept that we have probably got it right now. But did we get it wrong thirty or forty years ago? I think we were almost unique in putting our big helicopters with the air force. The Americans, the Germans and, I think, the French have all done it the other way and

allocated their big choppers to the army. I would be grateful for your views on that.

AVM David Niven. No, I don't think we did get it wrong. The Royal Air Force is all about operating in the air environment and that is where the support helicopter operates. Furthermore, the RAF was able to bring to bear its tremendous technical and engineering background to support the operations of the SH Force. I have to say, and I can say this with some experience, that the Army simply could not have done it, and they are still experiencing difficulties today. As to the other nations, the Dutch are still operating their helicopters with their air force, as are the Danes. As to the French, while most of their helicopters are with the army, they too have their problems. The French navy has relatively few helicopters; the army has to manage these and this approach is not a great success compared to the British experience, where we are now regularly taking RAF helicopters and crews to sea.

Sir Frederick Sowrey. Would someone like to say something about the offensive use of helicopters? Obviously the Army have such a capability with their TOW missiles. Did the RAF ever consider exploiting the offensive potential which the Americans seem to have perfected with the Apache?

Gp Capt Price. Did we think about offensive use in the early days? I think not. The RAF perceived its job to be transport support and I think that was probably right and proper at the time. I too, incidentally, think it was good thing that the RAF 'owned' the helicopters in the first place because we had the engineering back-up which the Army lacked. It was a pity that centralised servicing was pressed on us, however, because it interfered with a squadron's mobility. Even so, the army simply could not have matched the RAF in any way, so the SH Force was in the right place, although I do think that the combat element is also in the right place with the army.

Sir Timothy Garden. Perhaps, in response to the armament question, I could just add a comment based on personal experience. I recall that in the early 1990s we looked at whether we ought not to be providing all of our helicopters with offensive armament. This provoked a very sharp Army reaction in the corridors of Whitehall. This was, in part, a

reflection of the sort of things that AVM Niven talked about. The ownership debate was still a very live issue and we were also considering the acquisition of Black Hawks. An unfortunate incident that occurred at that time involved a letter (which should never have been written) in which a very senior serving RAF officer had outlined his philosophy in the context of who should own helicopters. The letter was copied to me, as Director of Air Force Staff Duties (DAFSD), but the senior officer had forgotten to put the F in, so it went to my colleague, the Director of Army Staff Duties (DASD), who very kindly brought it round to my office. That soured relations for another two years! (*Laughter.*)

Gp Capt Hans Neubroch. For Gp Cpt Price. In, I believe, June of 1964, I found myself one morning in the Radfan when Colonel Farrar-Hockley walked in, having been adrift for a couple of days. There had been an action involving a helicopter and I believe that he disposed of the people who attacked him. Can you recall any details of that incident?

Gp Capt Price. Yes. Lt-Col Farrar-Hockley went off in a Skeeter (*a member of the audience suggested that this might actually have been a Scout, a point which Gp Capt Price was content to accept. Ed*), to reconnoitre a wadi all by himself, without any pre-reconnaissance on the side - and he got shot down. It was as simple as that. It was also something I'd have been a bit reluctant to do myself. Fortunately, they were able to get the aircraft back and pick him up as well, so nothing was lost. It was just a preliminary reconnaissance down a valley which was occupied by rebels who were waiting to shoot at him.

Gp Capt Peter Hearne. Just a comment on the period that Gp Capt Price spoke of. At about that time, in 1954, I left the Comet Development Unit to run the experimental BEA Helicopter Unit. Mach 0·7 to '07 on Sycamores in the course of a weekend and, just as Gp Capt Price mentioned, I discovered that the helicopter world was absolutely full of folklore. As I was a very junior sprog in the business, it took a great deal of effort to persuade well-established helicopter pilots to accept that there were such things as IMCs, that one ought to try to introduce instrument rating tests, and that it really *was* possible to do crosswind landings, despite the fact that they said

that anyone who tried would kill himself. Nevertheless, with the help of one or two other ex-fixed wing pilots who joined at the same time, we were able to develop a realistic capability which ultimately resulted in today's commercial North Sea operation. That kind of all-weather capability seemed to take a lot longer to develop in the Royal Air Force.

Looking to the future, I wonder if a lot of the lessons learned in the past will be equally applicable to the next revolution in aviation, UAVs for instance. I would like to think that we shall not have to re-invent the wheel every time. We certainly seemed to waste a lot of time doing that with helicopters.

Sir Timothy. Thank you for that. I could add that there was still a bit of folklore around when I arrived at Odiham in 1985!

Gp Capt Price. The folklore business was almost impossible to overcome for about a year. Most of the pilots were at least ten years older than I was but they had had no formal scientific training at all. The 'instruction' provided by CFS at the time, was largely based on what people thought, rather than on aerodynamics. There was an extremely good book available, written by Gessow and Myers in 1952. I borrowed a copy from my local library; it was much better than anything that went into AP129. Far too many people were just *imagining* what helicopters could do, which was a shame as a great deal of useful information was available at Boscombe Down and in the other establishments, but there was very little liaison between these agencies. We did meet at the Helicopter Society in London, but no real advantage ever seemed to have been taken of that.

AVM Niven. I would like to just touch on a couple of issues which have been raised. First, the question of offensive action. In the 1960s the Royal Navy armed the Wessex with two-inch RPs and forward-firing GPMGs and used them offensively to support Royal Marines on the battlefield. They lost that capability when the Wessex Mk 5 went out of service; they did not replicate it with its successor, the Sea King Mk 4. The Royal Air Force has always equipped its helicopters with GPMGs, certainly, within my own experience, going back as far as the Whirlwind and on through the Puma and Chinook. More recently we've been equipping our Chinooks with mini-guns and these were

used this year during the very successful operation in Sierra Leone.

On UAVs, we do have a developing problem, and it's all to do with command and control. Who is to command them and who will control them in this particular piece of 'battle space', the air space, specifically the *lower* air space? This is a problem that we are now starting to wrestle with and I do hope that we *can* learn the lessons from the past.

AVM John Price. I'm 'the other' John Price - 'tail rotor - and carrier of reluctant passengers - Price!' (*Laughter*). I am glad that the command and control debate has been resolved, but, in view of David Niven's observations, I feel that I should point out that in Borneo, where we were fully committed to supporting the Army, the command and control system worked extraordinarily well. I certainly had no problems at squadron level; the tasking system worked and I believe that we satisfied the Army's requirements better than anybody else could have done at that time.

Wg Cdr Hoskins. On the question of offensive armament, I recall that No 225 Sqn had some SS 11 missiles on their Whirlwinds in Borneo. No 103 Sqn, took them over when 225 went home. I remember that we fired them at a cave in a hillside once, just for something to do. We had a funny little simulator thing; it had a sort of joystick which controlled a spot of light on a screen. The missiles were wire controlled, but I don't think that we kept them for very long, and I doubt that they were ever used properly.

I would also offer a comment on the command and control business. I agree that it worked well in Borneo; indeed I think we reached the point where the Army didn't give a damn what colour uniform the aircrew wore. But I remember a post-Borneo brigade exercise in Malaya where I, as a squadron leader, was at the Brigade Headquarters as the Forward Air Commander with four Whirlwinds and a Belvedere. For the next exercise, No 224 Gp sent up an air commodore to handle the same number of helicopters. I think that the RAF had a lot to answer for in over-egging the pudding; I'm sure that created a lot of distrust.

SEARCH AND RESCUE IN THE RAF

Group Captain Ian McLuskie



Ian McLuskie joined the RAF in 1967 and flew helicopters with Nos 72 and 33 Sqns. He later became a QFI and, following a tour in Kuwait, a QHI. He returned to No 33 Sqn as a Flight Commander in 1981 became OC No 230 Sqn at Aldergrove in 1991. He subsequently commanded the RAF SAR Force and, from 1997, RAF St Mawgan.. His staff appointments included tours with the Army and at HQ Strike Command and he is a graduate of the Indian

Defence Services Staff College. He retired this year and is now an aviation consultant, specialising in helicopters on which he has logged almost 5000 hours.

Good afternoon ladies and gentlemen, we have already heard from the previous speakers about the mainstream development of helicopters in the RAF over the last fifty years or so and, personally, I have found it all very interesting indeed. Throughout, they have alluded to the specialist role of the Search and Rescue helicopter in a variety of theatres. It would be very easy for me to continue this theme and, in purely chronological terms, tell you who did what, where and when in aircraft ranging from the Sycamore to the Sea King. What would be much more interesting, however, and, I believe, more relevant to an overview of the Search and Rescue role would be to chart the technical development of aircraft and the associated role equipment and analyse the way in which the new capabilities brought to the role by various aircraft were then applied in a range of demanding environments. From such an analysis we can then assess the impact that these technical and procedural developments have had on the overall operational effectiveness of the SAR organization.

So where did SAR start? Was it with the very earliest experiments with the Dragonfly or the more refined work carried out on the Sycamore, both in the UK and in the Far East? Actually, it was neither of these, important though they were. The true roots of the SAR role are not in the helicopter era at all but back in the early days of the

Second World War, in the Battle of Britain.

The Battle of Britain - The Crucible

To the vast majority of the general public, Search and Rescue is a purely civilian maritime activity. Indeed, over the years it has developed into a public emergency facility that is referred to as the Air-Sea Rescue Service. However, early air-sea rescue services were far from being civilian humanitarian activities. On the contrary, the stark reality is that air-sea rescue was born, in the early days of World War II, out of conflict and military necessity.

During the frantic days of the Battle of Britain, the RAF and the *Luftwaffe* were losing hundreds of aircraft over the English Channel and southern North Sea. Whilst the loss of aircraft was an acute concern it was the rapid depletion of the relatively small pool of trained aircrew that caused most alarm. Both air forces desperately needed an effective means of rescuing the valuable and irreplaceable aircrew that had ditched in the sea, if they were to sustain the tempo of the air campaign.

The Germans were initially well ahead in establishing a robust specialist rescue organisation to execute such a mission. At the outset of the Battle of Britain the *Seenotdienst* (Air Sea Rescue Service) had some thirty He 59 floatplanes, specially equipped for rescue duties, positioned along the Channel coast. The twin-engined Heinkel He 59, first flown in 1931, was a biplane designed as a reconnaissance bomber with a faired, wheeled landing gear. One of the early prototypes was successfully fitted with floats, however, and all subsequent production aircraft were built to this maritime configuration. The air-sea rescue model, the He 59C-2, was an adaptation of a stripped down, long-range reconnaissance variant with additional fuel tanks fitted in the fuselage to supplement the basic fuel load carried in the floats. The aircraft was unarmed and carried six dinghies for air-sea rescue operations.

The *Luftwaffe* also made provision for its downed airmen to survive once in the sea. They installed inflatable survival dinghies, not only in their bombers and reconnaissance aircraft, but also in their single-seat fighters. Further, to assist in the location of downed German aircrew all the life jackets and dinghies were equipped with a fluorescing chemical indicator to stain the sea to highlight the



An Air-Sea Rescue Lysander IIIA, V9547, of No 277 Sqn.

survivor's position in the water. Additionally, flare pistols and signal flares were carried in most aircraft and in the larger dinghies.

By comparison, the RAF's rescue organisation at the start of the Battle of Britain campaign was very *ad hoc*. The only real survival aid provided for fighter pilots was the 'Mae West' life jacket, which had severe operational limitations. Moreover, the location and subsequent recovery of an airman were dependant on a generally uncoordinated search conducted by available RN ships in the area, RAF high speed launches and any aircraft that could be spared by the downed pilot's own unit or Coastal Command. The AOC 11 Gp, AVM Park, was acutely aware of the shortcomings of such an improvised procedure and set about solving the problem. With the connivance of the Vice-Admiral Dover Sector he managed to beg, steal and borrow a number of Westland Lysanders and these, together with RAF launches and a dedicated command and control element were organised into the embryo service that was to lead, in time, to a comprehensive and specialist organisation for air-sea rescue. To quote the official RAF history: 'Few investments in aircraft were to yield more precious dividends.'

While the Lysander lacked the floats of the He 59, and thus the ability to alight on water, it did posses a number of other qualities that

suiting it admirably to the air-sea rescue role. It had been designed as a high wing cabin monoplane for army co-operation duties and was the first aircraft to enter service with fully slotted and flapped high lift devices on the wings. The slotted flaps were arranged so that they were automatically lowered by the opening operation of the root slats. This gave the aircraft almost vice-free low speed manoeuvrability which, when combined with the excellent visibility from the cockpit, made it an excellent low speed search platform. Additionally, with a top speed of 237 mph and a range in excess of 600 mls, it had good all round performance. In the air-sea rescue role, it carried air droppable dinghies as well as a pair of trainable Browning .303in machine-guns in the rear cockpit. Another significant aircraft to join the Air-Sea Rescue fleet was the Supermarine Walrus (fondly known as the 'Shagbat') a single-engined amphibian flying boat. It was much slower than the Lysander but had a similar range and, most importantly, it could land on the sea to pick up survivors.

During the months that followed the Battle of Britain, the RAF Air-Sea Rescue Service developed a very efficient and effective capability. High speed launches, directed by search aircraft, along with RN assets at sea and units from Coastal and Fighter Commands frequently combined to execute integrated and complex rescue missions, often in contact with a determined enemy - in modern parlance a Combat Search and Rescue package. Concurrently, there also grew, within the RAF, an acute awareness that in addition to the newly inaugurated Air-Sea Rescue Service there were other components and capabilities needed to accomplish a successful rescue. The allies began to design aircraft with built-in crash safety features, safety equipment and emergency communications (including, on some aircraft, accommodation for carrier pigeons). Rations, survival equipment and location aids were deployed in the dinghies of the 'Lindholme' gear and lifeboats which were eventually developed for air dropping to survivors. Most importantly, aircrew were thoroughly trained in the use of these new devices and subjected to regular sea survival drills. As a result of all these measures by 1943 some 3,306 allied aviator had been plucked from the sea under combat conditions.

The operational model developed by the RAF during the Battle of Britain proved to be so successful that it was very quickly implemented in other theatres. By the end of the Second World War

thousands of allied airmen had been rescued by what had become a world-wide network of RAF Air-Sea Rescue Units. Moreover, the provision of such a service was now ingrained in RAF doctrine and led to similar rescue organisations being deployed wherever the RAF operated in the decades that followed.

So, even before the helicopter arrived on the scene, all the basic components of a rescue service, the search aircraft, the means of recovery and a command and control system, had been established and tested in the most demanding of wartime operational environments.

The Early Helicopter Days – A Steep Learning Curve

In the immediate post war years, new-fangled flying machines called helicopters began to appear on the scene. Not surprisingly, the established SAR community quickly acknowledged that, despite some very severe limitations, the helicopter brought some rather unique capabilities to the role. In 1945 Coastal Command established an Air Sea Warfare Development Unit (ASWDU) to assess the suitability of the helicopter in a number of roles including search and rescue. The Sikorsky R-4 and R-6, the Hoverflies Mk 1 and 2, bore the brunt of these early evaluation exercises. Subsequently, in the spring of 1952, the ASWDU commenced a series of trials, using the newly procured Bristol Sycamore Mk 3, to assess the suitability of helicopters in the visual search role. It was all a little rudimentary, the only navigation aids being a compass and stopwatch, the rescue equipment comprising a rope ladder and a safety line. Despite these limitations, the ASWDU trials established the basic operating procedures and equipment requirements to permit helicopters to be employed on search and rescue duties and laid the foundations on which the newly formed search and rescue (SAR) squadrons would be built.

In April 1953 the first dedicated SAR unit, No 275 Sqn, was formed at Linton-on-Ouse equipped with the Sycamore Mk 4. The Mk 4 (military designations HR Mk 13 and 14) was the main production version and more than eighty winch-equipped aircraft were acquired for the RAF. The Sycamore proved to be a very rudimentary SAR aircraft because it suffered from a number of severe limitations. The cabin, in shape and size not unlike a family saloon car, was very small and, not having originally been intended for rescue work its configuration could make winching operations very fraught for the



A Whirlwind HAR 4, XJ760, of No 22 Sqn in 1958. (MAP)

two-man crew. The aircraft lacked sophisticated navigation and location aids, and communications between tasking organisations, such as the Coastguard and RNLI, were almost none existent. The operation was predominantly day VMC with night flying and IMC operations being regarded almost as emergency procedures. Despite these problems, however, the aircraft and crews gave a good account of themselves and in the context of a short-range 'scoop and run' operation they undoubtedly made a contribution to saving lives at sea, operations over the sea and the UK coastline making up some 90% of the missions flown. Mountain flying was an aspiration for the future. Overseas the Sycamore fared slightly better. In the medevac role, over the jungle and deserts of the Far and Near East, many of the uncertainties of operations at sea, out of sight of land, were removed. Generally speaking, the locations of jungle clearings or a desert strips were known and basic navigation techniques with map and stopwatch were the order of the day. The Sycamore proved to be a fairly reliable and popular helicopter and confidence increased as experience was gained. Most importantly, its limitations were recognised and the small cadre of professional SAR aviators and co-opted staff officers began to lobby for the means to overcome these drawbacks.

The first success of this lobbying was the allocation to the SAR role of the Whirlwind Mk 2 with which No 22 Sqn was equipped when it re-formed at Thorney Island in the spring of 1955. Unfortunately, the early Whirlwinds, the Mks 2 and 4, were not a

raging success. They proved to be very unreliable and were plagued with engine difficulties; difficulties that were not adequately resolved until the early 1960s with the introduction of the Mk 10 powered by a Gnome gas turbine. However, the larger cabin of the Whirlwind and the addition of slightly more sophisticated aids did pave the way for the development of many of the basic operational procedures still in use today. Very early on in No 22 Sqn's work up it was recognised that the most effective method of recovering a casualty by winch was to deploy a winchman on the wire. The double-lift technique was developed and the squadron used it in anger for the first time in January 1956 when it rescued two people on Beachy Head.

A three-man crew soon became the norm on the Whirlwind, the navigator doubling up as the winch operator. The manning of the third crew position, the winchman, represented a bit of a problem to begin with. It was eventually solved by posting in three admin orderlies who were to be paid the princely sum of one shilling and sixpence per day. Any current SAR crewmen in the audience will recognise the irony of this situation. The hero of practically any incident, and the man who employs a multi-million pound aircraft and crew to get him to the scene of his heroics, is *still* the lowest paid member of the crew.

Once the basic crewing regime had been established operating techniques were developed apace. Specific winching techniques applicable to a variety of different circumstances, for example over cliffs and at sea, were formalised and role equipment, such as Neil Robinson Stretchers, was introduced. It might surprise some of the younger members present to learn that these procedures differ little some forty years on. In 1958 a big breakthrough occurred with the installation of the Decca Navigator system. Now, for the first time, the crew could actually navigate to the reported scene of an incident with some degree of confidence. Although it was quite an accurate aid by day, Decca did have an annoying habit of wandering off a bit at night. The navigators learned to handle its idiosyncrasies, however, although, because it was never exactly a user-friendly system, most pilots tended to regard it as something akin to black magic. An even more welcome development, especially if you were a single seat fighter pilot bobbing about in the North Sea, was the provision of the SARAH homing and location aid. This was the forerunner of the SARBE homing system that was to remain in service for the next 35

years during which it was responsible for locating and saving hundreds of lives at sea. The purists within the search and rescue community can wax lyrical for hours on the nuances of multiple SARBE homing - it is truly an art form.

The Maturing Years

By the mid 1960s the Whirlwind Mk 10 had taken over all SAR duties in the UK and the two units involved, Nos 22 and, the newly reformed, 202 Sqns, were deployed around the shores of the UK in what has become a familiar pattern. Importantly, the command and control system was now much more robust with Regional Aviation Control Centres located at Mount Batten in Plymouth and at Pitrevie Castle, just outside Edinburgh. The squadrons had established good liaison links with the RNLI and HM Coastguard and, using borrowed radios, had managed to establish workable maritime communication links. Although a steady state had been achieved it was not an idle time for the SAR Force. During the 1960s there was a 'Klondike' oil boom in the North Sea that brought wealth to Aberdeen and the oil companies and a lot more work for the RAF SAR flights stationed on the east coast. The first of a series of memorable rescues from North Sea oil installations took place after the collapse of the Sea Gem rig in a gale on 27th December 1965. Sgt Reeson, the winchman, received the George Medal for his determination and courage in rescuing three survivors from this disaster. Much later, in March 1980, another memorable rescue, involving Sea Kings from Lossiemouth, Boulmer and Coltishall, following the Alexander Kielland rig disaster in the Ecofisk oil field. The Boulmer crew were awarded an AFC, an AFM and two Queen's Commendations for their outstanding bravery.

Some of you will have noticed that there is one very important aspect of UK SAR that I have yet to touch on; mountain flying. Mountain flying is what separates the men from the boys and the RAF from the other pretenders to the SAR crown. The mountains of Scotland and the north are very harsh and unforgiving and they demand respect from all who venture into them. In the early days of the Whirlwind, with its limited power and single engine, the crews trod very warily on their excursions into the mountains. With the introduction of the Wessex in the 1970s, however, we were able to meet the challenge presented by this harsh regime with much more

confidence. The Wessex was a rugged old beast but it was surprisingly agile and, with its twin Gnomes providing a very flexible engine response, it was ideal for mountain flying. The mountain flying techniques and procedures developed on the Whirlwind were refined and enhanced by the Wessex crews and paved the way to the extremely capable day and night capability now exhibited by the current Sea King crews. Unfortunately, I do not have sufficient time to say very much about the dear old Wessex. Indeed, it truly deserves a lecture all of its own. Suffice to say that it is still going strong, giving good service in both Cyprus and Northern Ireland.

The Status Quo

So where are we today? Let us take a look at the *status quo* and examine the legacy that history has left us. In many areas we have advanced immeasurably, but I feel sure that if any of the early pioneers were to visit an SAR flight today they would instantly recognise much of what goes on. Equally, I would imagine they would have a twinge of envy when they saw the obvious and quite stunning advances that have been made in the fields of avionics, communications and navigation. The basics, however, remain the same. Fixed wing maritime aircraft, like the Nimrods flying out of Kinloss, provide search and top cover, high speed patrol boats, usually these days from the RNLi, assist in operations and training and the helicopters go out and pluck the casualties from the sea in much the same way as the Walrus did during the war.

The tried and tested deployment posture of two-aircraft flights has also stood the test of time and is still the basic operational unit within the SAR Force. Of course, we now have an all Sea King force and the mix of aircraft, equipment and crews provides a potent capability. Command and control is now firmly in the digital age with a single computerised Aeronautical Rescue Co-ordination Centre (ARCC) at Kinloss in Scotland. The team at the ARCC have access to a wide range of communication facilities which link agencies such as the police, the ambulance and mountain rescue services, the RNLi and HM Coastguard. The ARCC is also the ground station for Sarsat, a global, satellite-based emergency location system, for which Kinloss has responsibility for the eastern and southern Atlantic.

The SAR facilities provided by the RAF and the RN provides 80%



A state of the art Sea King HAR 3A, ZH543, of No 22 Sqn. (MAP)

of the national coverage. I should also mention that the SAR Force also provides SAR cover in the Falklands. Once again this is a subject worthy of its own presentation, suffice to say that whilst not the busiest SAR flight it certainly has its share of interesting jobs, given the sheer scale of the South Atlantic. The total number of SAR callouts per year is currently of the order of 2200, the Force having assisted over 10 000 persons in the last seven years or so. Rescues follow a pretty steady pattern of one-third off shore, one-third cliffs and coastal and one-third mountains.

Finally, it would be remiss of me not to acknowledge the SAR Training Unit, No 203 Sqn, based at St Mawgan. All RAF aircrew are trained at St Mawgan using a combination of live flying and synthetic training on a state of the art, fully dynamic simulator.

So, in summary, we can see that, despite all the improvements over the last fifty years, SAR remains fundamentally the same. Yes, we have expanded the operational envelope and we do now have a much broader spectrum of capability, but it is still the courage, the determination and the selfless commitment of the men and women at the front line that ensure our continued success in saving the lives of others.

And the future? Who knows? Hopefully we can look forward to another exciting and extremely productive fifty years.

TRAINING

GROUP CAPTAIN SIMON COY



Simon Coy started his flying career with No 18 Sqn in 1967. Following a tour with the RN, he qualified as a QHI in 1970. Having previously commanded a flight of No 72 Sqn, he was OC No 33 Sqn from 1979 to 1982. In 1993 he was appointed to command St Mawgan and the RAF SAR Force. His staff appointments were all helicopter-related and included stints with HQ SAS, HQ AMF(L), MOD and HQ 1 Gp. His final tour was as Naval and Air Attaché in Korea. He

retired in 1999 and now lives in Cornwall.

Introduction

The helicopter force has made tremendous progress from the hesitant early days of the Hoverfly to our current capability. The training of the force has mirrored the improvement in equipment. Nevertheless, the pioneering era left its mark and the force has often been accused of being isolationist and insular. Some would say that this was because the RAF starved it of the resources that it needed; others that it was the force's insularity that inhibited its development. The legacy of the very early developments in training remains with the force, and I shall try to answer the question of whether or not the trainers have served it well. In doing so, I shall summarise the pre-history and then examine the following points: the evolution of basic training, and with it the development of Central Flying School (Helicopters) [CFS(H)]; the training of navigators and crewmen; the Operational Conversion Units; and the advent of simulators.

Helicopter Training Flight (HTF)

The story starts with No 1 Course run by the Helicopter Training Flight (HTF) that formed on 5th February 1945 at Andover within No 43 OTU - the unit that trained Air Observation Post (AOP) crews. While the HTF did train a number of helicopter pilots, the Hoverfly did not fulfil its early promise. By 1947, the RAF had concluded that they had exhausted the potential of the Hoverfly 1 and 2 and that they were unsuitable for operational use. In the absence of a clear role for a

helicopter of such modest performance, therefore, the RAF's small stockpile of experience began to dwindle.

FEAF Casualty Evacuation Flight

By 1949, when FEAF formed a Casualty Evacuation Flight, there were very few trained helicopter pilots available. Of these, one (a test pilot) was deaf and another (Brian Trubshaw) was shortly to leave the Service to achieve greater fame elsewhere. The navy's No 705 Sqn had broken their only Dragonfly. Westlands could not help, and the four stalwarts (Dowling, Lee, Fry and Clarke) had to settle for some hovering in a Hoverfly, although it was deemed unsafe to fly it at heights greater than six feet AGL! With these very modest rotary skills, they set off for the jungle where they proceeded to train themselves on their Dragonfly HC 2s, to develop SOPs and to achieve an operational capability. They had many problems. Most of these were attributable to the Dragonfly's very modest performance, particularly in high temperatures and humidity, and to the unpredictable behaviour of rotor blades distorted by heat, damp and erosion. Lesser problems were lack of control range coupled with extreme Centre of Gravity variations, loaded and unloaded, and very heavy manual controls. The only type of winch available was not fitted, as it weighed about 110 lbs and could not be operated out of ground effect. The flight lost two aircraft. One of the second batch, a Mk 4 with metal blades and powered controls, suffered a rotor head failure, and a Mk 2 sank through a landing pad in a jungle clearing. This is not to say that the flight did not operate successfully, but their success was not attributable to their formal training.

The First Crewmen in FEAF

Once the flight had accumulated some experience they identified a need for a second crew member. Since he did not need to be a pilot, they co-opted some of the unit's ground crew. Without any structured training, Sgt Bowman and FS Moss performed their duties with such merit that they were decorated with operational flying awards, an AFM and a DFM respectively. These were very unusual distinctions for ground tradesmen.

No 1906 AOP Flight

The trials and tribulations of the Hoverfly lasted until 1951 when the

Sycamore was introduced to fulfil the AOP and light liaison roles. There was still no properly organised helicopter training system, however, so semi-official conversion to type tended to be done on an *ad hoc* basis. The AOC No 81 Group, having been sent solo in one of 1906 Flt's Sycamores in April 1953, experienced ground resonance while attempting to land, tried to take off again and was fortunate to survive the subsequent disintegration.

Air-Sea Warfare Development Unit

The ASWDU moved to St Mawgan in 1951 where it was provided with one Sycamore. In September 1952, an attempted demonstration at the St Austell Speedway after dark ended with the aircraft overpitching on take off and crashing into the coach park, killing the pilot and a spectator and injuring several others. This was, perhaps, a symptom of the boundless enthusiasm, but ignorance of realities, that existed at this stage.

Conclusion

The official history summed up the trials and tribulations of the prologue period thus:

‘The early pilots, nearly all new to helicopters and having received only the most rudimentary civilian contract training, were in the true sense pioneers; almost totally isolated from one another, they were expected to operate in hostile environments and undertake unprecedented operational commitments which they frequently suspected (and usually correctly) to be beyond the operational capabilities of their aircraft. In all, their record can be seen as highly creditable.’

It is certainly true to say that the training was inadequate. Flying Training Command were aware of these difficulties and as soon as resources and suitably experienced personnel were available, the Central Flying School (CFS) was tasked to resolve them.

Basic Helicopter Pilot Training

The various contractors and units which have been involved in the basic training of RAF helicopter pilots and the aeroplanes which have been used have been summarised at Figures 1 and 2.

Commercial Training

In the absence of any Service facilities for basic instruction, contracts

Unit	Location	Period
Westland Aircraft Ltd	Yeovil	1950-57
Air Service Training	Hamble	1950-57
Bristol Aeroplane Company	Filton	1950-57
CFS Helicopter Development Flt	Middle Wallop	1954-55
CFS Helicopter Flt/Sqn	South Cerney	1955-61
CFS Helicopter Wg	Ternhill	1961-76
No 2 Flying Training School	Ternhill	1976
No 2 Flying Training School	Shawbury	1976-97
Defence Helicopter Flying School	Shawbury	1997-date

Fig 1. The provision of basic RAF helicopter training since 1950.

Unit	Location	From
Dragonfly	South Cerney	1954
Dragonfly/Sycamore/Whirlwind 2	South Cerney	1958
Sycamore/Whirlwind 10	Ternhill	1961
Sioux/Whirlwind 10	Ternhill	1966
Gazelle/Whirlwind 10	Ternhill	1973
Gazelle/Wessex 2	Shawbury	1982
AS350B/Bell 412EP	Shawbury	1997

Fig 2. Aircraft used for basic RAF helicopter training since 1954.

were let to Westlands, Bristol Helicopters and Air Service Training to provide basic helicopter training. The quality of this training varied. In the early 1950s, when pressure was on the manufacturers to get helicopters out to the units, they had very little spare capacity, and even when they did, their instructional abilities were limited. Several students have told of sharing with their instructors in episodes of mutual discovery of the ‘why did it do *that?*’ variety. In the very early days many students did not even acquire the stipulated number of flying hours. Things did improve later on, especially at Hamble, but the aeroplanes in use, the Hiller 12B and 12C, were not particularly representative of Service types.

It is informative to consider the experience of a typical contract-trained pilot of this era. His entry standard in 1956 was that of a Vampire QFI with 1500 hrs. He was provided with 20 hrs on the



Sycamore HR 14, XG513, in which Flt Lt E W T 'Lofty' Marshall came to grief at Sylt in September 1957.

Hiller by Air Service Training another 20 hrs on the Dragonfly by Westlands and 25 hrs on the Sycamore at CFS; his SAR role training was undertaken at unit level at Sylt. Not long afterwards he suffered a tail rotor failure on a Sycamore, which led to a rollover and serious consequential damage. The Board of Inquiry held (rather unreasonably) that the incident had been a result of pilot error. They also found, however, that the pilot's training had been so inadequate that he could not be held to blame!

The period of industry-based training had clearly started very badly. Even when it had become more firmly established, when the contracted flying hours materialised and competent instructors had been provided, it was still far from satisfactory. Nevertheless, the students, all of them experienced fixed-wing pilots, managed to cope. Eventually, in 1957, 'in house' arrangements were made to provide basic instruction to all RAF helicopter pilots, which brings me to the story of CFS(H).

CFS and Basic Students to 1976

In 1952, Flying Training Command had asked that a helicopter establishment be formed for the study of instructional techniques and procedures. Unfortunately, with FEAF having priority, there were no spare aircraft available at the time. Eventually, however, the acquisition of Sycamores permitted the CFS Development Flight to be formed at Middle Wallop in May 1954 with three Dragonflies and three instructors, two of whom had served on the FEAF Casualty Evacuation Flight. The unit had just set about devising instructional

techniques when it was directed to conduct a proving flight for a tour of BAOR by Princess Margaret! Once normal service had been resumed the flight completed its development work and then moved to South Cerney where it began to establish a training pattern. As the most easily diverted UK-based RAF helicopter unit, however, intermittent miscellaneous VIP tasks continued to come its way. Between these diversions the staff drafted a syllabus and began transforming piston Provost QFIs into QHIs. By August 1954 the new QHIs felt sufficiently confident to attempt their first basic course. The selected guinea pigs included Commandant CFS, the Station Commander and three QFIs who had been borrowed for the experiment. The course was successful and the syllabus duly validated.

By the end of the year, the unit's capacity had begun to expand, permitting CFS to handle an increasing number of basic students, as well as instructors. The Development Flight became the CFS Helicopter Squadron on 1st January 1956 and in 1957 it assumed responsibility for all basic helicopter training. This was an important milestone because it marked the start of a long period during which CFS(H) trained both *ab initio* helicopter pilots and QHIs, a very unusual situation and one that was not mirrored in the fixed-wing world. I believe that this practice had many advantages and that it led to the particularly happy and productive atmosphere that surrounded basic helicopter instruction for the next twenty years

Many problems remained, however, not the least of them being the provision of helicopters. CFS(H)'s initial aircraft establishment had amounted to just one Dragonfly on which it was expected to train instructors for all three Services *and* the RAF's basic students. Fortunately, CFS had acquired a secondary role as 'Helicopter Ferry Command' and this permitted it to 'borrow' each Sycamore and Whirlwind that rolled off the production line and move them *very* slowly from Weston-super-Mare and Yeovil to the Maintenance Units. This arrangement continued throughout 1955 and 1956 but by 1957 CFS(H) had two Dragonflies, one Sycamore and a Skeeter of its own.

While the Sycamore was developing well in service, in both the SAR and AOP roles, it had some deficiencies as a basic instructional aircraft. First, although the Sycamore HR 13 had a conventional twin-control layout, the HR 14 (the major production version) had a single



Representing the ab initio helicopter sequence circa 1970, Sioux HT 2 (XV311) and a Whirlwind HAR 10 (XP341).

central collective. Although many fixed wing aircraft are flown right-hand-throttle, left-hand-stick, the problem is more complicated in helicopters with the collective having a twist-grip throttle. Essentially, it complicates the QHI's job, since, in helicopters, the captain controls the aircraft from the right hand seat. Second, the Sycamore had manual controls, whereas the Whirlwind had powered controls. Finally, Raoul Hafner, the Sycamore's designer, had rigged it for level flight and the stick position on the ground and during take off was anomalous.

Nevertheless, the Sycamore continued as an advanced trainer for those who were to fly it operationally. Latterly, in the early 1960s, it replaced the Dragonfly as the lead-in trainer to the Whirlwind which by 1961 had become the turbine-powered Mk 10. However, once CFS had settled into Ternhill, now as a wing, the Sycamore's deficiencies, not least its poor serviceability, became increasingly apparent. There was a spate of accidents (three in a month) in which students mishandled the controls on sloping ground and the instructors failed to prevent the subsequent rollover. The time had come to phase the Sycamore out of basic training, and to replace it with the Bell 47, the Sioux. This proved to be an excellent lead-in to the Whirlwind and the combination was most successful, as was the Gazelle-Wessex

combination that followed it. CFS continued to provide *ab initio* helicopter training until 1976 when its basic instructional squadron was rebadged as No 2 FTS. There were few material changes, because CFS remained nearby, but the atmosphere became that of an AFTS rather than that of a post-graduate school.

CFS Instructor Training

Throughout the period from 1954 to 1976 CFS(H) continued to carry out its primary function of training QHIs from all three Services, employing traditional CFS techniques. That is to say, the 'take', in which the tutor shows the exercise to the student QHI, the 'mutual' where the student QHIs practice on each other, and the 'give' when the exercise is repeated back to the tutor. Initially, all QHIs were recruited from the ranks of QFIs, but the proportion of non-QFI QHIs increased with the size of the force, until the majority of QHIs had no previous instructional experience.

The need to be able to land successfully after an engine failure had been evident since the first helicopters had entered service. The helicopter had the advantage of a collective pitch control which permitted the rotor's momentum to be used to cushion the touchdown. Pilots practised autorotation by keeping the engine idling and so disengaged from the rotor. The linkage between the collective lever and the throttle meant, however, that raising the lever to cushion the touchdown violently re-engaged the engine, with possibly catastrophic results. Voluntarily dispensing with the engine in order to practise an engine off landing (EOL) seemed wantonly dangerous, especially in view of the lack of aircraft on which to conduct trials. Nevertheless, CFS(H) conducted a detailed investigation into EOLs and, in April 1955, it was able to begin teaching the whole sequence of an EOL from any combination of height and speed. During the later 1950s all basic students were being taught EOL procedures and imparting these techniques to earlier generations of helicopter pilots became a priority of QHIs visiting units in the field to raise standards. Practice EOLs continue to be carried out today on all single-engined helicopters, but they ceased to be a live exercise on twin-engined helicopters in the early 1970s, although they are still done in the simulator.

Similarly, while the early QHIs did demonstrate night and instrument flying (IF) to basic students, the initial techniques did not

really provide a truly practical capability. At the time there was considerable discussion, even squabbling, over the choice of markings for night landing sites and the most appropriate means of representing the glide path. Nevertheless, night and IF techniques improved with each successive helicopter type and became routine on the Whirlwind HAR 10. But, despite its poor performance in icing conditions, it was the Wessex, with its twin engines and auto-stabilisation equipment, that provided the RAF with its first realistic helicopter IF capability. Today, night flying has been revolutionised through the introduction of image intensification technology. Procedural IF is routinely practised on simulators, and today's Defence Helicopter Flying School (DHFS) has a Bell 412 simulator with a Harmony Visual System which is used by students at the basic stage.

Search and Rescue (SAR) Operational Training

SAR Sycamores had a two-man crew, pilot and crewman. This required the pilot to operate the winch when the crewman had to go down with the cable. This was far from easy but the provision of a third crewman had to await the arrival of aircraft with better performance. Once these became available, it became possible to establish a three-man crew, consisting of a pilot, a navigator and a winchman. To begin with squadrons employed their own ground tradesmen as winchmen, but airman aircrew soon became involved. Today's winchmen are predominantly, but not exclusively, air loadmasters, air electronics operators having supplanted the navigator on the Sea King, which also has two pilots for a total crew of four.

Search and Rescue Training Unit (SARTU)

SARTU formed at Valley in 1979 but it could trace its pedigree back to April 1962 when CFS(H) had established a role-related detachment there. This unit later became No 3 (SAR) Sqn of CFS Helicopter Wg and later still No 2 (SAR Training) Sqn of No 2 FTS. In its various guises it trained all operational Whirlwind and Wessex SAR aircrew, and demonstrated SAR techniques and mountain flying to basic helicopter students. Since the formation of the DHFS in 1997, basic techniques have continued to be taught at Valley using the Bell 412, the Griffin, but operational training on the Sea King is now carried out elsewhere.

Sea King Training

While it had previously been possible for Valley to handle all SAR training, the advent of the Sea King demanded a dedicated school. Known as the Sea King Training Unit, it formed at Culdrose in 1978 only to be absorbed into the corresponding RN unit, No 706 Sqn, in 1979. The RAF element regained its independence in January 1982, although it remained at Culdrose as a lodger until 1993 when it moved to St Mawgan. There it operated as the Sea King Operational Training Unit until 1996 when it was allocated the identity of No 203(R) Sqn. Throughout this period, RAF crews have had access to the navy's sophisticated Sea King flight simulators, such devices being particularly useful for an aircraft with an extremely complex engine management system and a fully automatic transition and hovering capability. The RAF commissioned its own simulator at St Mawgan in 1997, this now having a full Night Vision Goggle capability.

Support Helicopter Operational Training

In the early 1950s all students graduating from basic helicopter training proceeded directly to a squadron - be it Whirlwind or Sycamore. Even in the 1960s many students joined Whirlwind squadrons straight from CFS. Many went to Borneo where, after two weeks of in-theatre training and acclimatisation, they were given a categorisation flight and declared operational. In the same way, their colleagues proceeding to SAR units carried out a short period of in-house familiarisation and categorisation, and were operational within fourteen days of joining their squadron. Since then, however, more formal special-to-type courses have been introduced. These are summarised and tabulated at Figure 3.

These conversion courses have expanded with the increasing complexity and growing operational capability of the helicopter. Nevertheless, the increased output standard from the DHFS, including, for example, NVG flying, keep as much instruction as possible on the less expensive aircraft – the Griffin. The downside is that pilots destined for the Wessex (still in service with Nos 72 and 84 Sqs thirty-seven years after its introduction) are no longer Wessex qualified and require a longer conversion course.

Support Helicopter Simulators

Since the RAF did not make available the resources needed to provide

up-to-date simulators for the helicopter force as they became available, *ad hoc* methods had to be used. Access was gained to a second-hand Chinook simulator, courtesy of British Airways (BA). This was a very early example of a public/private partnership (which

Type	Unit	Location	Period
Belvedere	Belvedere Trials Unit	Odiham	1960-61
	No 66 Sqn	Odiham	1961
	No 72 Sqn	Odiham	1961-64
	Belvedere Conversion Unit	Odiham	1964-66
	Short Range Conversion Unit	Odiham	1966-67
Wessex	Wessex Intensive Flying Trials Unit	Odiham	1963-64
	Short Range Conversion Unit	Odiham	1964-67
	Helicopter Operational Conversion Flight	Odiham	1967-71
	Air Training Squadron	Odiham	1971-72
	No 240 OCU	Odiham	1972-80
	Wessex Training Flight	Benson	1980-82
	No 2 FTS*	Shawbury	1982-97
	No 72 Sqn	Aldergrove	1997-date
Puma	Air Training Squadron	Odiham	1971-72
	No 240 OCU	Odiham	1972-93
	No 27(R) Sqn	Odiham	1993-98
	No 33 Sqn	Benson	1998-date
Chinook	No 240 OCU	Odiham	1980-93
	No 27(R) [now 27] Sqn	Odiham	1993-date

Fig 3. Units involved in SH training since 1960.

*While No 2 FTS operated the Wessex as an advanced trainer, it automatically provided type conversion, role-related training being undertaken by Valley (SARTU) and Training Flights embedded within SH units, eg No 60 Sqn at Benson and No 72 Sqn at Aldergrove. Because the DHFS does not fly the Wessex, type conversion has been handled by No 72 Sqn since 1997.

was regarded in 1985 as ‘a fudge to get round a lack of financial provision’). BA provided the capital required to move the simulator from Aberdeen to Farnborough and to reconfigure it as a HC 1. They then charged the RAF by the hour and recovered their costs over the fifteen years that the contract ran. This arrangement also enabled BA to secure an income flow from third party customers when the RAF was not using the simulator. The Puma force had to make do with buying time on a Norwegian simulator. This actually represented a later version of the aircraft to that operated by the RAF but a software adaptation permitted it to emulate the performance of the British Puma so that emergency procedures could be rehearsed realistically.

The experience gained from this experience established a clear case for much better facilities. This led to a public/private partnership which has provided the RAF with six modern simulators, three Chinook, one Puma and two Merlin, all at Benson, plus a state of the art Sea King simulator at St Mawgan.

Support Helicopter Crewman and Navigator Training

In the early days, when performance allowed, squadrons drew the second crew member from their ground engineer establishment. Even in Borneo, Whirlwind 10s were operated on a pilot-only basis with the ground tradesman managing the landing site and refuelling. The deaths of technical personnel flying as Belvedere crewmen in 1962 and 1964 focused attention on the anomaly of ‘non-aircrew aircrew’ and this led to the establishment of SH crewmen in their own right. They were drawn from all airman aircrew trades but eventually most of them turned out to be air loadmasters. Initially the training units provided the necessary conversion training with experienced airmen aircrew instructing pilots and crewmen alike in the ground school. Air loadmasters are now provided with their initial training at Cranwell, along with all other airmen aircrew, before moving to Shawbury to be trained on helicopters by the DHFS.

In 1993, MOD accepted the Harding Report which had recommended substituting navigators for some of the pilots who were then occupying the left-hand seats of the Chinook. Currently, navigators make up a third of a Chinook squadron’s front seat establishment. They are trained at DHFS by Qualified Helicopter Navigator Instructors (and not by Staff Navigators as in other forces).



Since 1997 basic helicopter training has been conducted on a Tri-Service basis at Shawbury by the jointly-manned, contractor-operated Defence Helicopter Flying School. Flying is carried out on the Squirrel HT 1 (ZJ269) and the Griffin HT 1 (ZJ234) via stints with Nos 660, 705 and 60(R) Sqns.

Similarly, Qualified Helicopter Crewman Instructors train crewmen. CFS trains these specialist instructors in the same way as their pilot colleagues. The basic training of pilots, navigators and crewmen is carried out conjointly. At the conclusion of the DHFS course, all three aircrew trades move on to their respective operational training units.

Conclusion

The helicopter force has progressed dramatically during the fifty years that it has spent making its way forward, engagingly independently from the rest of the RAF. The early techniques developed by CFS to overcome the very serious deficiencies of contractor training have stood the test of time. While it can be argued that the helicopter force has been insular, the view from within suggests that, in training

matters, it has been well served by the basic standards laid down by CFS(H). Their men in the field, the Squadron QHIs, have administered the training system conscientiously and successfully for more than forty years. It is encouraging to be able to record that the lessons have been learnt, as a contractor (FBS Ltd, comprising Flight Refuelling and Bristows) is once again providing students of all three Services with their basic helicopter training. This is proving to be a very satisfactory arrangement, DHFS's operators evidently being rather more successful than their predecessors of the 1950s.

Acknowledgements:

RAF Helicopters - The First 25 Years by John Dowling. Published by HMSO

RAF Rotors by Raymond Bedford. Published by SFB Publications

Flying Units of the RAF by Alan Lake. Published by Airlife Publishing Ltd

Former Colleagues: Dick Holmes, Tom Jones, Mike Lloyd, Tony McGregor, Lofty Marshall, and John Strong

The following websites:

The MOD(RAF) at www.raf.mod.uk

The CFS at www.rafshawbury.demon.co.uk

The DHFS at www.rafshawbury.demon.co.uk

The RAF Museum at www.rafmuseum.org.uk

THE PROCUREMENT OF HELICOPTERS AND THE OPERATIONAL REQUIREMENTS BACKGROUND TO THE RAF'S SEARCH AND RESCUE SEA KING

Wing Commander Fred Hoskins

For Wg Cdr Hoskins' CV, see page 43

Sad to say, there has not been a great deal of original design activity on military helicopters in the United Kingdom. From the start, the RAF has had to lean heavily on the procurement of American designs. Dragonfly, Whirlwind, Sioux, Wessex, Sea King and Chinook were all from the USA. They were adapted, modified and in some cases given British engines, but the basic design was American. Collaboration with the French resulted in the Lynx for the navy and army, the Gazelle for all three Services and the Puma for the RAF. Collaboration with Italy has now brought about the Merlin for the Royal Navy and the RAF. So far as British designs go, however, all we have seen are the Sycamore and Belvedere for the RAF, the Skeeter and Scout for the army and the Wasp for the navy.

I am unable to speak about most of these helicopters from first hand knowledge but I can speak about the Sea King in more detail. Almost all of my helicopter flying experience was in the SH role with only a very small involvement with SAR, but when, in the summer of 1973, I went from the command of No 33 Sqn, the first to be equipped with the Puma in 1971, to the Operational Requirements division of the MOD, as OR21, I found that the most important task of my two years in that post was to work on the Air Staff Requirement (ASR) for a helicopter to replace the Whirlwind and Wessex in the Search and Rescue role.

There were other things to do, of course, even touching on replacements for transport aeroplanes and a powered glider for the air cadets, but what turned out to be the SAR Sea King was the biggest task. As to SH, we were involved with helicopter replacement inasmuch as we kept a financial place earmarked in the Long Term Costings (LTC) and deliberated from time to time on how many 'small' and how many 'large' helicopters we were likely to need in the future. Although we kept an eye open as to what might be on offer elsewhere, ie in the USA, we tended to talk in terms of 'Wessex

replacement' rather than of specific aircraft types such as Chinook.

I might as well mention that in the filing cabinet I found files on the proposals for a Medium Lift Helicopter, ie the Chinook, but the project had been shelved before my arrival and did not come out of the cabinet again until after I had left both the MOD and the Service in 1975.

As I have said, we looked at future fixed wing transport aircraft, but not in depth, and we also looked at various aspects of future SH helicopters and their equipment. I recall that one day a senior officer from another department came to see me about a paper I had written and said 'What's all this about fitting helicopters with all sorts of navigation aids?' I pointed out that the Puma was a very modern helicopter which had a good range when fitted with long range tanks and thus had a capability to deploy itself to operational areas without the need to dismantle it and take up valuable space in transport aircraft. The navigation equipment would increase its versatility and enable it to go in adverse conditions. The response to this was 'But you and I know that if the weather clamps en route you can just land in a field and wait for it to clear.' Perhaps this shows just what we have been up against at times when trying to bring in improvements, although, it may well have been that the senior officer concerned was merely acting as Devil's Advocate and was intent upon getting me to concoct a more persuasive argument. Many years later, in 2000, I was extremely interested, and pleased, to see that when the Chinooks were deployed to Sierra Leone they did so under their own power.

Similar objections were raised in connection with the ASR for the SAR helicopter: 'Why do you want to keep the long range tanks? Can't we make a saving on them? Why do you want such a comprehensive fit of radio and radar?' I have no complaints about these questions because it is obviously important and legitimate to watch the money and ensure that a case for equipment and expenditure is watertight. However, I was disappointed to learn that it *cost* money for the RAF to have the fifth integral underfloor tank, standard in the French production model, removed from the Puma, allegedly to *save* money!

Back to the new SAR helicopter. This, as we all know, eventually turned out to be the Sea King. You may ask whether the ASR was written and found to fit that aeroplane or whether we picked the Sea

King and wrote the ASR around it. To be truthful, I do not clearly remember. Suffice it to say that we were not going to be in the business of designing and developing a completely new helicopter. Clearly, it made sense to find an existing helicopter which had been tried and tested and which could be adapted for our purposes. Commonality with a type already in service was another obvious bonus. Let me remind you that the Royal Navy already had Sea Kings for anti-submarine work and that SAR versions were in service with the German Navy and the Royal Danish and Royal Norwegian Air Forces.

At this point let me say how OR works or, rather, how it worked twenty-five years ago. Someone had to initiate the idea for a new project and usually there would be an item in the LTCs assuming that funds would be required at some future date to pay for whatever replacement aircraft might be required. Inclusion in the LTCs did not necessarily mean that the project would ever materialise but it was a foot in the door and the chances of any new project ever going ahead were virtually nil unless financial provision had been made and approved, albeit provisionally, years before.

The Operational Requirements division worked closely with Air Plans and Operations and there would be papers going back and forth about what might be needed. When an idea for a new aircraft became fairly well defined OR would be asked to write an Air Staff Target (AST) and when this had been approved work would start on an Air Staff Requirement, as such. As the project gathered momentum the negotiation and collaboration between OR and other branches widened to include the Finance Branches, MOD(PE), the engineers and the personnel departments because the planning for and introduction of a new aircraft has an impact on many aspects of Service life and organisation.

When the parent Service department in the MOD was satisfied with its requirement then it had to go before the Operational Requirement Committee (ORC) for approval. The ORC comprised the heads of OR in all three Services and various other interested parties, not least the financiers, and the chairman was a civil servant. Papers had to be produced and circulated, in great quantity, as may be imagined. It will be abundantly clear that all the arguments had to be subjected to the closest scrutiny at all levels before the case could be



A Sea King HAR 3 (XZ599) of No 78 Sqn. SAR Helicopters are usually finished in a high-visibility yellow, but those deployed in the Falklands have been toned down with a coat of grey. (MAP)

referred to the ORC.

I was not involved in the drafting of the AST but I was heavily involved in the production of ASR 756 which resulted in the RAF obtaining the Sea King for SAR.

SAR Sea Kings for Denmark, Norway and Germany were being built at Westlands, so occasional visits to Yeovil were necessary. I arranged for members of the relevant Finance Branch to visit as well, in order to give them a chance to see and understand what it was that they were being asked to support. It might be said that if Westlands were already building for Germany, Denmark and Norway then we should surely just have ordered a few more of the same, but there were some differences between the models and they did not fit our specifications exactly. After all, although it might be attractive to buy off the shelf, it is also attractive to have the opportunity to introduce what one really wants rather than just accept what is there. Also, improvements and modifications are constantly in hand and one might as well be right up to date in as many aspects as possible. In the event, I believe that the result was that the RAF was supplied with a version of the Sea King superior in many respects to what was then available off the shelf

On the long path to the ORC many possibilities and problems had to be considered. What would the projected aircraft be able to do in

terms of radius of action and lifting capability? Could it be used in a secondary role? What would be its limits as regards weather and temperature? Icing was a problem exercising many minds at the time. What avionics fit would be necessary? How many aircraft would be needed to provide the cover required? What was the cover required? What geographical areas? What watch times; would it be 24 hour cover? Who was the cover intended for? As to the latter, the point was often made by the civil servants that RAF SAR cover was intended only for the military and that we should disregard the potential needs of merchant shipping and yachtsmen. But, we argued, how could distress calls from non-military sources be ignored? What would be the reaction of the taxpayer in such circumstances? Nevertheless, that point was often brought up and our only response was to say that if SAR was available for the military then it would have to respond to other calls. Perhaps we could have asked for assistance with funding from elsewhere, perhaps the Ministry of Transport, but the problem then would be that ‘he who pays the piper calls the tune’ and it would not have been acceptable to have another ministry having, or even wanting, a say in deployment and other operational aspects.

Following on from this, one of the items I suggested as being important was a radio to permit the Sea King to be compatible with the Coastguard, life boats and merchant ships. This was opposed, by the financiers who said, ‘If, as is the case, our SAR is for military use only, why do you think we need this equipment?’ Answer, ‘To communicate with those who use the seas, undertake rescue missions and may well become involved in the rescue of a military crew.’

Then again, we were asked, ‘The SAR helicopter is military, and RAF airfields are equipped with GCA or PAR, so why are you stipulating that the Sea King should have civil avionic equipment such as VOR and DME?’ Answer, ‘Because it is entirely feasible that in the course of a rescue operation over the North Sea the Sea King is likely to find itself nearer to a Danish or Norwegian airfield when the rescue has been completed and its capability is enhanced if it can land to refuel at airfields which do not have GCA or if it can use them as weather alternates. Also, the nearest hospital to a rescue might be on the other side of the sea.’

Another requirement that had to be defended was the provision of fuel. ‘The North Sea is not all that large; why do you want to have the

option of long range fuel tanks?’ Answer, ‘Long range tanks increase flexibility and capability. The Sea King might have to go to an incident considerably north of what we think of as the North Sea. There could well be other incidents a long way beyond the North Sea.’

Over the years we have seen reports of Sea Kings carrying out rescues at extreme range over the Atlantic, using long range tanks and refuelling in the south of Ireland. We have also seen reports of Sea Kings landing in Denmark after a rescue. Our arguments have therefore been justified but it is interesting that these long range missions usually involve merchant ships. Fortunately, the opportunity has been taken to use our equipment to do good for those needing help and, at the same time, to gain some credit for our country and our Service.

Another point of contention was the radar as fitted in existing marks. Was it essential or could it be discarded? Our argument was that the Sea King would have to operate at night and in all weathers and that it needed the radar both for cloud and collision warning and as an additional navigation aid. It had to be seen in relation to the entire avionics fit proposed which included equipment which would enable the navigation to be carried out by the pilots, permitting us to do without a professional navigator, inevitably an officer, since the radar could be operated by an airman aircrew, either an AEOP or an air signaller. We did our sums on the cost savings to which this would lead in terms of salaries and pensions and also in terms of training costs. Another important item that had to be defended was auto-hover, to assist in night rescues.

Since I left the Service it has become apparent that our recommendations about crews and our arguments about avionics and fuel tanks did get through in the end and these things have proved their worth over and over again.

If memory serves, those were the main problems of a technical nature. Now to some of the other obstacles on the road to approval by the ORC. The main obstacle? The Royal Navy.

To some degree, there has always been rivalry between the Services. They all have to fight for their budgets and fight for their own preserves. For years the Army wanted to take over the RAF’s SH role and the Royal Navy resented the RAF’s involvement in maritime affairs. It is quite natural that each Service should fight for its own

equipment and budget and, indeed, for its very existence. So I do not feel any animosity towards the RN for throwing spanners into the RAF's works over the SAR Sea King – although it did make a lot of extra work for us at the time.

The ASR went to the ORC twice in my time. I believe it was on the first occasion that the RN suddenly came up with a paper intended to show that the RAF did not need the Sea King for SAR because the RN could do the job from Culdrose and Prestwick using its ASW Sea Kings. In fact, the RAF did not really need to do SAR at all! Naturally, this paper was supported by charts showing the radius of action of RN Sea Kings and the area they could cover so we had to compare this with the charts we had prepared to show the areas covered by our own proposed deployments. It goes without saying that our cover, which still included the use of Whirlwinds and Wessex in those days, was much more comprehensive. Also, SAR was to be the primary role of our Sea Kings and they were to be equipped accordingly whereas SAR would be very much a secondary role for the RN. What degrees of readiness and guarantees of availability could the navy provide? I suspect that if the RN had won that argument they would then have put up a case proving a need to have more Sea Kings to enable them to do the entire SAR job. But I can only speculate.

That spanner was thrown into our works at short notice and with excellent timing. There was enough time to enable all the members of the ORC to read and be impressed by the arguments and hardly enough to allow the AFD to produce a counter. But we did. The other RN spanner must, superficially, have been even more appealing to the keepers of the purse. Equipping the RN with the ASW Sea King had made its fleet of forty or more Wessex ASW helicopters redundant, so the navy had proposed that the RAF should have these instead of the Sea King for SAR! They were all HAS Mk 3s which were powered by a single Gazelle engine. To have only one engine for SAR operations did not meet our requirements which was why the RAF's own SAR Wessex had two Gnomes! So we were not at all happy with the prospect of Wessex Mk 3s, especially as they were old and had been well used. A lengthy and expensive refurbishment and anti-corrosion programme would have been needed. So this had to be looked at and engineering opinions and advice obtained. As the second-hand ASW

Wessex could not possibly have offered the same cover as the Sea King, other than the fact that they had radar, they offered no improvement over what we already had. To have accepted them would have been a retrograde step. Thus it was apparent to us that the suggestion simply had to be a non-starter and I suspect that it was equally obvious to the Department of Naval Air Warfare (DNAW). Nevertheless, in most cases money conquers all and, in case there was a faint chance that a saving in cost could be achieved, we had to go through each and every possible argument and factor in order to preserve our own case and ditch the navy's proposal.

It may well have been that the RN knew that their argument could not possibly win the day but that they had thrown it in just to slow us down. On reflection, after all these years, it occurs to me that it may have been a tactic to take our projected expenditure out of the picture temporarily and make it easier to get a naval project through. Perhaps the advice of the naval aviators was ignored; I have no way of knowing. Repeating what I said earlier, apart from being confronted with sudden requirements to devil away and produce new papers in a hurry, I bore no grudge against the Royal Navy for their attempts to scupper the RAF's Sea Kings and I would add that, at the working level, our relationship with DNAW was excellent and the senior man in the relevant MOD(PE) department was an extremely helpful sailor.

In the event, the RAF got the project through with, apparently, all the equipment we designated and over the years I have watched the exploits of the SAR Sea Kings with great interest and a certain amount of pride.

HELICOPTER VIBRATION ENGINEERING IN THE ROYAL AIR FORCE 1963-92

Wing Commander Noel Trigg

Noel Trigg, an Aircraft Apprentice and a Technical Cadet, graduated as a Mechanical Engineer in 1960. Following early 'conventional' tours he specialised in helicopter engineering and, after squadron and MOD posts, commanded the Engineering Wing at Odiham. His last appointment was with the MOD where he was responsible for the engineering management of the RAF helicopter fleet. On retirement in 1977 he founded Helitune to create the world's first computerised helicopter vibration system. Helitune systems have been adopted by several air forces, including the RAF. In 1996 he founded another company which, in 1997, was granted the first ever CAA approval of vibration analysis and dynamic rotor and propeller balancing.



INTRODUCTION

The Underlying Problem. I joined the helicopter force at CFS(H) Ternhill in 1963, prior to being posted to No 110 Sqn during Confrontation. The daily state board was littered with the word 'vibration' against many of the aircraft. The story was the same in Singapore and it often appeared at our forward detachments at Labuan, Brunei, Long Samado, Bareo, Pensiangan and Kuching. Added to this pervasive problem, helicopter engineering was regarded as a bit of a backwater, yet it forged the young engineers into very self-reliant practitioners. They had to be. There was precious little back up, especially at forward landing zones and army forts. Looking back, it is clear that the Royal Air Force took a lead over the other two Services in solving vibration problems; a lead that it maintained throughout the period covered by this paper.

AIM

My task today is to trace the progress of helicopter vibration analysis in the Royal Air Force from its first faltering steps during



A helicopter detachment at Long Samado. FEAF had three Whirlwind HAR 10 units at the time so these aircraft could have been drawn from all or any of Nos 103, 110 and 225 Sqns.

Confrontation to the 1990s. Inevitably, as I have been closely associated with the development and design of equipment and techniques to provide helicopter vibration solutions, this will be a personal view.

BORNEO - CONFRONTATION; April – June 1964

Supply Chain. During 1964 in Borneo, the supply chain, such as it was, brought a meagre allocation of spares to Labuan whence Whirlwinds were used to transport them to stricken aircraft, both rotary and fixed wing. Small packages were carried in the cabin; large items and engines were underslung.

Crewmen. In order to complete servicings, to diagnose faults, and to fit the replacement parts, a promising young junior technician or corporal flew with each detached Whirlwind. They were also used as crewmen. This scheme worked very well from the engineering point of view but was unpopular with the Army customers who lost the weight of the crewman from their usable load. Crewmen were almost

invariably encouraged to fly the helicopter during operational sorties, providing a second pair of hands should the pilot be incapacitated.

SINGAPORE; June 1964 – October 1966

Adaptation of Servicing Methods. Back at FEAF HQ in November 1965, Air Cdre Reggie Harland had been shocked at the state of the deferred defects on the helicopters at Seletar. He created Centralised Whirlwind Servicing Flight (CWSF), which I had the privilege to command. Initially, the squadron aircrew reacted by continually snagging everything. Gradually, all of the deferred defects were cleared up, however, eventually resulting in 100% serviceability which was celebrated with a fly-past of all of the Whirlwinds. From then on, the CWSF worked well and generated an adequate supply of serviceable aircraft for the daily state.

Fuel Computer. The Whirlwind's Gnome engines were managed by a fuel computer, which gave cause for concern. Defects resulted in the helicopter being flown in manual control. The computer and throttle actuator were often incompatible, giving rise to unpredictable behaviour. Thankfully, the designers, Hawker Siddeley Dynamics, treated these problems very seriously and gradually raised the Mean Time Between Failures to an acceptable level.

Detachments. In 1966, for a singleton detachment, a Beverley was used to transport a Whirlwind to Udorn, in Thailand, to provide aid when the Mekong flooded its banks and cut the capital of Laos, Vientiane, into three 'islands'. Later on, in Exercise LION ROAR, RAF, RN, RM and Australian Army helicopters were deployed with the brigade of Gurkhas to Kuala Trengannu, to test the defences against a potential Indonesian coastal invasion.

Hand-Held Askania. It was while I was serving in Singapore as OC CWSF that I discovered an Askania hand-held vibrograph in my desk. Vibration had been a pervasive problem ever since the birth of helicopters and it would continue to be a major source of unserviceabilities for years to come. My Whirlwind course notes enabled us to create a transmission diagram from the gearbox, shaft, rotor and engine information. A series of test flights of all of our aircraft enabled us to determine which components were generating the vibration and to form a view on acceptable levels and reject levels. At last there was data upon which to base judgements rather than

having to rely on the pilot's guess at the cause. The Askania information, coupled with ground-based flag tracking, enabled us to identify problems and to measure the effectiveness of rectification. Word spread and it was not long before a procession of navy, army and Royal Marine helicopters flew into Seletar for their problems to be identified. This experience was to focus the course of my life. I was determined to develop the equipment and techniques to enable helicopters to fly smoothly, but more importantly, safely.

CFS(H), TERNHILL; February 1971 – October 1972

Gnome Engine Stall Margins. Whilst at Ternhill, as OC Aircraft Servicing Squadron with CFS(H), I was fortunate to be able to continue the Gnome engine stall margin investigations begun by my predecessor Tony Fairhead. The Gnome had been suffering compressor stalls and they had been torching themselves at the rate of seven burnt out turbines per year. These invariably resulted in hasty engine-off landings, followed by the engines being returned to Rolls-Royce for costly overhaul and hot end changes. With the help of David Roberts, a Clerk Stats, and the Rolls-Royce Small Engine Division, we were able to make sense of the airborne NgT4¹ checks. The results were correlated with the tie-down checks of the stall margin 'door closed', when compared with the stall margin 'door open'. Once we were confident of our understanding of the mechanisms involved, we persuaded the Station Commander, Gp Capt Jim Corbishley, to back our request to test our theories in flight. We modified a Whirlwind to be able to gag the inlet guide vanes (IGVs) fully open with fuel pressure. Once gagged, whilst in flight, the pilot lowered the collective lever, until the engine stalled. At that moment I operated a solenoid valve to cut off the fuel instantly, and we entered a full engine-off, auto-rotative descent to the runway. Even though we had practised this countless times on the tie-down base, the in-flight bang and rapid yaw caught Ron Sivewright, the A2 pilot, and myself

¹ Whirlwind pilots carried out NgT4 checks to establish the values of the Gnome engine's gas generator speed (Ng), compared with the power turbine inlet temperature (T4) at a prescribed height and airspeed, straight and level. Factored for atmospheric conditions, the engineers used these readings to calculate an installed power index for the engine and thus monitor any deterioration. The RN did much the same on its Gnome-Wessex to produce what it termed a Power Performance Index (PPI).

by surprise. Thankfully our theories were proved and Jim Corbishley's faith was rewarded, albeit that the Ternhill crash alarm had sounded at the exact time that Jim knew that we would be entering the first of the ten tests above Shawbury's runway. Not us, thankfully. What a boss!

Modified Nose Door. Meanwhile Brian Humphries, who was the Engineer Officer for No 22 Sqn's SAR Whirlwinds, was experimenting with fitting the original grill to the nose door, thereby eliminating the difference between the 'door closed' and 'door open' stall margins. Suffice it to say that with these combined actions, the stalled and burnt out engine problems ceased, thus saving a great deal of money - and adrenaline!

RAF ODIHAM; December 1974 – November 1976

Unexplained Vibration. My hand over at Odiham as OC Eng Wing was punctuated by two pivotal events. The outgoing OC told me that he had given up trying to solve the vibration problems on Puma XW222 (alias 'Trembling 2') and shortly after I was in the chair, one of our Wessex helicopters was put down rapidly after the very sudden onset of massive vibration. The pilot thought that the problem was behind his right shoulder. The decision had been taken to rob the gearbox from an aircraft undergoing scheduled servicing and to change the unit in the field. The first I knew about it was that when the pilot tried to engage the rotor, the vibration was so severe that he dared not run it up to full rotor rpm. The only equipment we had was the Askania. The SNCO engineer took it into the field and obtained a waxed tape reading at the highest rotor rpm, which the pilot was prepared to select. When the tape was examined, it was obvious that the vibration emanated from the tail rotor and had nothing to do with the main rotor gearbox. The initial visual inspection failed to find the cause but, on closer examination, it was determined that the complete leading edge metal sheath was missing without trace from one of the blades. Hence the instantaneous increase in vibration reported by the pilot.

Chadwick Helmuth Vibrex. We invited the Chadwick Helmuth representative to demonstrate the latest *Vibrex* equipment at Odiham, on dear old 222. We found that the main rotor was out of balance and

that the blade passing frequency $(4R)^2$ vibration was excessively high. We devised a rotor balance scheme, by winding black tape, of known length and weight, around one blade tip. After calibration we were able to add the appropriate weight of tape to each of two blades, to perfect the lateral balance. We also created a vertical balance chart, which enabled us to equalise the lift of the rotor blades with pitch link adjustments and hence to eliminate the vertical bounce. The high 4R was traced to the ‘barbeque plate’³ fretting on the cabin roof. Thus in one day, with the latest rotor track and balance and vibration analysis equipment, we were able to solve a problem which had defied solution for some 18 months.

FM Recorder and XY Plotters. The *Vibrex* was excellent at rotor track and balance but left a lot to be desired at vibration signature analysis. To bridge this gap we approached RAE Farnborough to borrow their FM tape recorder for in-flight vibration measurement.⁴ Recordings were made and sent to Farnborough. Here they were played back on their computer, producing plots of amplitude against frequency. With knowledge of the transmission diagram, we were able to identify the source of the peaks. The only problem was that this method was incredibly slow, taking up to three days to get answers. It also relied on masses of good will and persuasion to get hold of the equipment and to encourage the scientists to put *our* needs before theirs. Nevertheless, it was a big step forward.

Vibration Control Cell. To capture and to formalise the techniques and expertise acquired during these investigations, we formed the first Vibration Control Cell (VCC). It was staffed with dynamic young tradesmen with enquiring minds, good diplomatic skills and above all, persistence.

² ‘4R’ is shorthand for 4 times the main rotor speed. The Puma has four main rotor blades, each of which creates its own downdraught. Thus, for every turn of the rotor head the fuselage receives four distinct downward impulses, hence ‘blade passing frequency’ vibration.

³ The rotor head is attached to the main rotor gearbox which is connected to the top of the fuselage by a flexible, multi-fingered plate known as the ‘barbeque plate’. It is through this component that the four impulses at Note 2 are actually transmitted to the fuselage structure.

⁴ The RAE’s frequency modulated tape recorder had been specifically adapted to record vibration frequencies.

MOD AIR ENG (RAF); November 1976 – December 1977

Whilst at the MOD as the Chief Helicopter Engineer, I became aware of the Scientific Atlanta SA2520 Vibration Signature Recorder. It had been developed to find the sources of vibration on diesel engines on the Santa Fe railroad. Through the UK agent, we obtained one of these and we flew it on army, navy and air force helicopters to evaluate its potential to replace the Farnborough equipment. With suitable modifications, this became the SA2538, which was designed specifically for helicopter use. It was supplied to the RAF and the Army and was used very successfully as an adjunct to the Chadwick Helmuth *Vibrex*.

HELITUNE; December 1977 – May 1996

The Founding of Helitune. With the full co-operation of the F6 Branch, I retired from the RAF in 1977 to form Helitune Limited. My express intent was to continue the development of rotor track and balance, vibration analysis techniques and equipment for helicopters in particular and aircraft in general, as my personal contribution to flight safety. In 1982 the organisation was expanded to become a full research, development, production, testing and marketing company. We created the world's first computerised rotor track and balance and vibration analysis equipment; the *Rotortuner* Vibration Management System.

Pumas. Helitune's first customer was the RAF. The engineers were having severe difficulties optimising the new composite blades on the Puma. Unlike the previous metal blades, which could be replicated to very close tolerances, Aerospatiale had to build two blades for every one that they wished to sell. Each blade was laid up by hand with carbon fibre and composite skins bonded together with layers of resin. The advantages of the new composite blades, in terms of higher weight-carrying ability and damage-tolerance, were being negated by high vibration and high maintenance to optimise them for flight. Moreover, the Chadwick Helmuth equipment was highly susceptible to gusty conditions and aircraft were queuing up awaiting calm air for rotor track and balancing. We demonstrated the *Rotortuner* successfully and optimised a Special Duties Flight Puma to such low levels that the pilot landed the aircraft hands-off on the auto-hover



In 1985 this team used a Helitune Rotortuner to solve (with a precision which Boeing had thought impossible to achieve) rotor track and balance problems which had dogged a Chinook for months.

system, and then took off the same way. During this process we noted that one of the 'experts' was misusing the Chadwick strobe and had been training others to use it incorrectly. This had exacerbated the problems that the engineers were having with the composite blades. I leave to your imagination the delicacy with which we had to communicate this fact to higher authority! Fred, the wheel taper's hammer.

Chinook. In 1985 the Chinook was giving the RAF even more severe problems in terms of rotor track and balance. This culminated in one aircraft requiring thirty-two air tests before it was considered to be acceptable. We were invited by Sqn Ldr Andy Verdon to carry out a configuration exercise to determine the pitch link, tab and lateral weight sensitivities on the ground, in the hover and at 100, 120 and 140 kts. Using the information gathered by the *Rotortuner* we were able to determine the lateral-to-vertical cross-coupling within each rotor, the inter-rotor cross-coupling between the forward rotor and the aft rotor, and the sensitivity relationships from the aft rotor to the forward rotor. Using our unique line-scan camera we were able to

detect the position of each blade tip in space, to ± 2 mm in elevation and 48 millionths of a second in blade timing. Some time later, using RAF data, we also designed a computer program to optimise the adjustments on both rotors simultaneously, requiring only two or three flights to produce results that Boeing thought were impossible to achieve. We were also tasked to provide training programmes to pass on our findings and our understanding of the mechanisms behind the Puma and Chinook rotor optimisation procedures. Tribute must be paid to Andy Verdon, who devised the RAF's tripartite approach to helicopter vibration management of highly skilled men, the right equipment and the latest techniques.

Q Annotation. After acquiring the *Rotortuner*, the RAF pioneered the training and qualification of selected technicians by a specialist team at CSDE, to mastermind vibration management at each of the VCCs. These Q annotated men were usually screened from posting for five years and provided great continuity, expertise, quality assurance and training capabilities for squadron personnel.

Sea King. In 1990 we were also asked to optimise the rotor track and balancing and create mechanical fault detection techniques for the SAR Sea Kings. The trials were conducted in 1992 at RAF Brawdy, in the face of great scepticism from one of the SNCO shift leaders. After optimising a series of aircraft, which had been rotated around the flights, we were gratified to have the SNCO give spontaneous approval of our techniques. He had noted that after each of the aircraft had been optimised, the defect rate dropped significantly and remained low.

SUMMARY

Helicopter engineering and operations were dogged by vibration, poor serviceability, a lack of 'image' and a scarcity of spares. In the early days, the aircraft were kept in the air by the ingenuity and knowledge of Halton-trained SNCOs who could be relied upon to make do and mend, to sniff out spare parts and to rob downed aircraft. Vibration continued to blight both serviceability and availability for many years. In the early 1980s, however, computerised equipment was developed and the helicopter engineers created applications to manage and optimise the balance of the rotor systems. These developed later into balancing systems for shafts and fans, which further enhanced the

serviceability and availability of helicopters to the front line. Other Services world-wide have followed the Royal Air Force's example to such a degree that it is now inconceivable for a military helicopter to be flying without its rotor track and balance and vibration characteristics having been optimised.

AFTERNOON DISCUSSION PERIOD

Hugh Lake. I am currently a consultant in developing management structures and I found some of this morning's presentations particularly interesting because I use the helicopter force as an example of what happens to an organisation if it fails to produce a balanced top-to-bottom and side-to-side skill base. I offer that as a free management 'message' that everybody is welcome to take away with them. It has certainly been brought home here today.

When I joined the helicopter force everyone else seemed to be over 35 years old. I did my basic training on Jet Provosts and Vampires and then volunteered for helicopters. As a result I was interviewed in turn by my instructor, my Flight Commander, my Squadron Commander and my Station Commander (*Laughter*). I was not quite accused of LMF, but when I said I thought it was the only remaining real flying left, they caved in and I was allowed to go to South Cerney to learn to fly these things.

I would like to add to Fred Hoskins' excellent presentation on the Sea King, to point out that procurement doesn't always happen like that, the Chinook being a good example. I was sitting quietly in OR, minding my own business, my boss having spun off to have a nervous breakdown, when Wg Cdr, as he was then, Bill Croydon, popped his head round the door and said, 'We've got a little bit of spare money, Hugh, how many Chinooks do you think we ought to have?' As we'd cancelled them twice already, I said, 'Well, it's got to be an order big enough so that cancellation would cause a riot; we've got to have at least two squadrons - nine in each - so we've got to have eighteen.'

The problem, of course, was holding off competition for the spare money. We did that by persuading the army to insist that a particular gun had to be lifted, one which we knew the CH-53, the only sensible alternative, couldn't manage. Then we shot round to the navy and said, 'If you get in our way (because they wanted us to buy the Merlin), we'll screw the Merlin up.' Meanwhile, the money surplus grew and the Minister called for my then boss, John Maitland, to talk to him about helicopters. We produced two diagrams to sell our case. One showed cost against payload, the other showed the relative size of the various aircraft in contention. Having 'cut the rotors off', we were able to show that the Chinook really wasn't very big, certainly smaller

than the Merlin, and that it was very cost effective. The next thing was a note from the Minister saying, and I quote, 'The purpose of my committees is to protect me from a bad decision. In this case, I am absolutely convinced that I don't need protection; we are going to buy the Chinook.' Now that is another way of procuring a major piece of equipment, so don't put all your faith in doing it with staff papers. A bit of luck and fast footwork can often absorb a budget deficit!

Sir Timothy. I'm afraid that the truth is that it very rarely is the staff's paperwork that actually carries the day. Whether it works or not, however, that was a good story.

John White. A recent edition of *RAF News* drew our attention to the fact that during the rescue of survivors from the Greek ferry disaster by helicopters from HMS *Invincible*, it was found necessary to use the Harrier pilots of No 1 Sqn as look-outs. Why are helicopter crews not issued with night vision goggles, and should not these and other facilities, perhaps thermal imaging devices, be standard equipment for helicopters used for search and rescue duties?

Wg Cdr Dave Simpson. The RAF's Search and Rescue Helicopter Force has actually been equipped with night vision goggles (NVG) as standard since 1991, although we started using them as early as the mid-1970s, as did, as we heard earlier, the Support Helicopter Force. Some helicopters are presently being fitted with Forward Looking Infra-Red (FLIR) imagery equipment and this should include the SAR element in the next year or two. The RAF is actually leading the field in many respects and, as CO of a Search and Rescue Squadron, I am convinced that mine leads the field in SAR NVG operations.

(Wg Cdr Simpson was OC No 22 Sqn on this date - Ed)

Gp Capt McCluskie. On the particular rescue mission that John White referred to, the pilots involved were not specialists in SAR techniques; they were embarked naval aircrew who were using their helicopters in their *secondary* SAR role. There was a very interesting article on this in *Cockpit*, the FAA's house magazine, a year or so ago. It expressed some concern at crews undertaking tasks at the edges of the flight and operational envelopes for which they may not have been adequately trained. It is all too easy to look at a job and think you can just go and do it by jumping in at the deep end. In this instance, the

navy was doing its best but, since it was operating in a secondary role, it may well have been inadequately equipped and, perhaps, not even fully trained.

Gp Capt Price. Just an observation on a problem that Noel Trigg may have encountered at Odiham. When I went there, we were very short of groundcrew. I think I'm right in saying that we were about 140 men short on an establishment of around 800. We had acquired another 70 or so by the time I left and they got another 70 afterwards. In effect, however, the SH Force had been fully engaged in Northern Ireland while about 20% short of the manpower it needed.

Cecil James. Some of you who were at the Society's AGM may have thought that I went a little over the top on that occasion in expressing my personal opinion as to how far one could afford to trust the Royal Navy. What Wg Cdr Hoskins had to say about the Sea King SAR saga was very much the sort of thing I had in mind. I thought, at the time (I was then the Under Secretary with the Air Staff) that the navy's behaviour in respect of that particular project was quite disgraceful and I continue to hold that view. It was just another example of the practice I referred to at the AGM, of the navy's taking the line that what was good for the Royal Navy was good for everybody. The Jetstream saga, which Freddie Sowrey was involved in, was another instance in which I thought the navy behaved very badly.

Mike Meech. I was an airframe fitter on No 72 Sqn from about 1978 to 1981. We had eight Wessex in Northern Ireland plus four from the RN. We had a very good relationship, so at the bottom level we usually worked very well with the other Services, even including 'Teeny Weeny Airways', the Army, who were forever borrowing equipment from us. I would also take this opportunity to point out that in the SH Force, the squadrons always included an RAF Regiment contingent. Usually employed to drive bowsers, they were actually a very important element, as they provided a Quick Reaction Force whenever we were deployed in the field. Because it has not really been brought out, I should perhaps also make the point that support helicopter squadrons handle their own defence in the field, which involves living in the trenches, just like ground troops.

Tony Bell. Just a technical point - to do with 'advanced technology'

in the Sycamore; we rather skated over the Sycamore's more advanced features. I was one of the last SAR pilots to fly it in Aden, by which time we had had SARAH fitted to our Sycamores. One of the main benefits of SARAH was a pair of substantial aerials out the front, which were very useful because you could rest your foot on one of them if you had the door off. This produced a lovely draught up the trouser leg, which, in Aden, was invaluable! (*Laughter.*)

The other thing that wasn't mentioned was that with only two crew members in a Sycamore, we had to develop a double winching technique. This involved the hapless crewman, usually a fairly elderly master aircrew, wearing a large harness, going down the wire, with an intercom lead which was reeled out from a fixture on the airframe. Using a throat mike, he would 'talk' the pilot to the survivor, pick him up and then the pilot operated the winch. This replaced an earlier system which had involved a polished car hub cap, which the pilot used as a mirror to see what was going on below, although it was a system that people got terribly confused over.

The 'two crew double' was a great improvement. It was rarely used in anger, but we did practise with it, the only thing you had to watch out for was winching *out* when you meant to winch *in*, because you got awful spluttering noises on the intercom and, even worse, you got a very wet crewman down the back of your neck when he finally came back on board.

CHAIRMAN'S CLOSING REMARKS

I am tasked with summing up the incredibly disparate and wide-ranging selection of topics that we have examined today. I can perhaps do this best by offering you the perspective of somebody who spent a little time in the Helicopter Force and followed this up with a stint at the Ministry of Defence observing how the procurement of new capabilities was managed in later years. From the different impressions that we have been presented with today, many of them first-hand reminiscences from the coal face, I get the feeling that the development of helicopters, effectively during the 1950s and '60s, was uncannily like a re-run of the development of fixed wing aviation between 1910 and the early '20s. It really did seem to be as archaic as that, almost a reversion to the days of sticky tape and string. Somehow or other, the early helicopter force, such as it was, appears to have been isolated from the mainstream in terms of the practices and procedures followed by fixed wing operators. As late as the 1980s, when I was posted to Odiham, I found that there was still a sense among the older hands who, like some of you here today, had spent many years flying or supporting helicopters, that they were in some way distinct and different from the rest of the air force. Perhaps this morning's presentation by David Niven completed the circle by underlining the fact that helicopters have finally been admitted to the mainstream and, allowing for their inherent peculiarities, that they are now treated in much the same way as the rest of the Service.

My abiding impression of today's events, therefore, is that, within the memory of most of us here today, we witnessed real pioneering activities, covering the whole spectrum from flight trials, through engineering aspects to the devising and refining of operational techniques. Helicopters are undoubtedly complicated beasts, but I believe that we have finally tamed them, not least through the endeavours of some of today's speakers.

BOOK REVIEWS

Hunters of the Reich: Night Fighters by David Williams. Tempus; 2001. £19.99

This book is the outcome of first-person interviews of five surviving big names in the German night fighter force during World War II. Its 250 pages are profusely illustrated, with an average of one photo per page. Most of those photos came from the interviewees' personal albums and they add greatly to the credibility of the work.

The highest calling for a service pilot is to fly in defence of his homeland and loved ones. The five did not shirk that duty, and between them they were credited with the destruction of nearly two hundred Allied aircraft. The great majority of their victims were RAF bombers shot down at night, and David Williams traced and interviewed several of the aircrew aboard those planes.

Speaking a different language and wearing a different uniform, all five men would have fitted in well in an RAF squadron. One of the many ironies of war is that the opposing sides' aviators usually have more in common with each other than they have with the politicians on their own side.

In one major respect the German officers' careers differed greatly from those of their RAF counterparts, however. Their side lost. If ex-members of Bomber Command feel they did not receive due honour after the war, they might spare a thought for their opponents. One pilot suffered 4½ years imprisonment in the Soviet Union. For two others, the only work available to them immediately after the war was as farm labourers.

David Williams has set down the mens' stories in a factual manner. His book is recommended, especially to those who flew in the night skies over Germany and who would like to know a bit more about those who opposed them.

Dr Alfred Price

The History of 73 Squadron, Part 3 (September 1943 to March 1969) by Don Minterne. Tutor Publications; 2000. £17.

With the publication of this third volume, Don Minterne has finally completed his self-imposed task of recording *and* financing *and* marketing the history of No 73 Sqn. This reviewer has, as they say,

'been there, done that' and I can vouch for the fact that the demand for RAF squadron histories is so small that they simply are not commercially viable. A relatively slim, and therefore superficial, monograph just might recover the outlay involved but, because unit costs are magnified by short print runs, the best that anything more substantial can hope for is to break even. That is why so few squadrons have had their stories adequately told; why the best of those which have appeared in print have been privately funded and why it takes a dedicated man to embark on such a project.

The first and second instalments of No 73 Sqn's story appeared in 1994 and 1997, the author reckoning that the project took him about twelve years in all. They were twelve years well-spent. What is the result? Three well bound A5 paperbacks running to some 1000 pages in all and including about 600 photographs. It goes almost without saying that many (but certainly not all) of the pictures are of indifferent quality, because they were taken with cheap and cheerful cameras on poor quality film under field conditions, but it is their grainy spontaneity that gives such 'snaps' their charm. That having been said, it would seem that something has gone amiss with the computerised processing of Part 3, some of the pictures in this volume being so coarsely pixilated that the images have been badly distorted.

In a work of this size, it is almost inevitable that one will be able to spot mistakes. In Part 3, for instance, the Lisunov Li-2 is described as a 'pirated Russian version' of the Dakota (p.51); it was actually built under licence. On p.164 we are (twice) told that some of 73's Vampire FB 9s were delivered to Malta by No 47 Sqn; they would surely have been flown out by the ferry pilots of No 147 Sqn, rather than 47's 'truck drivers', and on p.224 the Akrotiri Strike Wing is said to have maintained an eight-Canberra detachment in FEAR during Confrontation but by p.289 the number has gone up to twelve; I am sure that it was always eight.

The Canberra problem stems from the author's apparent reluctance to wield his editorial blue pencil as ruthlessly as he might have done. All three books are built on the firm foundations provided by contemporary documentation, notably the ORB and Combat Reports, but from 1940 onwards it has been possible to make increasing use of personal recollections and well over half of the text of Part 3 has been contributed by ex-members of the squadron, of all ranks, and it is

pleasing to see how many airmen have had their say. There are three problems with this approach. First, memory is fallible (hence the different numbers attributed to the Canberra detachment); secondly, bodies occupying relatively low levels within the food chain may not always fully appreciate the whys and wherefores of events, leading to misinterpretation and/or misrepresentation; and thirdly, the overuse of lengthy quotations can become repetitive and/or, if the recollections of individuals differ, confusing.

On the other hand, if one is paying the piper, one is fully entitled to call the tune. There are no rules in such matters and if an author wishes to make extensive use of personal contributions, he has every right so to do. Furthermore, there is a very powerful argument in favour of doing so, since it ensures that different perceptions of events are recorded for posterity, rather than merely a clinically factual account. While obviously not intending to distort the record (nor does he), Minterne's primary aim was, I suspect, to try to recapture the *ethos* of No 73 Sqn. A detached academic historian can certainly nail down the facts but he can only attempt to reflect something of the atmosphere of a particular period; in the latter endeavour he cannot really compete with 'war stories' told at first hand by those who were there, backed up by those grainy snapshots.

Don Minterne's three-parter is an attempt to convey something of his unit's spirit, the corporate identity that was No 73 Sqn. His method has been to include as much original material as possible. While the content is arranged chronologically, the author has not made any serious attempt to collate all of the available information and rearrange it to create a piece of coherent prose. The result, therefore, is a little like a scrapbook, but it is none the worse for that and it certainly achieves the aim.

I have to declare an interest in the context of squadron histories and while No 73 Sqn's may not be the best one ever published it must surely come a close second. One is reluctant to use a *cliché*, like 'labour of love' but it really does fit the bill. All we need now is for another 500 or so dedicated enthusiastic volunteers to step forward and fill in the gaps by writing some more books like this one.

Note. Part 1 is no longer available, although it might be reprinted if there were sufficient demand. There are still stocks of Part 2 (November 1940-August 1943) at £15; Parts 2 and 3 may be

purchased together for £25. Available from Tutor Publications, The Cleve, Bradford Peverell, Dorchester, DT2 9SA. Tel 01305 266464.

Air Battle of the Ruhr by Alan Cooper. Airlife; 2000. £9.95.

First published in hardback by Airlife in 1992; this edition, substantially the same as the original, is a good quality paperback at a fair price.

The period covered is March to July 1943 - the opening phase of what Sir Arthur Harris described as 'The Main Offensive'. A well-tryed format is used: the opening chapters describe an extensive background before turning to the build-up and development of Bomber Command, followed by individual chapters for each of the operations within the Ruhr area. There is also a lengthy chapter on raids to targets outside the Ruhr, some reference to minelaying sorties and a summing-up. Appendix 2, occupying 79 pages and confined to Ruhr targets, lists the missing aircraft and their crews. Extensive use is made of the personal recollections of many veterans, albeit not all memories are infallible. So far so good, but there are more than a few errors - three examples will suffice, the italics are mine.

Page 36, in referring to the Commonwealth contribution and the training of all aircrew on returning to, arriving in or qualifying in the UK, says 'they then went to *Advanced Flying Units (AFU)*, Operational Training Units (OTU) and finally to conversion units and operational squadrons. The exception to the rule was the flight engineers who *did not go to conversion* units.' Comment: There were two types of AFU; (P)AFUs for pilots and (O)AFUs for observer/navigators. The reader must assume that 'conversion units' is intended to mean Heavy Conversion Units (HCU) which was the one pre-operational course that flight engineers did attend and where they would be allocated to a crew fresh from an OTU.

Page 53, Mannheim, 16/17 April, No 166 Sqn. 'But then the port engine cut out and then picked up again , the rear gunner hearing the pilot say: "Oh Christ! The three engines are icing up, we'll have to turn back." and then after a while "It's okay, they're picking up again."' Eventually the aircraft had to ditch the outcome being that two of the crew survived; the pilot was drowned and two others were lost. Yet there are said to be only two named on the Runnymede Memorial. Comments:

1. This was a twin-engined Wellington.
2. The pilot's surname was Lupton, not Upton.
3. Aircraft and crew are not in the appendix for the 'Missing'.

Page 69, Bochum, 13/14 May, No 218 Sqn. 'By the time the aircraft reached *home base* at Chedburgh, Suffolk' it crashed killing four more of the crew. Comment: No 218 Sqn was based at Downham Market throughout this period, although this crash did occur at Chedburgh. Yet again this aircraft and crew are not included in the 'Missing' list for this raid.

It is also clear that the spellcheck facility was not used to reinforce the proof-reading.

Not one of the author's better books in my view.

Roy Walker

So Long, Singapore by Hugh Campbell and Ron Lovell. Privately published in Hobart in 2000. Available in the UK from D Lumbard of 2 Smileyknowes Court, North Berwick, EH39 4RG (Tel 01620 895079) at £15 inc p&p (Cheques made out to 'So Long Singapore').

This substantial 238-page softback is concerned with the first three months of the war in the Far East. The campaign has been visited by historians before, of course, and a number of books have been written by participants but this one provides a distinctively fresh slant. The authors have traced the movements and adventures of forty-three men and three women, most of them members of, or closely associated with, the RAF, whom they have dubbed 'the Tjilitjap Set' because they passed through the Javanese port of that name in the spring of 1942. The book is divided into two parts. The first deals with the story of the SS *Tung Song*, the last British ship to leave Tjilitjap before the Japanese arrived, and those members of the 'set' who were among the 200 plus who sailed to Australia on board her. The second part is more diffuse as it lacks a strong central theme, recounting the individual stories of those who were evacuated to Australia or Ceylon on other vessels, those who got away in Catalinas and those who were left behind to become prisoners.

The book consists in the main of personal recollections interspersed with contributions from the authors in an attempt to distil a coherent account from a collection of individual experiences. They do not succeed entirely in this endeavour, as the timeframe tends to

skip about from chapter to chapter but one must admire their diligence and skill in using surviving official records (the book is underpinned by specific documentary references) and relating these to a variety of disparate, half-century old memories to reconstruct a convincing impression of what really happened. This is not a book about policy or tactics. It is about life as it was lived during three months of retreat and defeat, and it is very much a bottom-up view of events as seen by aircraftmen rather than by air marshals.

What impressed this reviewer was that, although there were numerous instances of individuals 'using their own initiative' to achieve their aims and despite the fact that domestic conditions were often appalling, discipline never seem to have been seriously threatened. Furthermore, throughout this chaotic period, a semblance of order prevailed and someone, somewhere seemed to know where (most) people were to the extent that the eventual evacuation was handled on a selective basis with priority being given to formed units, aircrew and skilled tradesmen, and drafts being assigned to specific vessels. In the meantime, although they rarely seemed to know what was going on, or even where they were going, the men would, to the extent that they were able, generally attempt to comply with any orders they were given. In this context, it is interesting to note how much influence an inspirational leader can have under such circumstances; a Wg Cdr O S Gregson clearly made a very positive impression as his name crops up repeatedly in the recollections of the several individual airmen with whom he came into contact.

For those with an interest in particular units, there is much incidental detail to be gleaned on the exploits of Nos 84, 211 and 205 Sqns, especially the latter, including the most recent interpretation of what happened to each of its Catalinas. Perhaps the most illuminating aspect of the book, however, is the insight it gives us into an obscure aspect of RAF activity. One of the authors, Ron Lovell, an armourer by trade, was a member of the five-man RAF detachment permanently assigned to the *Tung Song*, a 549-ton freighter impressed as a Royal Air Force Auxiliary in 1939. Lovell joined the ship in August 1941 and stayed with her for a year, plying between Rangoon, Malaya and the Nicobars until the outbreak of war and ultimately sailing with her to Australia. By the end of March 1942 she was one of the very few units in the RAF's Far East ORBAT which was still intact.

There are a number of useful maps and a couple of dozen photographs, most of the latter being of necessarily indifferent quality, having been blown up from ancient and very small original prints. There is a very good index. Although its episodic construction makes it a little difficult to keep up with the plot, *So Long, Singapore* is a worthy effort which adds a great deal of 'texture' to the story of the allied collapse in the face of the Japanese onslaught. It is reasonably priced, especially for a privately financed project, makes a positive contribution to the recording of RAF history and deserves to do well.

CGJ

Call to Arms. A History of Military Communications from the Crimean War to the Present Day. Editors Maureen Bridge and John Pegg. Focus; 2001. £19.99.

This book covers a somewhat different area than its title suggests. The title might lead one to expect coverage of the development of military communications in all nations, or at least the major ones. In fact, after an interesting general introduction into military communications and signals systems dating the ancient Greeks to the Crimean War, the book concentrates almost solely on British military communications. In the case of the coverage from 1939 on, most of this relates to the work of GPO telephones, its successor organisation British Telecommunications and the latter's defence offshoot BT Defence.

Clearly, this book is not aimed at the general reader. The text is peppered with code names, equipment designations and acronyms. Those heavily involved with BT Defence and the various governmental signals organisations may find this book of interest. Those without such a background - like the reviewer - will find it hard going.

Dr Alfred Price

The Distinguished Flying Medal Register for the Second World War by Ian Tavender. Published 2000 by Savannah Publications, 90 Dartmouth Rd, Forest Hill, London SE23 3HZ. Price £165.

In 1990 Hayward published *The Distinguished Flying Medal - A Record of Courage 1918-1982* also by Ian Tavender; it went to a second edition in the same year and became recognised as a standard

work of reference.

This even more substantial project comprises two volumes totalling just over 2000 pages, and reproduces in full the Squadron Commanders' recommendations for the 6500 plus awards in WW II, less a mere 140 which proved untraceable. Where a Station Commander's, Base Commander's or AOC's comments add new information, as distinct from straightforward confirmation, these are also shown.

In addition to the recipients' usual personal details: full names, service number, and rank, it also records the parent squadron, date of recommendation, *London Gazette* date, number of sorties and operational flying hours, aircrew category and, most crucially, the key to tracing the original document - the AIR2 file reference number.

The price, by no means unreasonable for what is involved, means that private purchases are probably confined to enthusiasts or serious researchers with a comfortable pocket or purse. However, this book will surely be taken up by the major museums and sizeable public libraries; members will be interested to know that this new source is available.

Roy Walker

Masirah. Tales from a Desert Island by Colin Richardson. Pentland Press; 2001. £24.95.

Masirah is a small island off the coast of Oman whose RAF history began in the 1930s and ended in 1977 when the Sultan of Oman's Air Force (SOAF), later the Royal Air Force of Oman (RAFO), took over. This book tells its story from the early days when the RAF was using the place as a staging post for a route to India which backed up the more politically volatile one involving the north coast of the Persian Gulf, through the war years, when it played an important part in anti-submarine activities in the Indian Ocean, then beyond until the Omanis arrived. The last part of the book continues the Masirah story from that date until the 1990s. It was a harsh environment. Imperial Airways, later BOAC, had staging posts in the area and used Masirah at times. A BOAC Captain described Masirah as, 'completely uninhabited apart from the RAF...it never rained there...the personnel went around almost naked. Not at all Halton or Cranwell! The heat was always 100°F and the humidity about the same. I don't know what

crime one had to commit to be posted to Masirah but it must have been a fairly serious one'. The author, a Cranwell trained pilot, left the RAF in 1973 and joined the SOAF, later serving for a number of years on the island. He clearly has a deep affection for the place and has written an interesting book about it. His text derives from many personal memoirs, extracts from log books or diaries and quotations from official documents, letters and reports. Unfortunately the latter are not always individually cited so that it would be difficult for others to go to their sources – a matter of some concern for a historian wishing to follow up issues dealt with in the book.

It is a book which is difficult to pigeonhole. A curate's egg, perhaps, but one in which the good parts border on the excellent and the bad – mainly down to prolixity - on the good. It has many of the features of a travelogue. We get to know about the geography of the area and there are colourful accounts of dealings with the locals - from desert bandits to Sheikhs. The 1930s skies were populated by flying boats which touched down in the anchorage established on the island, Southamptons, Rangoons and Singapores, and by Wapitis and Vincents from neighbouring squadrons which played their part in the policing of the area. The Vincent, described as rugged and stately, gets a very good press indeed. The author writes in the relaxed style of a raconteur and has a nice sense of humour. His descriptions of the procedure required to start a Vincent engine and of the Heath Robinson contraptions for steam cleaning the men's clothes at Masirah and for providing distilled water at Sharjah are little gems. On more serious matters his account of the requirements laid down for the bombing of a fort occupied by dissident tribesmen in 1932 shows the lengths to which the RAF went to avoid killing people in the process – the aim being the demolition of the fort alone. An expert in the convoluted politics of Arab states – which I am not – may find points at which to differ from the author but his treatment of such things seemed logical enough to me.

During the war Masirah retained its staging role, also hosting detachments of Catalinas involved in anti-submarine work. Only one squadron was ever based there, when 244 moved in from Sharjah with its maritime version of the Wellington in 1944. As the war developed in the Far East the island was also used as a staging post by the Americans who set up their own facilities. The contrast between those,

with their air conditioned messes, their purpose-built accommodation, their cinema with its regular supplies of films, their plentiful fresh fruit and veg and the Spartan arrangements of the RAF was marked. Our lads lived in huts which they had made for themselves out of sand-filled petrol cans and were able to visit the American cinema if they took along an empty can to sit on!

In the 1950s the RAF and Masirah were drawn into the internecine warfare of the region in, for example, the Jebal Akhdar campaign. In 1980 Masirah was involved in the abortive American mission to rescue its Tehran Embassy staff, who had been taken hostage by Iranians in their efforts concerned with the overthrow of the Shah. It was also used by the USAF during the Gulf War. There is much informed and interesting comment on the aircraft and procedures followed in all these things.

Technically the book is of good standard. There are over 100 photographs, mostly of decent quality, and the 29 maps provided are essential for the average reader to make sense of the geography of the area. There is a plethora of incident, items of local colour and detail which can be overwhelming at times. Quite a lot could have been edited out without loss but, overall, a valuable picture of what it was like to serve in such a region emerges. The price is a bit steep, unless one has a specialist interest in the Gulf, but there is plenty to enjoy in the text and the £24.95 spent will provide pleasure for much longer than a similar amount spent on an evening out.

Dr Tony Mansell

Douglas Bader - a Biography of the Legendary World War II Fighter Pilot by John Frayn Turner. Airlife; 2001. £9.99

The character and life of Douglas Bader is the stuff of legend and, as such, many have written of his exploits, notably Paul Brickhill and 'Laddie' Lucas. The book under review is a paperback edition of one which first appeared in 1995. The author, who was a close friend of Bader's for thirteen years, contacted many of his colleagues to gain a deep insight into the complex character of his subject.

The danger in writing about such a well-known man is that of repeating information already public. This is inevitable but the author has been able to contribute additional material about Bader's post-war career and interests up to his death in 1982. If there is a negative side

to the book it is the detailed concentration on air combats during late-August and September 1940. Over a period of five days some forty-four pages are devoted to microscopic accounts of each air battle, from 'Red One to Green Three' to how each German aircraft was damaged. One was tempted to count the number of times the port engine caught fire on a hapless enemy bomber. That said, this was the period when Bader was pressing his 'Big Wing' theory on authority and when put into practice successfully the results were spectacular — the text certainly amplifies the intensity of combat. The author presents both sides of the then controversial subject; Bader champing at the bit at Duxford in 12 Gp waiting for the call from 11 Gp, whose aircraft were scrambled, often having to fly northwards to gain sufficient height to meet the enemy. If the call came late Bader's wing lost the advantage of height and attacking from down-sun. Notwithstanding the crucial differences in policy between Park and Leigh-Mallory, Bader's philosophy held its ground from then until the end of the war, as did adoption of his finger-four or line abreast formations.

Following his mid-air collision and subsequent capture in 1941, Bader's story follows the familiar path of frequent changes of prison camp and persistent non-co-operation with his captors.

After his release in 1945 and his refusal to enter the political field (a wise move) his second career, the renewal of his pre-war association with Shell, saw him flying worldwide, often accompanied by his wife Thelma. During this period Bader's keen interest in the welfare of the disabled came to the fore and the author quotes many cases of how his charisma and forceful character changed the lives of so many people, young and old. His driving force in this field continued throughout his lifetime; his wartime service, his pugnacious success at the frustrating game of golf, the publicity associated with the publication of *Reach for the Sky* and the subsequent film all contributed to the dynamic impact that he was able to make on the lives of amputees. His services were rewarded first with the CBE and then a knighthood.

No story of the man would be complete without a mention of the ladies in Bader's life. The author reveals what an important influence Thelma exerted. Ever the constant companion she was, by Bader's own admission, the pillar of strength without which he would have

been a lesser man. Her calm, sympathetic yet firm demur was the perfect foil to Bader's more extrovert nature. She died in 1971 and two years later Bader married Jean Murray. His vigour and purpose restored, together they pursued his interest in the disabled. Further honours were given him until his sudden death, following a speaking engagement in September 1982.

The author has left us with a more complete picture of a man of many contradictions. Possessed of great courage, both physical and mental, singular vision, an astute mind and an unwavering love of his country, he made many devoted friends, although his apparent arrogance and brusqueness could also make him enemies. His sense of purpose saw permitted him to succeed in many spheres and few would deny that he achieved a great deal through his single-minded approach to whatever lay in his path.

For those who enjoy action-packed dialogue this book contains an abundance; for those wishing to read what a man with a physical disability can do for his fellow man, the latter part of this biography is highly recommended.

Sqn Ldr David Haller

VCs of the Air by John Frayn Turner. Airfile; 2001. £9.99.

VCs of the Air was first published as long ago as 1960. Since no one appears to have seen fit to revise the content, it is a pity that it has been disinterred. For a start, the title is extremely misleading, as the book deals only with those VCs which were awarded during WW II, so the nineteen men who won their 'VCs of the air' during the Great War do not get a mention.

Since the stories of all VC winners are well documented, there really ought not to be any factual errors but the book still manages to contain some along with a number of significant omissions. For instance, in dealing with the action in which Garland and Gray won their VCs, Turner avoids the contentious issue of the total lack of recognition afforded to the third man in the crew, Reynolds, by simply not mentioning him at all. Then again, Turner states quite categorically that, having taken to their parachutes, Manser's crew saw their aeroplane 'plunge and plough into the German earth'; it actually crashed in Belgium. The section dealing with Newton is particularly inadequate as it consists largely of a reproduction of his

VC citation, which reflected the belief that he had died in his Boston; in fact he had survived to spend several days being interrogated as a prisoner before being beheaded by his Japanese captors.

The author's style tends to employ some rather hollow journalistic turns of phrase, such as 'the prehistoric island of New Guinea' (would that be older than the Isle of Wight then?) and 'fighters were fighters in 1944' (what had they been in 1943?). He also uses some odd terminology which suggests that he is/was not too familiar with aeroplanes or with the *patois* of aviation. For example, we are told: that Cruickshank banked his Catalina 'heavily', rather than steeply; that bullets embedded themselves deeply within the fuselage of a Battle, as if it were a solid entity, rather than a hollow shell; and that the pilot of a Me 110 'pressed (*sic*) a stream of fire from the fighter'. In explaining how the Battles attempted to escape from the bridge that they had bombed in 1940 we are told that 'Garland and the others pushed their sticks up again'; one is tempted to ask, 'Up what?'. In describing the response to one of raids led by Wg Cdr Malcolm, Turner tells us that Junkers 52s 'screamed' into the air; I would have thought that 'trundled' would have been a more appropriate verb. The section dealing with the last air VC to be awarded contains several oddities, including references to 'the crew' and what appear to be verbatim reports of exchanges on the intercom of the 'Bombs gone' variety; Robert Gray was flying a single-seat Corsair when he died.

If you want an authoritative work on VCs of the air, this paperback edition of a forty-year old book is not for you. You would be much better off tracking down a copy of Chaz Bowyer's *For Valour*.

CGJ

The Junkers 87 Stuka by Manfred Griehl. Airlife; 2000. £29.99.

Of the aircraft types in operation at the start of the Second World War in 1939, only a handful remained in front-line service when the conflict ended in 1945. The Junkers Ju 87 Stuka was one of them. During the first half of the war this dive-bomber would always turn up where the fighting was hardest. For the rest of the conflict it was always active, though in declining numbers, on the eastern front.

With 315 pages, profusely illustrated, this appears to be the Stuka book to end all Stuka books. There is a hugely detailed account of the development of the aircraft and the various sub-types. Of particular

interest to this reviewer was the folding-wing torpedo bomber variant intended to operate from the German aircraft carrier *Graf Zeppelin*, which was launched but never completed. Another interesting variant was the Ju 87G, the specialised tank-busting variant with two 37 mm automatic cannon - modified anti-aircraft guns - mounted under the wings.

There is a comprehensive review of the front-line and second-line units, German and foreign, that flew this aircraft. Also there are potted biographies of the more famous pilots who flew the type in action.

This author's sole criticism of the book is that it gives insufficient detail on the air operations flown by the Ju 87. Although there is a lot about the aircraft itself, nowhere does one get a feel for the tactics employed or what it was like to have been there 'in the cockpit'.

Alfred Price

The Great Government Aerodrome published by the Narborough Airfield Research Group in 2001 and available from the Secretary (R F Sheldrake, Church Farm, Narborough, King's Lynn, Norfolk, PE32 1TE) at £14.95 inc p&p.

The last vestige of the WW I airfield at Narborough disappeared when the old YMCA hut burned down in 1998. By that time, however, a great deal of information had already been unearthed through the endeavours of a small group of enthusiastic local historians. The results of their endeavours are presented in a handsome, 145-page, indexed hardback containing about 100 illustrations, all of the latter being very well reproduced on coated paper.

Located a mile or so to the north east of, what was in WW I, the relatively small airfield of Marham, Narborough occupied some 908 acres (Marham had a mere 80). Narborough's primary function was to provide flying training for RFC/RAF pilots and, in 1918, for a substantial number of Americans. By the end of the war, its activities were largely devoted to supporting the growing Independent Force. While the book focuses on Narborough, it also pays some attention to other contemporary airfields in Norfolk, particularly the adjacent Home Defence aerodrome at Marham. It is surprising how much detail the team have managed to unearth: scores of period photographs of people, aeroplanes and buildings; sketch maps and plans; details of the

units which used the airfield and of the fatalities which they sustained; extracts from log books; reproductions of documents and so on. Interesting as these are, the final chapter of the book is particularly significant as it traces the way in which an industrial complex as large as an aerodrome can slowly fade into obscurity. In fact, while nothing now remains on site, some of Narborough's (and Marham's) original buildings have survived. Perhaps the most remarkable example is the latter's Officers Mess hut which was moved to West Acre and re-erected there some eighty years ago to become the Village Hall; it still serves as such today.

One can spot the odd typo, eg No 83 Sqn arrived at Narborough in December 1917, not 1918, but these are very few. *The Great Government Aerodrome* represents a significant contribution to the recording of British aviation history. It may be a little esoteric for most members, but it is a most praiseworthy effort for all that. Recommended.

CGJ

Spitfire Mark V – RAF Operations in Northern Europe by Peter Caygill. Airline; 2001. £19.95.

Many books have been written dealing with a particular aircraft type and the Spitfire has probably been the subject of more than most. However, a volume covering a specific variant of an aircraft and its operational life in one theatre of war, is not common.

As the title indicates, Peter Caygill has taken for his subject the Mk V, the most prolific version of this most famous and endearing of aircraft types, more than 6000 examples of this model having been produced. Besides RAF use, the Mk V served with the Americans, Yugoslavs, Turks and eventually the Soviets. Although the Spitfire V served with the RAF and Allied and Commonwealth air forces in several overseas theatres, including Northern Australia, this account is confined to its use in North-West Europe.

The book begins with a short chapter which describes the genesis of the Mk V and outlines its features but there is no detailed technical appreciation of this specific sub-type and those readers minded to enquire more deeply, would be well advised to turn to *Spitfire – The History* by Morgan and Shacklady.

The operational life of the Mk V and the squadrons which operated

it is told through a series of chapters dealing with individual events, such as the Dieppe Raid and the Channel Dash. Others cover the work of those fighter wings which operated the type. These accounts are the essential 'meat' of the book and they are told through a mixture of references to Operations Record Books and debriefings, and the personal reminiscences of those involved.

The book is well illustrated, its monochrome photographs being embedded within the text, rather than being segregated into plates inserted at random intervals. This certainly makes it easier to relate the pictures to the narrative, the selected photographs having been chosen to cover a wide range of subject matter, rather than being an endless series of aircraft views. The book is well provided with simple and clear maps, which allow the reader to orient himself as he follows the action.

There is an interesting summary of the history of surviving SpitfireVs but the book tends to fade out with a few testimonials, rather than a comprehensive appreciation of the value of the Mk V and where history sees it in the wider context of the overall Spitfire story.

Spitfire Mark V runs to over 260 pages, including an index. It is an interesting and very well researched volume and is a must for Spitfire enthusiasts and those interested in the manner in which Fighter Command carried the war to the enemy in the years following the Battle of Britain.

Wg Cdr Colin Cummings

Park: The biography of Air Chief Marshal Sir Keith Park GCB KBE MC DFC DCL by Vincent Orange. Grub Street; 2001. £12.99.

This is a paperback reprint of a biography of Sir Keith Park which was first published, by Methuen, in 1984. It has stood the test of time well, the new edition being complemented by a thoughtful Introduction contributed by Chris Shores.

After three years afloat as a purser, Park left his native New Zealand in 1915. He was then a lance-bombardier bound for Gallipoli where he was to spend nine months ashore serving the ANZAC's guns. Commissioned in the field, he arrived in France in 1916 in good time to participate in the bloody offensive on the Somme. Wounded in October he was evacuated to England where he transferred to the RFC. All of his air combat experience was gained on Bristol Fighters

(and he was notably successful, the latest research indicating that, with the aid of various back-seaters, he emerged victorious from some twenty engagements) which, unusually, he flew with only one unit, No 48 Sqn, which Park joined as a tyro and finished the war commanding.

The only significant factual error that this reviewer came across in the entire (typo free) book occurs on p.32 where it is stated that No 48 Sqn's Equipment Officer, 2/Lt Palmer, won a DFC for rescuing wounded men after a German air raid. One does not have to be mustered as aircrew to win a DFC but it is supposed to be awarded for gallantry in the air and against the enemy. On checking elsewhere, it transpires that no one named Palmer won a DFC during WW I. Odd.

Granted a permanent commission in the peacetime air force he attended the first Staff College course after which his career followed a predictable parabola, involving command of a number of units (No 111 Sqn, RAF Northolt, Oxford UAS and RAF Tangmere), staff appointments in the UK and Egypt and a stint as Air Attaché to South America (all of it!). By mid-1938 Park was SASO to Dowding at Bentley Priory where he played a leading part in building the machine that he was to operate two years later.

On being appointed AOC 11 Gp, Park's first challenge was to provide cover for the Dunkirk evacuation, a task that required a degree of improvisation as it was not what 11 Gp was supposed to do. His handling of his resources impressed those who understood the problems involved and his conduct of the subsequent Battle of Britain was masterful. About a quarter of Orange's book is devoted to Park's nine months at Uxbridge, his relationships with other prominent players, notably Douglas, Dowding, Leigh-Mallory, Brand and Evill being explored at length, as is Bader's 'Big Wing' concept. These remain controversial issues which can still provoke spirited debate. The reader can make his own assessment, but it is clear where the author's sympathies inevitably lie.

After a year as AOC 23 Gp, Park spent six months in Egypt before returning to prominence as AOC Malta. In his year-and-a-half on the island, with little help from his CinC, Lord Gort, he transformed a besieged fortress into an offensive base which proceeded to strangle Rommel's supply lines before playing a major role in the invasion of Sicily. From Malta, Park returned to Cairo for a few months as

AOCinC ME before moving to Ceylon to end the war as the Allied Air CinC for SEAC. As such he oversaw the final advance through Burma and supervised the liberation of much of South East Asia, including setting up British caretaker arrangements in the Netherlands East Indies and French Indochina pending the re-establishment of colonial regimes. By 1946, Park was too senior and/or too old and/or too lacking friends in the right places to be found an appointment in the post-war Service. The closing chapters of the book cover his subsequent career in business (South America again) and his eventual retirement to New Zealand.

One notable characteristic that emerges is that Park was a shrewd publicist and during his time at 11 Gp he would frequently arrive unannounced at his stations in his personal Hurricane, wearing his trademark white overalls. Similarly, in Malta, he would drive around the island in a very obvious red MG sports car offering lifts to all and sundry; he had a personal Hurricane there too. It was not all show, however; Park had the 'common touch' and a real concern for his men which was probably rooted in his WW I experiences.

Nevertheless, while his subordinates seem to have been unanimous in their praise and affection, there can be no doubt that he was seen in a very different light by some of his peers. Orange does not shy away from this and his thoroughly researched and amply referenced book provides us with a deal of evidence to show that, for a variety of reasons, many of Park's contemporaries had problems working with him. He certainly seems to have provoked extreme reactions. We are told, for instance, that Eisenhower regarded Park with 'admiration' and that Trenchard thought him 'magnificent'; Slessor, on the other hand, is on record as thinking him 'very stupid' while Adm Power described him as a 'conceited idiot'. They cannot all have been right, or could they? One thing that does become apparent is the extent of the intrigue and back-biting that went on within the upper reaches of the wartime hierarchy. Sadly, such shenanigans may well be unavoidable. It is reasonable to assume that if an individual has sufficient ambition, intellect, energy and charisma to reach the top he is likely to possess a powerful ego. It would seem that like egos attract and unlike egos repel. Perhaps it is the other way round but, either way, the result can be titanic clashes of personalities which, when underpinned by inter-Service rivalry, can be very unproductive in

prosecuting a joint enterprise, a war, for instance.

It must be almost impossible for a biographer to avoid developing an affection for his subject and Orange plainly has a deep respect for Park. He successfully avoids being overly partisan, however, and his admirable and readable book presents a balanced account of one of the RAF's most prominent officers. Indeed, as the tactician who defeated the *Luftwaffe* in 1940, Park may have been far more than that. Some have called him the saviour of the nation and (unless one subscribes to the revisionist view that the Battle of Britain was of little consequence, because Hitler was already looking east and had never intended to invade the UK anyway) that may not be too far fetched. It is good to have this book available again, especially at the price. Strongly recommended.

CGJ

Desert Eagles by Humphrey Wynn. Airlife; 2001. £9.99.

This is a paperback edition of a book that first appeared in 1993. It tells the tale of Fg Offs Hal Marting and Ed Miluck, a pair of American pilots who had enlisted in the RCAF and RAFVR, respectively. The book summarises their early experience flying with the Eagle Squadrons in the UK but the story proper covers the period from May 1942 until the end of that year. During that period both men flew Kittyhawks with No 239 Wg. Marting was shot down to become a POW on the first day of the Battle of El Alamein. He escaped while in Greece en route to Germany and eventually made his way back to Egypt via Turkey. In the meantime, having accompanied the advancing 8th Army to beyond El Agheila, Miluck had completed his tour. The pair were reunited in Cairo on New Year's Eve 1943.

Although ostensibly written by Humphrey Wynn, his contribution was more that of an editor as something like 80% of the content actually consists of quotations from ORBs and from the comprehensive diaries kept by the two leading characters. These, often humorous, accounts provide insights into the nature of air combat and colourful descriptions of aspects of daily life in the desert and elsewhere. It is amusing to read the rueful recording of the accumulation of wisdom as lessons are learned the hard way, for instance, Miluck's '...we were attacked by several 109s and I squirted at one for a hell of a long time. When the next one came by, I

remembered to turn on my gun switch and did much better'. Similarly, after allowing his concentration to wander and having his Kittyhawk liberally sprayed with bullets as a result, Marting concluded that, 'What you see won't hurt you; it's what you don't see that clobbers you.' As to the Spartan domestic conditions during the first few days at Marble Arch, after complaining at some length about the poor quality of the rations and the scarcity of water, Miluck noted that they had been getting a little more of the latter 'from a well down the road, but there's a dead Italian in it, so we don't use it for drinking – the Army does though.'

By providing passages to link the diary extracts, Wynn has succeeded in presenting a coherent account, amplified by numerous footnotes which serve to identify other personalities whose names crop up within the narrative and to explain some contemporary jargon and local terminology. These notes are very helpful, if occasionally repetitive; we are, for instance, twice told what a Lysander was, this same duplication occurring with the Bombay and the Ju 87, and Fran is identified as Marting's wife twice in a single Chapter. One could also point out that the photograph of a downed Macchi C.200 opposite p.114 has been printed back-to-front. Such observations have only a superficial significance, of course, and they are made more to demonstrate that this reviewer has actually read the book than as criticisms. *Desert Eagles* is an entertaining and informative read and at the price, excellent value for money.

CGJ

Hurricanes over Murmansk by John Golley. Airline; 2001. £9.99

When Germany invaded Russia in 1941, the UK unexpectedly found itself allied to the USSR and, not unnaturally, the hard-pressed Stalin promptly demanded assistance. As an initial gesture it was agreed to despatch some 550 men and 200 Hurricanes to Murmansk. The decision to create this force, No 151 Wg, was taken in late July; six weeks later it was operational in theatre. The primary function of the two units within the wing, Nos 81 and 134 Sqns, was to teach the Russians how to fly the Hurricane while making a contribution to local air defence. In the three or four weeks that remained before the Arctic winter closed in and the aeroplanes were handed over, the wing claimed to have destroyed fifteen enemy aircraft for the loss of only

one; furthermore no Russian bombers had been lost while being escorted by the RAF. This is the story told in this paperback reprint of a book which first appeared in 1987.

The structure of the book is a little odd as the trials and tribulations of the wing's various elements are recounted against the background of the personal experiences of two (then NCO) pilots, Charlton 'Wag' Haw and Ibbey Waud. There is, therefore, a significant change in pace and texture as the narrative switches back and forth between the relatively sober formal account and more clichéd passages worthy of W E Johns – 'With fingers gently caressing the stick and a hand resting lightly on the throttle....'

The key facts of the story should be substantially correct, not least because the author acknowledges that he owes a great deal to an account by Hubert Griffiths which was published in 1942. Griffiths had been the Wing Adjutant, a fact of which we are annoyingly reminded on at least seven occasions! As such, he is described as a 'wingless wonder' but I suspect that he was actually a battle-scarred veteran aviator who had flown operationally as an observer with No 15 Sqn in WW I, although he may not have chosen to wear his flying 'O'. Where the author (sadly now deceased) let himself down was in his somewhat cavalier attitude to incidental facts. For instance: there is some confusion over the date of the Munich crisis which is noted on p.21 as having occurred in 1939; Merville was not 'a famous WW I fighter station' (p.26); Wick is about twelve miles from John O'Groats, certainly not three (p.27); the bomber force despatched to attack Brest on 24th July 1941 comprised 100 aircraft, not 129 (p.68); in the 1930s, even as a lowly AC2, a Fitter II(E) would have earned not less than three shillings and sixpence a day, not one and sixpence (p.85); Flt Lt Rook is a Mickey on p.67, a Micky by p.109 but back to being a Mickey again on p.130. Then again, HMS *Argus* could hardly have been converted from a merchant ship which had been 'captured from the Italians' during the Great War, as stated on p.94, because Italy had been an ally during Round One; she was actually created from the *Conte Rosso* which was being built in Scotland for Italy, the hull being purchased by the UK in 1916. None of these errors has any significant bearing on the main content of the book, of course, but they do create a sense of unease. If one can spot inconsistencies and inaccuracies like these, are there others that have escaped detection?

In short, can the book be relied upon as a reference?

My answer to that one is - probably. In its essentials the book is, I suspect, tolerably accurate. Beyond a tendency towards repetition, it is also a fairly easy read but, most importantly, making this book available again will permit more people to become aware of a little known RAF campaign. It was not the only occasion on which the RAF has operated from Russian soil but, in view of its timing and the goodwill that it generated, it may have been the most important one.

CGJ

Poles in Defence of Britain. A Day by Day Chronology of Polish Day and Night Fighter Pilot Operations: July 1940 – June 1941 by Robert Gretzyngier. Grub Street; 2001. £20.00.

The aphorism, don't judge a book by its cover, doesn't apply to this one. The title tells you just what to expect and you get it - in Spades! Drawing on ORBs, Combat Reports, and personal memoirs, this is a record of the activities of Polish pilots on virtually every day they flew in the period covered by the book. No episode seems unworthy of notice. The entry for 14th January 1941 records only that P/O Chciuk of 308 Squadron 'force landed at Wittering in Hurricane I, P3598, in unspecified circumstances.' Most of the action occurs in the Battle of Britain, to which around 60% of the text is devoted. The appendices contain detailed information concerning the men, the aircraft they either flew or fought against and their squadrons. Sources are identified and there is a reasonable bibliography - including some Polish titles which will not be of much use to British readers. However, since this book is published in 2001, the reference to Ken Wynn's *Men of the Battle of Britain* should have been updated from the 1989 to the 1999 edition and that of F K Mason's *Battle Over Britain* from 1969 to 1990. The index is a reliable guide to the text. Now, what of the text itself?

It is full of the sort of account of combat which is now very familiar from the many books which have been written on the Battle of Britain - but in this case the Poles take centre stage. What emerges is a picture of their excellent qualities as fighter pilots and of the contribution which they made to Fighter Command. One picks up insights into the relationships between these men and the unfamiliar practices of the RAF to which they had to adapt quickly. Their

volatility – ‘It is our Polish nature to be rash, impulsive, foolhardy even’ writes one of them - did not always go down well with more formal RAF procedures. Language difficulties presented their own hurdles which had to be overcome. Even our aircraft seemed back to front. Used to throttles which had to be pulled to open them, they discovered that British engines lost their revs when treated in that fashion. Given the difficulties of acclimatisation which the men faced the contribution which they made was a great tribute to their professional skills, determination and courage.

This is not a book to buy if you are looking for an analytical treatment in which the author has selected important themes for you and used his rich material to illustrate them. However, if you enjoy reading combat accounts then go ahead, you will not be disappointed. For me, the book’s main merits lie in the opportunity it has given to Poles to speak for themselves through such accounts and in the value which it may have as a source for those who want the sort of detail which can underpin the writing of history. It is well produced and given the generally good quality of the print and the accompanying photographs, the price is reasonable.

Dr Tony Mansell

RAF Squadrons by Wing Commander C G Jefford. AirLife; 2001. £40.00.

Some years ago, I wrote in the *RAF Air Power Journal* that if you could afford only two RAF history books, you could do no better than buy Owen Thetford’s *Aircraft of the Royal Air Force* and Jeff Jefford’s *RAF Squadrons*. I had long been a fan of Jeff’s magnificent book, first published in 1988, because it gave us the first really comprehensive record in one volume of the movement and equipment of all RAF squadrons and their antecedents since 1912. What therefore, I hear you ask, is the point of a second edition?

In bald terms, apart from generally updating and incorporating a few minor corrections, the main tabulations and cross-references by aircraft type and airfield are much as before. Similarly, about twenty of the fifty-three location maps have been subtly amended, including Map 43 which has been redrawn to reflect the Gulf War. But Jeff has changed the vast majority of the pictures, expanded and re-written the

section on Reserve Squadrons and introduced a new section on the Selection and Preservation of Squadron Numbers.

This second edition is therefore pitched at two audiences. The first are those who do not own the book. To them I must declare an interest. I have known Jeff for some twenty-five years since we were both on the mighty Vulcan. Unlike some modern ‘cut and paste’ aviation writers, Jeff has always been dedicated to accurate, painstaking and meaningful historical research. I found the entries on the five squadrons that I have served on to be impeccable.

The second audience are those who might want to upgrade their first edition. All I can say is that Jeff’s revised analysis is well worth reading, mixing fine scholarship with the dry humour of an aviator who knows the RAF system inside out. Jeff might think that some of his comments verge on the barbed:

‘When the RAF went to war against Iraq in 1991 it had a grand total of 54 regular squadrons from which to assemble a force...Ten years later it had only forty-four, roughly the size it had been in 1924 (although it had four times as many air officers as it had then.)’

I would argue that his views are very measured. When it comes to explaining the apparently arbitrary nature of squadron disbandment after 1980, Jeff says that ‘one can only guess at the machinations’ behind some of the decisions to reform ‘junior’ squadrons at the expense of long-established principles. Perhaps Jeff’s third edition should include a section correlating squadron number plate survivability with the number of retired air marshals fronting squadron associations at the time.

But I digress. This book should be a must in any aviation historian’s bookcase because you will never stop digging into it. Moreover, the illustrations are first rate and very well captioned. The whole is held together by a man whose authoritative, lucid writing and grasp of his subject are second to none. If you can find a place for only one RAF history book on your shelf, this has to be it.

Wg Cdr Andrew Brookes

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. GL12 7ND. (Tel 01453-843362)

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