THE HERCULES IN THE RAF

Marshall

ROYAL AIR FORCE HISTORICAL SOCIETY

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CONTENTS

SELECTED GLOSSARY

AAC	Army Air Corps
AAR Rx	Air-to-Air Refuelling Receiver
AARI	Air-to-Air Refuelling Instructor
ACO	Airspace Control Order
ANVIS	Aviator's Night Vision Imaging System
AT	Air Transport
ATO	Air Tasking Order
ATR	Air Transit Route
AUW	All up weight
AWACS	Airborne Warning and Control System
BFME	British Forces Middle East
CMF	Commonwealth Monitoring Force
DERA	Defence Evaluation & Research Agency
DIRCM	Directional Infrared Counter Measures
DSF	Director Special Forces
DZ	Drop Zone
ELINT	Electronic Intelligence
ESM	Electronic Support Measures
FIEZ	Falkland Islands Exclusion Zone
FLA	Future Large Aircraft
FOB	Forward Operating Base
GPS	Global Positioning System
HDU	Hose Drum Unit
HP	Harness Pack
HUD	Head-Up Display
IAT	International Air Tattoo
IED	Improvised Explosive Device
IN or INS	Inertial Navigation System
IOT	Initial Officer Training
IR	Infra-Red
JATE	Joint Air Transport Establishment
JEngO	Junior Engineering Officer
JHQ	Joint Headquarters
JSCSC	Joint Service Command and Staff College
JTMS	Joint Transport & Movements Staff
KKIA	King Khalid International Airport (Riyadh)

LCN	Loan Classification Number
LLTV	Low Light Level Television
LOX	Liquid Oxygen
MAMS	Mobile Air Movements Squadron
ME	Manually extracted
MEZ	Missile Engagement Zone
MRR	Maritime Radar Reconnaissance
NOTAM	Notice(s) to Airmen
NVG	Nigh Vision Goggles
OR	Operational Requirements
QRA	Quick Reaction Alert
QTR	Quick turnaround/round
RP(Air)	Resources and Plans (Air)
RWR	Radar Warning Receiver
SAR	Search and Rescue
SAS	Special Air Service
SBS	Special Boat Service
SDR	Strategic Defence Review
SELCAL	Selective-Calling system that alerts an aircraft's crew that a radio station wishes to communicate
SF	Special Forces
SH	Support Helicopter(s)
SOP	Standard Operating Procedure
SOS	(USAF) Special Operations Squadron
SPAG	Submarine Parachute Assistance Group
TGDA	Training Group Defence Agency
TIT	Turbine Inlet Temperature
ULAS	University of London Air Squadron
UNHCR	United Nations High Commissioner for Refugees

THE HERCULES IN THE RAF

BAWA, FILTON, 8 October 2019

WELCOME ADDRESS BY THE SOCIETY'S CHAIRMAN

Air Vice-Marshal Nigel Baldwin CB CBE

Ladies and Gentlemen – good morning and welcome. Before I introduce our Chairman for the day, I must thank Alex Clark, the Chairman of the BAWA, for allowing us to use this splendid facility here at Filton. We have done it before of course – every time with much success. So thank you Alex to you and to your colleagues.

Members of our Society here this morning will know that our Life Vice-President, Air Marshal Sir Freddie Sowrey, died just over two months ago aged 96. In 1986, Sir Freddie, along with the late Air Commodore Henry Probert, established this Society; he was our first Chairman. He was a wonderful man who loved the RAF – I cannot remember an event when he wasn't sitting down here in the front row encouraging us. Please join me in a short silence to respect his memory.

* * *

As always, today's proceedings, along with any supplementary papers, will eventually be published in a hardback volume which all members will receive. If non-members here would like a copy, it will cost £15. Our Secretary, Kevan Dearman, has an order form if this is of interest.

Our Chairman today, Air Chief Marshal Sir John Cheshire, spent much of his RAF flying life on the Hercules, including much time operating with Special Forces and eventually commanding RAF Lyneham. So much did he admire the aircraft, he tells me that he jumped out of it more than 150 times!

The Hercules was followed by time in Moscow as our Defence Attaché and several NATO appointments culminating in Commander-in-Chief of Allied Forces Northwestern Europe. On leaving the Service in late 2000, he spent five years as Lieutenant-Governor of Jersey.

With all that experience behind him, we are clearly in good hands. Sir John - you have control

CHAIRMAN'S INTRODUCTION AND PERSONAL OBSERVATIONS

Air Chf Mshl Sir John Cheshire

President, Chairman and committee members of the RAF Historical Society, fellow members of the Hercules fraternity, ladies and gentlemen. May I start by saying that we, of the Herc fraternity, join the Society in saluting the life and contribution of Sir Freddie Sowrey to this Society in particular and to the RAF in general. He was indeed a great man.

It is a huge privilege to have been invited to chair today's seminar and satisfying to see so many old friends supporting the occasion. My credentials for being in the chair are, I have to admit, somewhat thin. But I was part of the Hercules Force when the RAF acquired its first 66 aircraft in 1967. Our first speaker will be covering those early days and I have no intention of stealing his thunder.

For my part, I was lucky enough to be a captain on No 48 Sqn at Changi until 1970. My next very close association with the Force was as Tac Ops (SF) at HQ 38 Group at Odiham and then at Upavon. My second flying tour on the aircraft was at Lyneham, initially as a Flight Commander on No 30 Sqn and then as the SF Flight Commander on 47 Squadron. And my last direct involvement with the C-130 was as Station Commander at Lyneham, 1983-85.

My penultimate Hercules sortie was on 10 October 1998. It was my only opportunity to fly the 'J' model – out of Andrews AFB in the States in exceptionally bad weather. So bad that I had no option but to fully test the HUD for the whole 2 hours of the sortie!

So, my close association with Fat Albert (as the Hercules is known) covered only the first 20 years of its RAF service – and even that was a fractured association. I am, therefore, the first to admit that all of today's speakers, and many in our audience, will have vastly more operational experience on the many C-130 variants than I have in the 52 years that the RAF has been operating this fine aircraft.

Having mentioned the audience, may I thank you all for finding the time to support this important event. Your contributions to the panel discussions will be important if we are going to provide the Society with an accurate account of the Hercules in RAF service. For that is the objective of today's exercise and it is an objective that we must

deliver. You will all have seen today's programme which has been created thanks to the considerable efforts of Jock Heron, Jeff Jefford and Simon Footer. To them, and to the RAF Historical Society, at large we, Team Hercules, owe a huge vote of thanks.

Back to the programme; it is very ambitious, and the timing is tight. It calls for discipline by each speaker if we are not to compromise the discussion periods. We are particularly fortunate to have, amongst our speakers, Alan Paul from Marshall of Cambridge. Marshall has been instrumental in providing continuous engineering support and significant modifications to the Hercules since it entered RAF service in 1967.

I emphasise 1967 for two reasons. First, although the USAF had been operating the aeroplane since 1956, today we are going to focus exclusively on the first 52 years of its service with the RAF. The second reason for mentioning 1967 is that it is when the RAF's Hercules fleet began to clock up more than 1·75 million hours – and still counting. In accumulating that remarkable total, our aircraft have done sterling work, world-wide, in both friendly skies and hostile environments, and in many roles. Whilst we will cover a selection of those operations today, it is impossible to cover them all in the limited time available. However, the Society will publish supplementary papers submitted to cover operations which have, *per force*, had to be excluded from today's discussions.

That said, there are also a considerable number of operations which remain classified and which cannot, therefore, be addressed in an open forum – or in an RAF Historical Society publication. So I would ask you all to bear that in mind.

The, essentially tactical, C-130 has always been a robust, survivable, manoeuvrable aircraft and a delight to fly. But I have to admit that it is uncomfortable down the back – unless you were lucky enough to have been travelling in the VIP cabin that was created for Margaret Thatcher . . . But there is not much that the Hercules cannot tackle. Indeed, it has often been tagged as the 'can-do airlifter'; and after 52 years in RAF service, its flexibility envelope has been tested and extended in all directions and it has almost never been found wanting.

Let us now leave it to our speakers to explain how, when and where those extensions have been delivered.

REQUIREMENT, HISTORY AND INITIAL DEPLOYMENT

Air Cdre Brian Poulton

Brian Poulton joined the RAF in 1961 and trained as a navigator to spend an initial four years on the Beverley with Nos 47 and 34 Sqns. He converted to the Hercules in 1967 and, after a tour with No 70 Sqn in Cyprus, he joined No 38 Gp's Examining Unit. Following two staff tours and a stint as a PSO at Ramstein, he was OC 70 Sqn 1986-89 and commanded Brize Norton 1993-94. Having been Deputy Commandant at Bracknell, he left the Service in 1997 to spend the next eight years as Military Advisor to Airbus, initially at Bristol and then Toulouse.

The RAF's medium-range air transport fleet in the early 1960s comprised two very different aircraft: the Handley Page Hastings and the Blackburn Beverley.

The tail-wheel configuration of the Hastings immediately suggests that this aircraft's origins lay in the 1940s. Indeed, the Hastings evolved from the Halifax bomber which, following its first flight in 1939, had developed rapidly to a Mark 7 variant. Handley-Page had designed a new high-aspect ratio wing intended for the planned Mk 8 Halifax bomber which was going to be renamed the Hastings B.1. However, in late 1944, the need for air transport was greater than that for bombers and the aircraft was redesigned around the new wing to become the Hastings C Mk 1. This 50-seat transport first flew in May 1946 and entered RAF service in September 1948. The RAF bought 147 Hastings and the aircraft took part in the Berlin Airlift in 1949.

The Beverley was designed and built by the Blackburn & General Aircraft company and first flew in June 1950 as the Universal Freighter. It was originally intended for the carriage of heavy oil-drilling equipment in North Africa and the Middle East. The RAF placed an order on 1 October 1952 for 20 aircraft as the Beverley C Mk 1 and further orders followed. In all the RAF took delivery of 47 aircraft, the first of them entering service in 1955. The Beverley had a large freight bay box measuring 10-feet square and 36 feet long; the tail boom had 36 comfortable seats. It had a 20-tonne payload.

Not the most attractive of aircraft, it acquired such irreverent names as ‘Dragmaster’ or ‘Crudmaster’. It was mocked for its slow speed, particularly when flying homebound up the Rhône valley against the northerly Mistral wind and being overtaken by French trains! Nevertheless, she was much loved by the crews who flew her; to them, she was a ‘Rhapsody in Rivets’.

The Hastings and Beverley were joined in 1962 by the first of 56 Armstrong Whitworth Argosys, a military variant of the roll-on/roll-off commercial freighter – the AW 650 – that first flew in January 1958. The Argosy also attracted irreverent nick-names such as the ‘All-Soggy’ and ‘The Whistling Wheelbarrow’ (because of its Rolls-Royce Dart turbo-prop engines and twin-boom tail).

So, in the early ‘60s, one could say that, apart from the Argosy, the medium-range fleet was old, tired and slow. Thus, it was no surprise when, in 1961, the MOD issued OR351 seeking a replacement for both the Hastings and the Beverley. It laid out the basic requirements: short take-off and landing capability, bigger freight bay, a tactical payload of 35,000 lb (around 16 tonnes) into short strips, but a strategic maximum payload of 45,000 lb (just above 20 tonnes) for normal operations.

Three proposals made it through to the play-offs:

a. the BAC 208 was a radical new design with deflected-thrust engines and multiple lift fans,

b. the Armstrong Whitworth 681 – a 4-jet new design with STOL capability, and

c. the Short Belfast SC.5/21 which was a basically a Belfast with STOL capabilities.

Of the three contenders, the winner was the Armstrong Whitworth 681. It was to have a swept, high wing with four Rolls-Royce Medway jet engines each with vectored thrust, like the Harrier, thereby giving the aircraft its short take-off and landing (STOL) capability. As required by the OR351, it had a payload of 35,000 lb but there was no mention of it being capable of carrying 20 tonnes on normal operations. However, it did come with proposals for a vertical take-off and landing (VTOL) capability. A large pod would be built into each wing, outboard of the Medways, each of which would contain nine vertically-mounted RB162 ‘lifting fans’. These were single-spool turbojets each with a thrust of 5,250 lb and a height of

The AW681 in its twenty-two-engined VTOL fit . . . (BAe)

4 feet 3½ inches.

A contract was signed with Hawker Siddeley (Armstrong Whitworth's parent company) in late 1963 and first flight was anticipated for 1966. The initial order was expected to be for 62 aircraft.

However, it was not to be. 1964 saw the election of a Labour government under Harold Wilson. The new administration faced major economic challenges and, from the outset, it was looking to make savings in public expenditure. The Defence Secretary, Dennis Healey, produced his first White Paper in February 1965 and, at a stroke, it cancelled the massively expensive and over-budget TSR2 programme and the AW681 project. The forecast for the whole AW681 programme was £4·1 billion pounds (in 1965 money) and the programme had already spent over £4 million at the time of its cancellation. Mr Healey's aims were to replace the TSR2 with the General Dynamics F-111 Aardvark, which was an American supersonic, medium-range interdictor, and to replace the projected AW681 with 66 Lockheed C-130 Hercules. The cancellation of the expensive TSR2 and AW681 programmes was undoubtedly of benefit

to the nation's balance sheet but it also brought benefits to America's aerospace industry. The USA had witnessed the elimination of both the world's most advanced and capable 'under the radar' bomber and, potentially, the first STOL and VTOL medium-range transport. Arguably, it was a 'win' for both sides.

In the event, we didn't buy the F-111. Instead, we imported 50 American Phantoms for the Navy and 116 for the RAF which took over the Navy's fleet of Buccaneer tactical bombers. However, the Hercules order for 66 aircraft went ahead. The UK paid £800,000 for each aircraft versus the projected £2·4 million for each AW681. Three for the price of one!

So, what were the origins of the C-130 Hercules? The USA emerged from the Korean War in May 1953 with a very tired and inadequate medium-range air transport fleet. The USAF was operating the twin-engined Curtis C-46 Commando which had first flown in May 1940. The not-dissimilar Douglas C-47 Dakota had first flown in December 1941. The youngster was the Fairchild C-119 Boxcar which had first flown in November 1947. The Boxcar could carry 62 troops but its 4·5-tonne payload was inadequate as the USA looked beyond the Korean conflict.

In February 1951 the USAF issued a General Operational Requirement (GOR) specifying freight-bay dimensions, capabilities and stressing from the outset that they sought a 'designed for purpose' military transport. The new aircraft had to carry 92 passengers, 72 combat troops or 64 paratroopers in a freight bay that was approximately 41 feet (12 metres) long, 9 feet (2·7 metres) high and 10 feet (3·0 metres) wide. Loading and unloading was to be over a hinged ramp at the rear of the aircraft.

Nine companies were given the GOR but they were narrowed down to just two: Lockheed and Douglas. The contract was awarded to Lockheed in July 1951; the fact that the contract was given just five months from the publication of the GOR suggests a degree of urgency!

The first flight of the Hercules (designated YC-130) was in August 1954 from Burbank in California. It was an hour's flight that ended at the Air Force Flight Test Centre at Edwards AFB. The prototype did not have the distinctive black nose radome and it was drawn by 3-bladed propellers rather than the 4-bladed props that we see today.

The YC-130 was distinguished by its snub-nose and 3-bladed props. (Lockheed)

Meanwhile, the C-130's production line at Marietta, Georgia, was ramping up rapidly. Deliveries of the C-130A to USAF Tactical Air Command began in December 1956. Powered by Allison T56-A-9 engines, the C-130A did have the nose radome that we know so well but it still had the 3-bladed propellers. The Royal Australian Air Force was amongst the earliest overseas customers with an order for twelve aircraft. A total of 212 C-130As was built and the type served in the Vietnam War.

Further models of the Hercules came thick and fast. The C-130B entered service in 1959 and also served in Vietnam. It had built-in auxiliary fuel tanks in the wing, thereby allowing the external drop tanks to be removed. The B-model also had uprated engines and 4-bladed propellers. A total of 209 C-130Bs was built. The production rate at Marietta was remarkable. The next variant to emerge was the C-130E which went into service in 1962, just three years after the B. The E-model, of which 488 were built, came with two external drop tanks each containing 5,100 litres, giving it extended range. The engines were again uprated, permitting increases in payload and maximum take-off weight.

Next up was the C-130H which entered service in 1964. It had

A major consideration was that the C-130K should be able to use the RAF's existing freight-handling infrastructure – like this Medium Stressed Platform.

improved avionics, a redesigned outer wing, up-rated Allison T56-A-15 engines and it provided the basis for the RAF's C-130K. The UK was very keen to maximise the British content of their fleet and, from the outset sought to have Rolls-Royce Tyne engines in place of the Allison 'Dash 15s'. However, that would have been such a change to the aircraft that a new Type Certificate would be needed, leading to a lengthy period of flight trials. Nevertheless, the UK was successful in having RAF-style cargo bay flooring and role equipment (as per the Beverley and Argosy) fitted so that it could continue to use its standard load configurations, eg 1-ton containers and Medium Stressed Platforms (MSPs). Also to be provided by the UK, were the weather radar, the autopilot, the navigator's station and some communication equipment.

A formal acceptance ceremony was held at Marietta on 16 December 1966 at which the RAF's first Hercules, XV176, was handed over. Three days later, the second aircraft off the line – XV177 – arrived at Cambridge Airport where Marshall was to paint it and install the UK-sourced kit. Twenty-three years later, in March

'After a slow start, ranks of completed UK Hercs built up' at Marietta.

1990, four members of the crew that brought that first aircraft home were reunited to celebrate the one million-hour milestone in the K's life.

Meanwhile, back in the 1960s, C-130Hs were coming off the line at Marietta at a rate of one every 10 days and Lockheed were happy to interrupt the production run to accommodate the RAF's order. After a fairly slow start, ranks of completed UK Hercs built up. Meanwhile, captains and engineers from the medium-range AT Force were being posted to Sewart AFB in Tennessee for a seven-week conversion course. On graduation from Sewart, they moved on to Marietta to do a 3-week simulator and flying course before getting their hands on the RAF's unpainted C130Ks. Navigators came across from the UK for a 4-week simulator course at Marietta. The first aircraft to head home routed via Bermuda but it was soon decided that, with no autopilot, it was better to route via Lajes. There was an American autopilot on the aircraft but Boscombe Down had not authorised its use on a British Hercules, hence the manual control all the way back.

The first dozen crews who had ferried aircraft to the UK went down to RAF Thorney Island to set up the Hercules OCU in the May of 1967. Some of the more experienced personnel started screening newly-converted crews as they ferried the aircraft to Cambridge. Once the OCU was fully up and running, however, there were four crews at Lyneham whose sole job was to ferry new Hercules back to

Cambridge.

The next high priority was to replace the very tired Hastings of 48 Squadron at Changi, but it was 36 Squadron at RAF Lyneham that received its first C-130K in August 1967. Changi got its first aircraft in the October. In 1967, Lyneham was still home to the 'Shiny Fleet' of Comets and Britannias and the base was soon overflowing as more Hercules arrived. There was insufficient space for all four C-130 squadrons, hence Nos 47 and 30 Sqns formed at Fairford, in February and June 1968 respectively, and remained there until the Comets and Britannias had moved to Brize Norton to join the VC10s in June 1970. The two Fairford squadrons joined their colleagues at Lyneham in February 1971. In November 1970, half-a-dozen Hercules had gone to Akrotiri to augment No 70 Sqn's few remaining Argosys.

People associated with the RAF's Hercules fleet tend to refer to the aircraft as 'Fat Albert', but there is no agreed explanation for that name. One argument is that, when the Americans saw the brown and yellow camouflage of the British Hercules, they related the aircraft to the skin tones of the characters in Bill Cosby's 1967 popular animated TV series *Fat Albert and the Cosby Kids* – although that suggestion might be deemed 'politically incorrect' these days. The alternative argument is that 'Fat Albert' was the name given to the US Marine Corps C-130 that supported The Blue Angels, the US Navy's flight demonstration team. However, The Blue Angels didn't acquire their Hercules until 1970 when it replaced a C-121 Super Constellation. So, the question remains – when and why did the RAF's Hercules acquire the name 'Fat Albert'? If it was in use before 1970, its origins are arguably with the Cosby Kids programme. If it was post-1970, however, we have to thank the USMC. Either way, there is no question that the aircraft of our much-loved fleet will always be referred to, and remembered as, 'Fat Albert'.

THE INTRODUCTION OF TACTICAL AND SPECIAL FORCES ROLES AND THEIR APPLICATION DURING OPERATION AGILA

Wg Cdr Tony Webb

Tony Webb joined the RAF in 1961, initially as Vulcan AEO. Retrained as a pilot in 1966, he flew the Hercules with Nos 36, 24, 47 and 48 Sqns, mostly as an instructor/examiner. He was associated with the implementation of SF operations and AAR and, later, the introduction into service of the BAE 125 and 146 and the TriStar. He was OC 241 OCU (VC10s) and OC STANEVAL at HQ 38 Gp before a final appointment at the MOD. Following retirement in 1993 he spent twelve years as Director of Public Affairs at Royal International Air Tattoo (RIAT).

In the mid-1960s the RAF transport workhorses, the Hastings, Beverley and Argosy, were being phased out. All three were to be replaced by the Lockheed Martin C-130K Hercules.

Whilst this introduction was taking place, the tactical aspects of transport operations tended to take a back seat. Work focused on strategic commitments, most prominently the need to maintain a steady flow of air supply to and from Singapore and the staging posts in between. In addition, the introduction of a new generation of air transport created its own challenges of engineering and operation.

The first important tactical commitment was the creation of the Joint Airborne Task Force (JATFOR), in support of the Parachute Brigade. This involved a formation of up to 36 Hercules, flying at 2,000 ft intervals, which could deliver enough personnel and supporting equipment to mount a major and rapid intervention force. Training for this commitment was extensive and took place between 1971 and 1976.

Contemporaneously, the SAS and SBS were pressing to revive the ‘air’ aspect of their roles using the new Hercules fleet. In 1972 each of the five squadrons at Lyneham was required to nominate one crew to be made available for Special Forces (SF) tasks. There were no training programme in place, however, and several tasks would require procedures and techniques which were unfamiliar to the crews.

Not a full blown brigade assault, a flypast at the 1987 IAT (not 'Royal until 1996) at Fairford in 1987, but you get the idea. Note the problems that the back-markers are clearly having dealing with the turbulence created by the leaders. (UKMAMS Old Bods Association)

As a first step towards introducing an appropriate training programme, I was given the 'secondary duty' of setting up some training. The most obvious aspect of SF tasking was that much of it would need to take place in darkness. A range of parachuting techniques, including low level delivery, high level delivery with low opening, and high level delivery with high opening all needed to be practised. Another, and especially challenging, procedure was to land on a natural surface strip in total darkness.

In the event the whole range of SF tasks was slowly grasped, and the procedures used on earlier types of aircraft adapted to the capabilities of the Hercules. Much of this work was not confined to the aircrews. Apart from the obvious fact that the SAS and SBS were the customers, support was needed, and enthusiastically provided by, the staff of the Parachute Training School (PTS), the Joint Air Transport Establishment (JATE) and 47 Air Despatch (47AD) Regiment of the Royal Corps of Transport (RCT).

One of the early tasks for 47AD – a unit based at Lyneham, and a task completely removed from their normal responsibilities – was to provide volunteers to hold nine torches in a field as the flare-path for the first attempts at night strip landings. This was a cautionary experience for all involved and tended to reduce the numbers of

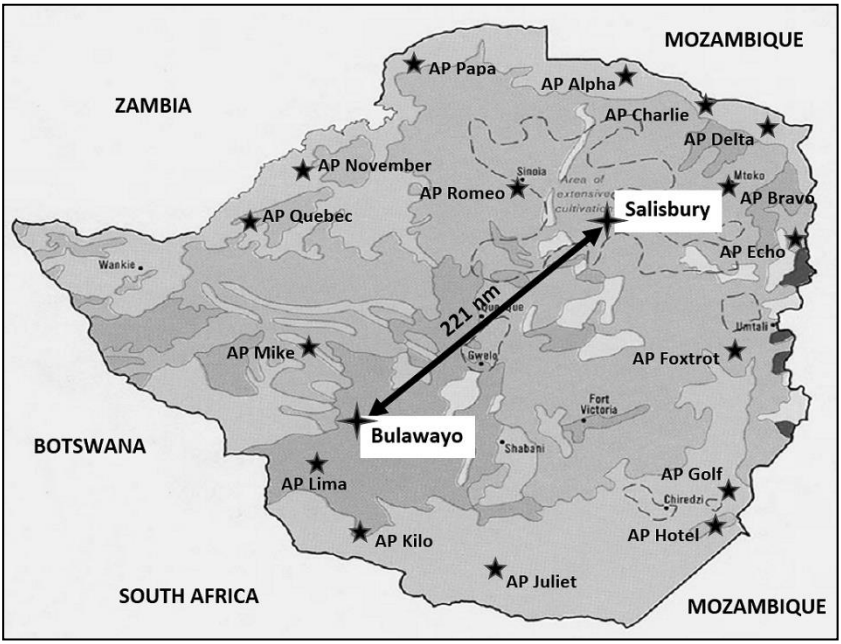
Op AGILA adopted the pangolin, a seriously threatened species native to Rhodesia/Zimbabwe, as the emblem for its flying suit patch (although there were some who thought it looked more like an exploding tortoise).

willing volunteers from 47AD! For example, there was one occasion when we managed to run over one poor soldier's lunch box.

It became increasingly obvious that five crews on five squadrons was not a recipe for co-ordination; the formation of a dedicated SF flight became essential. Despite a lot of opposition, both at HQ level and at station level, the flight was eventually formed on No 36 Sqn in the summer of 1974. When 36 Squadron disbanded in November 1975 the flight became a part of No 47 Sqn where the role remains today.

The evacuation of Cyprus, following the Turkish invasion in 1974, was the first significant non-exercise task for the Hercules Force; the first operation was Operation AGILA, in 1979-80 as part of the Commonwealth Monitoring Force (CMF) deployed to Rhodesia/Zimbabwe to oversee the elections held 14 years after Rhodesia's Unilateral Declaration of Independence. Led by the UK, the CMF included other forces from Australia, Fiji, Kenya and New Zealand. The settlement for Rhodesia/Zimbabwe depended on the successful outcome of talks held in Lancaster House, chaired by the then Foreign Secretary, Lord Peter Carrington.

The AGILA experience proved a great success, but for us its early stages were characterised by much short-notice change and, for many of the participants, a lack of information. My own experience was instructive, and an illustration of how good training can lead to good outcomes. It should be noted that, in 1979, the Hercules had none of the equipment that is available today. There was no IN, no GPS, no RWR, no LLTV, no IR radar and no NVGs. The aircraft was fitted with a bubble sextant, a non-working Decca system, a LORAN and an unreliable Doppler radar. The best available aid for tactical flying was



Southern Rhodesia/Zimbabwe is approximately twice the size of the UK.

the Mk 1 Eyeball.

For AGILA, the allocated SF Hercules crews had been pre-positioned in Cyprus, but they were unable to cross Africa before the Lancaster House talks were completed and the subsequent agreement signed. As a result, there emerged an urgent requirement to get crews and aircraft into theatre to assess the situation. Back home at Lyneham I was given two hours' notice to find an SF crew and to set off for Salisbury via the Atlantic Ocean. Some two days and 27 flying hours later we arrived in the Rhodesian capital shortly after midnight. It was only at the top of descent that we received a SELCAL message telling us that we were to stay in theatre.

Having found our booked accommodation, we collapsed into an exhaustion-inspired sleep. The next day we managed to discover that an Air Commander and an Air Adviser were already installed on the staff of the interim governor, Sir Christopher Soames. We met up and found that our task was to distribute the CMF to sixteen Assembly

A Hercules making an air drop during Op AGILA.

Areas around the country. Unfortunately, this was to start in the middle of a civil war and there was no reliable method of informing the Patriotic Front fighters that our purpose was peaceful; in addition, they were accustomed to seeing South African Hercules operating in support of the Rhodesian Armed Forces. We therefore had to assume that we would be treated as hostile and that we urgently needed to know the extent of the potential threat. Because we had left Lyneham at such short notice, and because we had no inkling of what we were going to be involved in, we had little or no intelligence and only some outdated maps that happened to be in the station map store. Most of what we knew came from what we had read in the newspapers or heard on the news!

We decided that our best bet was to ask the Rhodesian Air Force (RhAF) Dakota squadron – based in Salisbury – if they would be prepared to help us. Thankfully, the Squadron Commander was very co-operative and gave us access to much of what they knew; they also provided some more up-to-date maps. Based on this information, we now had to decide on tactics.

It is helpful to note that Rhodesia/Zimbabwe is about 10% larger than Germany and divides into three areas, the low veldt, middle veldt and high veldt; the high veldt is between 3,000 and 5,000 ft, with the highest point at about 8,000 ft. At the time, the country's population

The two white identification crosses were applied locally with household paint.

was about 7 million, so it had a very low population density. The weather was variable, but in December and January – the summer in that part of the world – it was generally fine but subject to days of rain and low cloud on occasion.

The SAM-7s were effective up to a height of 14,000 ft, and, other than IR absorbent paint, the Hercules had no protection against them. In the interests of speed, it seemed reasonable to spiral up above 14,000 ft and down again above the relatively safe centres of population. Other than this it seemed that the best tactic thereafter would be to fly as fast and as low as possible. However, we routinely trained at 250 ft agl and at 210 kt. This would be too high and too slow, so what criteria could we adopt? We also had the advantage that the RhAF were good enough to monitor a local flight against a captured SAM-7. We proved a good target, especially the two identifying white crosses either side of the nose! These had been applied locally with household paint and contrasted nicely with the IR absorbent paint!

We planned a trial sortie, spiralling up over Salisbury and down over Bulawayo. We would then see how fast and how low was

maintainable. This turned out to be 300 kt and 60 ft. In an aircraft with a 133 ft wingspan, this required a great deal of concentration. As time went by, we found that alternating the two pilots for about 15 minutes each was a sensible option. There were other oddities with this tactic. For instance, a strip arrival would also be at 60 ft, with no visual circuit to orientate oneself. A pre-planned speed reduction point was calculated in order to arrive at the strip in the landing configuration at the right speed. Strange though this felt, it was perfectly achievable.

Another of the unforeseeable problems was the degree of familiarity that the intensity conferred. Over time, flying three sorties each day, one became so accustomed to sitting in the aircraft that, instead of increasing alertness, you had to resist relaxing; it became the normal environment, where you felt most at home. The other syndrome was what might be called 'motorway tiredness'. The task was exhausting and the concentration so fierce that there was a terrifying inclination to doze off. This is not a good idea when driving along a motorway; it's a considerably sillier one when flying at great speed a few feet above the ground. We became adept at watching each other for signs of sleep.

Another feature of the flying was the frequency of bird strikes. Had we followed peacetime rules the aircraft would have spent a great deal of time on the ground. Thankfully, there was a very large supply of speed-tape and a great deal of inter-sortie patching. This was no doubt a contributory factor to the excellent sortie rate of which we only lost one out of 254 – due to an engine failure.

The weather for the first days was excellent. But, of course, Murphy's Law intervened, and on the first day of the operation proper we woke to low cloud and rain. Our aircraft was first off, and we duly spiralled up over Salisbury and down over Bulawayo. As we set off to the west, the cloud got lower and lower and the visibility worse and worse. In the end we had to climb up and return to Bulawayo. In the meantime, we found that there was some lower ground to the north west that led towards a railway line. If we could reach the railway line, we could follow it to a kink that was not far from our intended first strip. From there we could fly a timed procedure to intercept the extended strip centreline and then another timed leg to the strip. This we managed to do, even though the strip was about 6 seconds late in

The Op AGILA team.

appearing. We landed, having lost a bit of weight . . .

In the early days we saw tracer quite often, although only one aircraft was actually hit when a ·762 round flew past the co-pilot's right leg and lodged itself behind the instrument panel. In consequence we emptied all the LOX tanks to reduce the risk of explosion. As time progressed the war slowly petered out and flying became more relaxed and less demanding. There was one tragic accident when an RAF Puma flew into wires with the loss of three lives.

We achieved the first objective of distributing the CMF on time. The re-supply became more of a challenge as the patriotic front fighters started demanding more and varied supplies. At one stage we flew down to South Africa to pick up several full loads of frozen sides of beef – which were subsequently free-dropped.

In conclusion, although this is written from an aircrew perspective, it would be quite wrong to fail to acknowledge all the vital support that we, and the operation, received from our engineers, from UK MAMS, from 47 Air Despatch and from our own local higher authority who worked hard to keep us free from interference and free to fly as we thought fit.

Forty years on, it is sad to see that the operation did not bring the hoped for freedom and success to the emergent Zimbabwe.

SOUTH ATLANTIC CONFLICT – RAF HERCULES INVOLVEMENT

Wg Cdr Paul Shepherd

Having joined the RAF in 1971, Paul logged 4,000 hours as a Hercules navigator while flying with No 47 Sqn and its SF Flt, No 70 Sqn and, as a Flight Commander, No 24 Sqn; he later commanded the Airbridge Detachment at ASI and No 1312 Flt. Ground appointments included a tour at the RMA Sandhurst, and three at the MOD, twice in AT/AAR Policy and once as Air Advisor to DSF. A tour as OC Ops Wg at Brize Norton, flying VC10s, was followed by appointments with HQ TGDA and at JSCSC. Having been medically discharged in 2003, he spent another eleven years at Shrivenham working with the JSCSC and, later, in the Defence Concepts and Doctrine Centre.

Background.

The Argentinian invasion of South Georgia and the Falkland Islands (FI) in 1982 caused an intense political and media frenzy across the Atlantic Ocean. The British Prime Minister – the Rt Hon Margaret Thatcher – directed her Defence Secretary to 'park' her request for defence cuts and devise an immediate plan to regain control of the islands.

This huge task was complicated by the enormous range, an atrocious weather factor, the lack of 'friendly combatants' in the vicinity[1] and the absence of any FI contingency plans. The Falklands are 6,950 nm from the UK – Singapore, Tokyo and Brunei are all closer. Lyneham to Ascension Island is 3,800 nm – beyond the range of loaded VC10s and Hercules. Ascension to Port Stanley is a further 3,400 nm, with very strong headwinds southbound. At the time, accurate and timely Met forecasts were unavailable; and, with most Latin American countries siding with Argentina, no staging posts or diversion airfields South of Ascension were available, except in dire emergencies.

The Op CORPORATE deployment became the biggest UK airlift operation since the 1948/49 Berlin Airlift.[2] The Hercules carried over

7,000 tons (15 million pounds) of freight, including 114 vehicles, 22 helicopters and nearly 6,000 troops plus support personnel. During the conflict, Lyneham's engineers worked 54,000 man-hours – much more than their planned duty time. In the first three months of the Operation (April-June 1982), the Hercules Wing flew 214% of its Authorised Flying Task, without any appreciable reinforcements, other than partially or recently current aircrew.[3] [4]

Essential support.

Clearly this submission is 'aircrew centric'; however, the aircrew achievements relied on essential support from three groups of non-aircrew professionals:

- Base and Mobile Air Movements personnel at Brize Norton, Dakar, Lyneham, Ascension and (post-conflict) Port Stanley who processed an enormous amount of air freight and personnel to ensure expeditious loading and unloading of aircraft.
- RAF engineers, plus their colleagues at Marshall of Cambridge and Flight Refuelling Ltd, performed miracles against ludicrously tight timelines.
- Air Despatch personnel of 47 AD Sqn not only prepared loads on the ground and despatched them in-flight, they also provided additional airborne 'look-outs' when operating in low-level 'threat environments'.

Task Force deployment.

The Maritime Task Force assembly began on 2 April for deployment from the UK on 5/6 April. In the absence of appropriate contingency plans, the deployment was based on RM Norway reinforcement plans. However, these were reliant on moving a War Maintenance Reserve, comprising 30-days' support for the deployed force, including 5,000 tons of fuel, vehicles, equipment and supplies, to the UK ports by rail. Sadly, the contingency plans did not take into account the 'Beeching cuts' – British Rail could only offer limited rolling stock. 'Plan B' was rapidly devised, using military and contracted road haulage, with limited rail back-up, to move 100,000 tons of equipment and supplies plus 9,000 troops to the ports for shipping to the FI via Ascension. Although the tight embarkation deadline was met, numerous loading issues arose – most notably the lack of combat and tactical loading. Combat troops often lacked easy

The MV Maersk Ascension – *a floating gas station.*

access to, or were separated from, their essential equipment and freight.

Consequently, as the Task Force staged through Ascension:

- RN and RM SH were extremely busy ferrying cargo and troops from ship-to-shore and ship-to-ship. Ascension's Wideawake airfield often handled more aircraft movements per day than Heathrow.
- The RAF's Air Transport Force (VC10s and Hercules), backed up by chartered civilian aircraft, mounted a massive airlift of troops and equipment to Ascension, using Gibraltar and Dakar (Senegal) as staging posts to overcome range/payload issues.
- Hercules SF and tactical crews conducted numerous aerial re-supply drops, which became increasingly challenging as the Task Force sailed south of Ascension towards the FI.

US assistance.

Although the UK governed Ascension and the FI, it was evident that US support would be pivotal for any UK military operation. However, the US State Department was keen, publicly at least, to maintain a neutral stance to avoid military conflict in its 'own back yard'. The Pentagon staffs, however, whilst not exactly flying Union Jacks, were willing supporters, offering significant support.[5]

At Ascension, they provided: the 'concertina city' accommodation complex;[6] admin and catering support; and the *Maersk Ascension* – a resident tanker moored offshore at Georgetown, to store 12·5 million gallons of aviation and diesel fuel. The Royal Engineers (RE) provided a transfer pipeline and bulk fuel storage at Wideawake

Wideawake's 'Concertina City', provided courtesy of Uncle Sam.

airfield.

In terms of operational support, the Pentagon provided: weapons; Omega equipment to enhance the RAF's large aircraft fleet's navigational capabilities; intelligence and communications support; plus AM2 matting for Port Stanley airfield following its recapture. Significantly, the US also covered some of the UK's NATO commitments, thus enabling the MOD to focus on regaining control of the FI and the surrounding British Territories.

So, why go to all that trouble?

It is worth considering the UK's rationale for going to such enormous lengths to regain control of the FI, South Georgia and the South Sandwich Islands. Some considered it simple loyalty to the 2,000 or so Falkland Islanders who strongly backed British governorship of the islands. Sceptics argued that the conflict presented the UK and Argentinian Governments with a much needed diversion from domestic pressures. However, the significance of the Antarctic Treaty should not be overlooked. The UK was one of twelve original signatories of the Treaty, based on its governorship of

the FI, South Georgia and South Sandwich Islands.[7] [8] The UK is allocated a significant sector of Antarctica, but faces territorial disputes with both Chile and Argentina. Unsurprisingly, the Argentinian invasion effectively undermined the UK's status within the Antarctic Treaty Organisation. This, combined with the Treaty's renewal in 2045, and the prospect of significant mineral resources, may have influenced the UK's action.

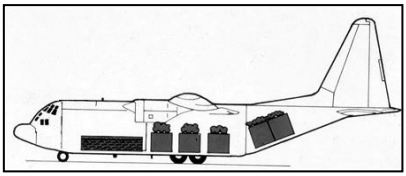
RAF Hercules operations in Chile.

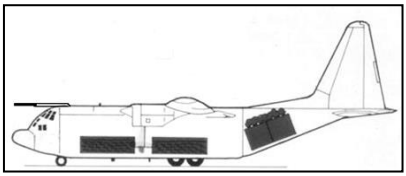
This submission would be incomplete without mention of the RAF Hercules' role in support of UK communications and intelligence gathering operations conducted in and around Chile.[9] [10] Here, Hercules, 'disguised' with rapidly applied Chilean Air Force markings, deployed powerful radar equipment to Punta Arenas from Easter Island, where it had been positioned by VC10s. The radar monitored Argentinian aircraft movements and relayed the information to Northwood. The Hercules aircrew also closely examined options to land on the Pan-American Highway in the north of Chile to refuel, using the Forward Air Refuelling Point (FARP)[11] [12] technique, inbound Canberras deploying to Chile from Belize. Although feasible, the task didn't materialise.

Engineering miracles.

Traditionally, the RAF's large strike, maritime and air transport aircraft were designed for use within the NATO area, and not configured for air-to-air refuelling (AAR) (Vulcans excepted). In 1982, the Vulcans were being replaced by the Tornado GR1, and their notional AAR capability had not actually been used for twenty years. Suddenly the Hercules, Nimrod and Vulcan fleets required an immediate 3,400 nm radius-of-action plus time-on-task to mount return operations from Ascension into the Falkland Islands Exclusion Zone (FIEZ).[13] This presented the combined engineering team of RAF engineers, plus Marshall of Cambridge Engineering (MCE) and Flight Refuelling Ltd, with a monumental challenge.

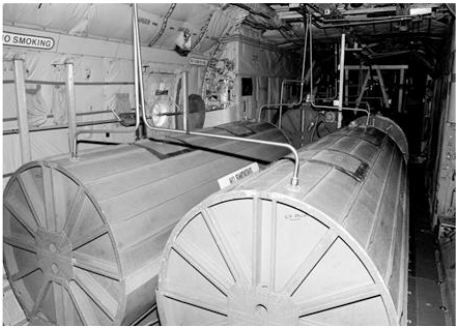
The Vulcan's in-flight refuelling probes and the probe tips were in short supply and were recovered from museum aircraft, aircraft salvage facilities and also crew rooms and offices where they were being used as souvenirs. In addition, the Vulcan engineers' task was further complicated by having to reconfigure five aircraft from





Above left, the 2-tank (at the front of the hold) LR2-fit still allowed the carriage of a substantial quantity of freight compared to the 4-tank LR4-fit, above right. With a probe, as on the right, the designation became PLR2 or PLR4. Below, a side-by-side pair of 6,600 gal Andover overload tanks installed in a Hercules freight bay.

strategic nuclear bombers to strategic con-ventional bombers, equipped with ECM pods plus, later, AS37 Martel and AGM-45A Shrike missiles.



For the Hercules and Nimrod fleets, the increased range presented an even bigger challenge. First, the engineering team had to design and install an AAR Rx (receiver) capability for both fleets. Then trials and training staff had to develop, then test and approve AAR Rx techniques, before training crews from scratch. Considering the Argentinians invaded on 2 April 1982, it is extraordinary that the first two modified Nimrod MR2s arrived in Ascension on 13 and 17 April. These aircraft had enhanced weapon fits, including the carriage of 1,000lb bombs, BL755 cluster bombs and AIM-9L Sidewinder missiles. They also had a 'jury-rigged' AAR Rx fit which increased the aircraft's endurance to more than 19 hours.

As the Task Force sailed south beyond 1,500 nm from Ascension, it was evident that the Hercules required an interim range-enhancement capability. Two options emerged; both involved fitting surplus Andover auxiliary fuel tanks in the freight bay, plumbed into the aircraft's fuel system. Each tank provided an additional 6,600 lb of fuel. A 2-tank fit (LR2) provided an additional 2½-3 hours flying; a 4-tank fit (LR4) provided an extra 5 to 6 hours. Clearly, the penalty for such installations was a corresponding reduction in payload and a

This was the first Hercules/Victor AAR trial flight.

limited air-drop capability; the aircraft could only carry and drop small items of high priority freight and passengers – typically SF personnel and their equipment.

The Hercules AAR Rx programme commenced at MCE on 15 April; the prototype installation took just 10 days; the initial test flight was completed on the 28th and the aircraft was delivered to Boscombe Down the next day. The prototype completed its first 'wet' contact with a Victor tanker on 2 May and the first trials/training flight occurred on 6 May – just 34 days after the Argentinian invasion.

Sqn Ldr Max Roberts, OC 47 Sqn SF Flt and fellow SF captain, Flt Lt Harry Burgoyne, together with Sqn Ldr John Brown (Boscombe Down Test Pilot) conducted five concurrent training/trials flights. These involved AAR at up to 175,000 lb[14] on four engines and at lighter weights on three. Tanking on two engines was attempted but proved impossible. On completion of these flights, John cleared Max and Harry for South Atlantic AAR operations. Harry flew 11 hours and 45 mins with John, involving some 6 hours handling, including 1½ hours at night and completed some 20 Victor AAR 'contacts'. After the final trial sortie on 11 May, Harry and his crew deployed to Ascension on the 12th. Max, with similar AAR experience to Harry, remained at Lyneham as the 'Hercules AARI/Flt Cdr SF'.

By 6 June, the RAF had six modified Hercules C1Ps available for use and it was decided to modify the entire fleet. The combined engineering team worked, literally, 24/7 to perform 'miracles' against such tight timelines.

On 30 April, just as the Task Force established the FIEZ, MCE

received a second Hercules challenge – to convert, at best speed, six Hercules C1 freighters into C1K tankers. These would primarily provide an in-theatre AAR capability, once the FI had been recaptured. The first aircraft was delivered in just 76 days. The modification included welding the aircraft's ramp and door shut, fitting a Mk 17 Hose Drum Unit on the ramp, providing adequate internal cooling, installing and plumbing-in four Andover ferry tanks, fitting a refuelling probe and modifying the aircraft's rear with external strakes and markings.

No 47 Sqn SF Flt's dichotomy – capability versus customer-driven requirements.

No 47 Sqn SF Flt's aircrew comprised highly-capable individuals selected to provide specialist fixed-wing air support for SF units (including the Special Air Service (SAS), the Special Boat Service (SBS) and the Submarine Parachute Assistance Group (SPAG). Sadly, the only 'club in their bag' was advanced training to provide specialist support techniques using a standard Hercules. The flight's war role involved the long-range, covert insertion of SF ground forces behind enemy lines, primarily to conduct reconnaissance. Ever since the SF Flt's inception in the 1970s, its aircrew and their supporting staffs had repeatedly requested a 'mini fleet' of aircraft fitted with defensive aids, an improved navigation capability and vision enhancement equipment. Sadly, these efforts always failed in the annual funding process, frustrated by a fast jet-centric 'light blue' hierarchy's apparent failure to grasp the nature, and strategic importance, of the SF role. Regrettably, this situation prevailed until after Gulf War I commenced.[15]

In reality, the SF Flt's preparedness for war in 1982 was woefully inadequate. They operated standard Hercules devoid of: EW protection; night/all-weather operating capability; a modern navigation fit; crew protection; or an extended range capability. These shortcomings were highlighted by: the flight's involvement in Op AGILA (Rhodesia) in 1979/80; exercising with the USAF's 7th SOS C-130 Combat Talon aircraft; participating in RED FLAG exercises; and during SAS airfield assaults as TACEVAL injects at Laarbruch and Kinloss, just two weeks prior to the Argentinian invasion. That said, during RED FLAG, USAF observers were so impressed by the

RAF's effective use of terrain masking, lookout and manoeuvrability, that they procured cupolas for their own C-130s.

No 47 Sqn SF Flt's operational involvement.

Initially, No 47 Sqn SF Flt's five crews believed the Argentinian invasion to be of mild academic interest only. The theatre of operations was 3,800 nm from the nearest useable mounting base (Ascension Island) – well beyond the Hercules' operating range. However, Sqn Ldr Roberts, soon dispelled this impression with a situation brief confirming the flight's immediate involvement in the impending conflict. In response to 'customer-driven'[16] requirements, one SF crew was hastily detached to Ascension Island, to conduct aerial re-supply drops to the Task Force, as it sailed south towards the FI. The remaining four crews began an extremely challenging period of 'procurement', trials and training to facilitate essential Hercules support for 'customer-driven' operational plans.

The first detailed task, driven by 22 SAS on the back of discrete RAF operational activities in and around Chile, was to covertly air-drop a reconnaissance team onto East Falkland. The mission, to be mounted from Easter Island via Punta Arenas, was the subject of extensive aircrew planning, scrutinised by HQ 38 Gp staff. The plan involved a covert low-level insertion onto a drop zone (DZ) in East Falkland with a rapid climb to 3,200 ft to use the more flexible GQ 360 steerable square parachutes.[17] However, the Task Force's arrival within helicopter range of the FI nullified the requirement for this operation.

Running in parallel was Op MIKADO – a more radical plan by 22 SAS to conduct an opposed night airfield-assault onto the Rio Grande airfield in Argentina, to eliminate the significant Exocet threat to the Task Force. This would involve a pair of Hercules landing at night, in a non-permissive environment, in close formation, to deliver a 22 SAS assault team comprising 60 troops and their vehicles onto Rio Grande airfield on mainland Argentina. Their mission was to destroy the Exocet missiles, the Etendard launch platforms and their pilots. The assault force would then return to the two Hercules and escape to Chile! Should the aircraft be destroyed, the assault force and aircrew would attempt overland escape and evasion to Chile.[18] An uneasy feeling existed on the flight that 22 SAS held a misguided perception

of likely mission success, stemming from earlier Laarbruch and Kinloss TACEVAL injects. During these, the Hercules had been seen on radar while still some 10 miles inbound and would have been 'shot down' – this didn't seem to register with the SF troops . . .

No 47 Sqn SF Flt's concurrent ops, procurement, trials and training programmes.

The first deployed SF crew, together with other 47 Sqn and LXX Sqn tactically trained crews, conducted Task Force resupply drops from Ascension, initially using standard Hercules C1/3s and subsequently aircraft upgraded to PLR2 and LR4 standard. The remaining SF crews commenced an intense programme of concurrent trials and training against ludicrous timescales, including training for two-aircraft close-formation night assault landings in a 'non-permissive' environment.

This placed a huge demand for engineering, training, trials and staff support; thankfully, no area was found wanting. In addition to range enhancements, the crews also initiated self-help initiatives, with limited staff support, to procure: rudimentary cockpit armour; enhanced navigation equipment to provide essential accuracy for tanker RVs and penetration of the FIEZ (also a missile exclusion zone (MEZ)); flight-deck cupolas – only three of the original 66 could be traced; a hand-held Radar Warning Receiver (RWR) from the Fleet Air Arm; and sea-survival suits. HQ 38 Gp supplied and cleared the use of Aviator's Night Vision Imaging System (ANVIS) NVGs – the SF crews became the RAF's first fixed-wing operational users.

Hercules trials/training programme – problems and solutions.

Some concurrent trials/training flights lasted more than 10 hours, involving medium and low-level flying, as low as 50 ft over water – at night! These ultra-low-level sorties highlighted the need for a co-pilot's radar altimeter 'repeater', an enhanced night vision capability and much more accurate navigation equipment. Eventually, and after much pleading, a Carousel INS was installed in record time by the hard-pressed Lyneham engineers. Issues arose with the Carousel's initial alignment – it was very sensitive to aircraft ground movement prior to start-up. Cockpit lighting was modified to provide ANVIS compatibility, although this took several flights to perfect. Crews discovered the pitfalls of heavy operations with internal fuel tanks.

Mutual Hercules AAR was a comparatively sedate procedure compared to the 'toboggan ride' required by the Victor.

On one trial of the four-tank interim fit, the improvised plumbing burst and flooded the aircraft's freight bay with fuel. The solution was to open the aircraft's rear ramp and climb to enable the fuel to escape!

The hand-held RWR, nicknamed the 'hair dryer', provided good aural differentiation between radars and good 'lock-up' indications, but did not provide usable range or threat-direction information.

Introducing Hercules AAR presented an operational challenge – the Hercules had a speed incompatibility with a Victor using a 'high-speed' basket.[19] The Victor's minimum IAS was 230 kt and the maximum IAS for a heavy Hercules was circa 220 kt, decreasing as weight increased with AAR up-load. The solution was to employ a 'toboggan' technique, where both aircraft entered a slow descent during AAR. Around 30,000 lb of fuel could be delivered in 25-30 minutes. However, this procedure presented some weather challenges as the aircraft descended through cloud layers.

The trials/training programme was completed in three weeks – it would have taken more than two years in peacetime. It was demanding, arduous flying for the crews, but never boring! The South Atlantic operations also presented significant Crew Duty Time (CDT) issues. During peacetime operations, air transport crews were restricted to 120 flying hours in 28 days. Op CORPORATE required crews to fly at least 150 hours in 20 days and significantly more during the initial trials/training period.

Op MIKADO Phase 1 – 16/17 May 1982.

Just 44 days after the Argentinian invasion, the SF Flt was tasked to undertake Phase 1 of Op MIKADO – to airdrop the SAS recce

team, comprising eight troops and stores (2 × 1 ton ME[20] loads) to RFA *Fort Austin* just 60 nm north of Port Stanley. It was to be the first operational Hercules AAR task and the flight, captained by Harry Burgoyne, lasted 24 hrs 5 mins. The actual take-off weight was 180,000 lb – 5,000 lb above the Release-to-Service maximum AUW. In the knowledge that earlier Op CORPORATE SF sorties had taken-off at similar weights, and that the USAF SF Iranian rescue mission (Op EAGLE'S CLAW) had departed Masirah at 190,000 lb AUW, Harry was confident that the aircraft would perform. That said, extrapolation of take-off data from the Operating Data Manual (ODM)[21] focused the crew's mind, confirming that if an engine failed after take-off, 'the remaining 3 engines would take them directly to the scene of the inevitable crash!'

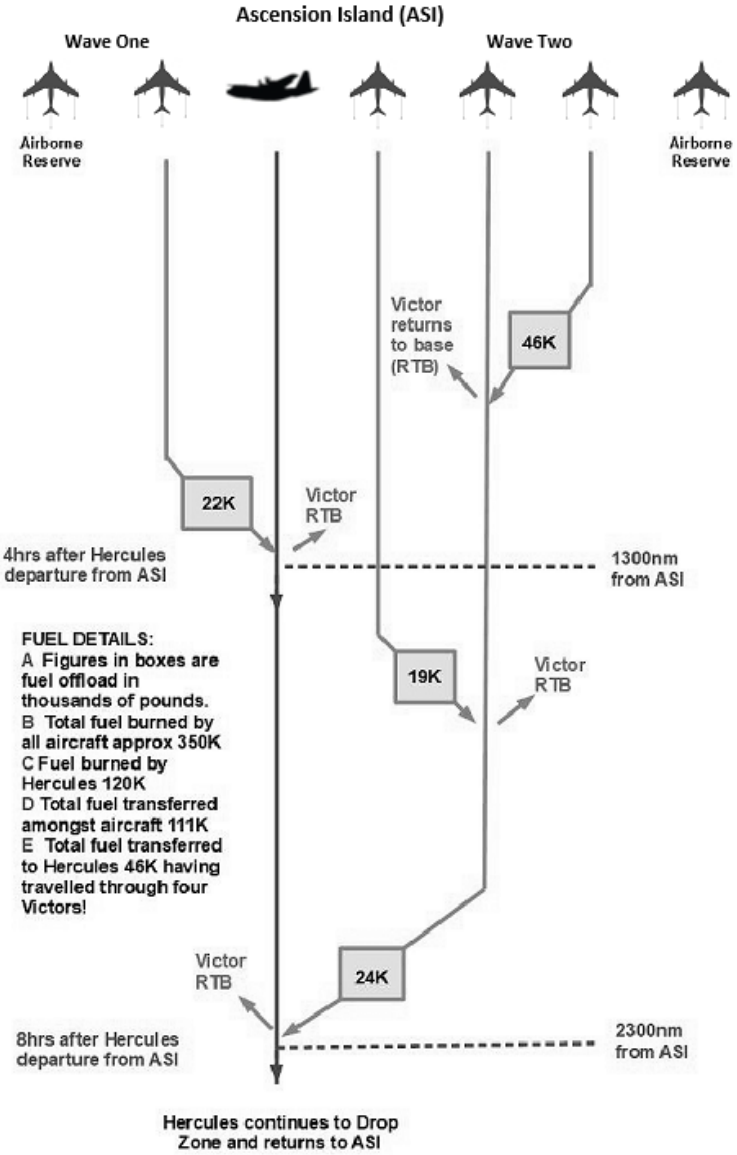
During planning, the crew were informed that the Victor tankers were also committed to support a long-range Nimrod sortie and that they could only support a single AAR bracket to uplift 37,000 lb of fuel, 6 hrs after take-off. The Hercules sortie was planned accordingly, but presented a challenge, as the toboggan manoeuvre lasted almost 40 minutes, ending up below 2,000 ft – still receiving fuel! Any break in contact at that heavy weight would have precluded a re-connect. For all future Hercules AAR sorties an SOP was introduced to ensure a double AAR bracket.

The Hercules approached RFA *Fort Austin* at 2,000 ft – 500 ft below a 2,500 ft cloud base to counter any Argentinian fighter threat – with the drop conducted at 800 ft. Troop recovery from the freezing water took 45 minutes, causing the onset of hypothermia.[22] The stores drop and recovery took a further 70 minutes, by which time it was almost dark. Fortunately, the containers were fitted with SARBE beacons and McMurdo lights.[23]

For later drops and the early airbridge sorties, the SF crews were augmented by crews from Nos 47 and LXX Sqns. Eventually, enough of these became AAR and fighter affiliation trained to undertake airdrop and airland tasks. A total of 20 re-supply airdrop sorties were conducted before the Argentinian surrender on 14 June.

RAF Stanley – the early days.

Immediately upon the Argentinian surrender – just two months after their invasion – the REs began assessing the condition of Port



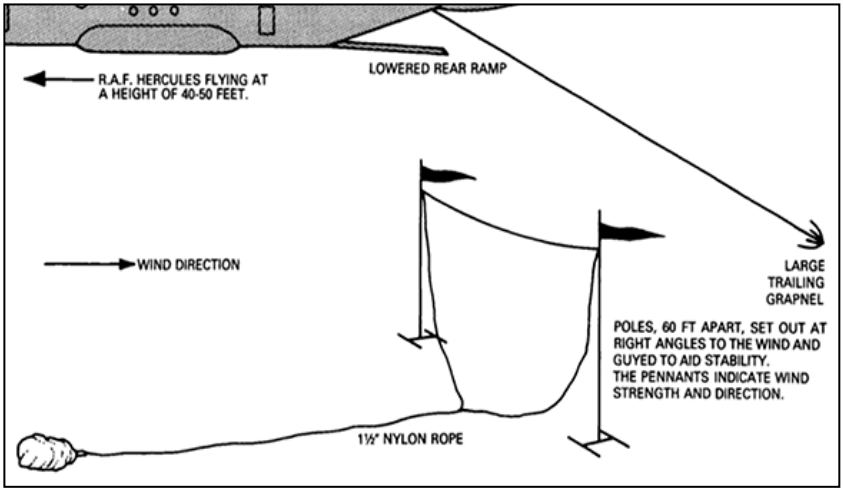
A typical AAR-supported sortie, in this case a non-stop round trip to deliver a load by parachute.

Stanley's runway being repaired and extended with US-supplied AM2 panels.

Stanley airfield. They quickly established that areas on and around the airfield were mined and booby trapped, although the 4,100 ft runway had suffered only relatively slight damage from Vulcan and Harrier attacks. Temporary repairs were completed and the airfield re-opened,[24] enabling completion of 77 Hercules sorties and hundreds of Harrier sorties before closure for further work was necessary.

On 24 June – just 10 days after the Argentinian surrender, Flt Lt Jim Norfolk and crew completed the first Hercules landing at Stanley – a quick-turn-around (QTR) and return to Ascension Island. This was effectively a rehearsal for Flt Lt Harry Burgoyne and his crew to return the Falkland Islands' Governor, Mr Rex Hunt, back to his 'office' the following day. Harry and Jim exchanged detailed airfield information by radio as they passed each other en route. Harry and crew were also on a QTR, with Flt Lt Dave Sargent and crew inbound just two hours behind. With considerable media attention, and only one Hercules parking space available on the runway itself, a problem arose. The fuel-transfer rate from the internal ferry tanks to the main fuel tanks was very slow, resulting in a 'nose-down', out-of-trim situation for take-off. Harry had to clear the runway before Dave Sargent arrived so the passengers, mostly 22 SAS personnel, were invited to sit on the ramp for take-off, with two bottles of single malt as compensation – the aircraft departed on-time, perfectly trimmed!

On 8 January 1983, Flt Lt Graham Forbes and crew arrived in



The outbound mail pick-up system devised by JATE was reportedly based on the glider snatch-recovery system of WW II, but it looks to be even more like the message pick-up procedure used by the army co-operation biplanes of the inter-war years. *See page 64.*

Stanley with PM Margaret Thatcher and her entourage plus a caravan/container to provide her personal living/working space. They managed to overcome some Hercules tanker serviceability issues when refuelling and, upon arrival, the PM asked Graham if he could circle Bluff Cove to see *Sir Galahad* before landing at Stanley. With all the authority he needed, Graham obliged to provide what proved to be an emotional experience for the PM! The return flight was aborted on take-off owing to RPM malfunctions with both port propellers. When advised of the need, and the time required to replace the aircraft with another incorporating the 'creature comforts', the PM told Graham to use a standard aircraft and she sat on the flight-deck bunk for the northbound leg.

Re-supply/snatch sorties.

RAF Stanley airfield was closed 16-27 August for Phase 2 repairs. This work: extended the runway to 6,100 ft × 150 ft and raised the LCN[25] to 45; installed five Rotary Hydraulic Arresting Gear (RHAG)[26] barriers, to permit Phantoms to operate; increased aircraft parking space and aircraft engineering facilities; and installed a ship-

to-store fuel pipeline.

During this work, urgent freight and mail was delivered to Port Stanley by Hercules airdrop; urgent outbound mail and freight was recovered using a snatch recovery technique. This involved a cable being suspended across two tall poles and mail bags on the ground being attached to the cable. The aircraft would fly low into wind, trailing a cable and grappling hook which would engage the suspended ground cable, enabling it and the bags to be winched into the aircraft. The technique, devised by the Joint Air Transport Establishment (JATE), was a very basic, but effective derivative of the WW II glider recovery system. In all, 30 'snatch' sorties were conducted, each being of 26-27 hours duration; one of these was completed with a 60 kt surface wind. The longest Op CORPORATE flight, an airdrop resupply sortie conducted by Flt Lt Terry Locke and his augmented crew, lasted 28 hrs 4 mins.

No 1312 Flt.

Another milestone in the incredible RAF Hercules history occurred on 17 October 1982, with the arrival of a pair of Hercules C1K tankers (XV192 and XV201) flown by Sqn Ldr Dave Farquhar and Flt Lt Dave Turner, to establish a Hercules detachment to support the locally-based Phantoms. The motto of the detachment (renamed No 1312 Flt in November 1983) was 'Support, Search, Save and Supply' which encapsulated the unit's broad role. The two tankers were later supplemented by a 'flat-bed' C1P for maritime radar reconnaissance (MRR)[27] and airdrop sorties.

The detachment comprised three crews (including the Flight Commander) and 24 ground personnel (including a JEngO). Personnel initially did three months in-theatre, later extended to four. The operational routine at Stanley was for crews to stand QRA, at 10 minutes' readiness, every third day. The flight flew two daily routine Phantom AAR support sorties, involving several fuel top-ups and fighter affiliation training. In addition, daily MRR sorties were flown to record details of vessels sailing/fishing in the eight outer and some inner sectors of the Total Exclusion Zone (TEZ). Approximately every three weeks, MRR sorties were tasked to South Georgia, including resupply airdrops; sortie extensions to include the South Sandwich Islands were less frequent. There was also an occasional

The post-conflict ramp at Wideawake with the Hercules of the Airbridge Detachment.

SAR sortie to locate and provide 'top cover' for boats with injured crew members requiring rescue by SAR Sea Kings when within range. The flight also provided Hercules airbridge support and CASEVAC cover.

Between October 1982 and May 1986, the Hercules Detachment transitioned from humble beginnings, operating from tented working and living accommodation, to Portakabin working facilities with 'Coastel' living accommodation.[28] No 1312 Flt moved to RAF Mount Pleasant in May 1986.

Steady-state airbridge.

The first Hercules airbridges were flown by augmented SF crews in PLR2 aircraft with AAR support from up to five Victor tankers. These crews simply did a QTR at Port Stanley before returning to Ascension Island. However, the airbridge evolved quickly into a steady profile operated by basic AAR Rx qualified crews with a Hercules C1P aircraft. The southbound leg was flown with two AAR brackets supported by two tanker (a combination of Hercules and Victor) before changing crew at Port Stanley for the northbound leg, which was flown without AAR support. The airbridge loads were positioned at Ascension by daily VC10 and TriStar schedules from Brize Norton. In all, 650 airbridge sorties were flown, the final one

being in May 1986.

The Airbridge Detachment at Ascension Island was commanded by a, non-flying, aircrew squadron leader in post for 3-4 months. It comprised a pair of Hercules C1K tankers and two crews on four-week attachment, and four C1P (freighters) and five crews supported by a JEngO plus 24 engineering personnel, all on four-week attachments. The Victor Detachment had three crews (including the Flight Commander) with four aircraft and supporting engineering personnel – all also on 4-week detachments.

'Albert's' Close Shave.

On 3 March 1984, Ascot 8173 – a standard northbound overnight airbridge – flown by Flt Lt Bill Akister and crew, departed Stanley for Ascension. They had a full fuel load, a fair weather forecast and 60 passengers, including returning Hercules and Phantom aircrew. After an uneventful flight, with only isolated clouds showing on its cloud and collision warning radar (CCWR), the crew contacted Wideawake Tower, when 300 nm inbound. The weather details confirmed the earlier Met forecast, indicating a chance of showers. At 100 nm from Ascension and with 137,000 lb of fuel remaining, descent was initiated for a routine TACAN-to-visual approach for runway 14.

At 75 nm, Wideawake Tower updated the weather, advising that Travellers Hill[29] was experiencing unexpected torrential rain and the airfield weather was rapidly deteriorating with a cloud base of 300 ft, less than 1 mile visibility and extremely variable wind. As the aircraft neared the island, CCWR avoidance of thunderstorm cells became essential. Their first approach, at 0915Z, resulted in a missed-approach procedure with 102,000 lb of fuel remaining. During this, they did observe the sea and also noticed SS *Uganda* anchored near the runway threshold. The flight engineer saw the approach lights at 11 o'clock – but Bill did not.

With only 'island holding fuel',[30] an uncertain weather factor, no diversion airfield and the unavailability of AAR and SAR,[31] the crew elected to attempt further approaches. With increasing tension and severe turbulence, the freight-bay atmosphere was terrible and air-sickness rife. Further approaches were unsuccessful and fuel steadily decreased. With 5,900 lb remaining, Bill informed his crew that he would declare a 'Mayday' at 5,000 lb, order life jackets to be worn at

4,000 lb and ditch alongside *Uganda* at 2,000 lb remaining. Listening in on the radio, the SS *Uganda's* Master ordered lifeboat manning.

On the sixth attempt, at 300 ft with the co-pilot (Fg Off Paul 'Obie' Oborn) flying, they didn't see *Uganda* and, just as they were about to overshoot, the flight engineer called, 'Lights at 11 o'clock!' Bill spotted them, took control and landed on a flooded runway, using only reverse thrust to stop; they had just 4,700 lb of fuel remaining. Bill received a Flight Safety award.

Hercules/Sea King mid-air collision.

On 27 June 1985, a Hercules C1P of No 1312 Flt was tasked by HQ British Forces Falkland Islands (HQ BFFI) to conduct MRR of the FIEZ outer sectors and some inner sectors. Concurrently, a RN Sea King was tasked by Northwood to conduct MRR of some inner sectors. The two aircraft, flying in the same inner sector, in marginal weather, were unaware of each other. They collided in cloud at 1,000 ft AMSL. Tragically, all four Sea King crew members perished. With 20 feet of its port wing missing, the Hercules initiated an emergency diversion to the only partially open Mount Pleasant Airfield and landed safely.

Addendum.

The House of Commons Defence Committee noted the success of Op CORPORATE as a tribute to the planning and labours involved in delivering the Task Force logistic support.[32] The Hercules' role had been pivotal, of course, but it did so much more – before, during and after the conflict. Records were set and frequently broken. Aircrews, supported by air staffs, planners, engineers and suppliers alike, had to adapt and improvise to ensure safe South Atlantic operations under very trying circumstances. It was a truly noteworthy achievement, often with minimal supervision and little in terms of SOPs or experience.

Notes:

1 Delves, Lieutenant General Cedric; *Across the angry Sea – the SAS in the Falklands War* (C Hurst & Co; 2018).

2 The airlift was additional to some regular tasking, including Parachute Training School support.

3 Evans, AVM Clive; *RAF Lyneham and the Airbridge* in RAF Historical Society Journal No 30, pp47-52.

[4] This writer was one of these.

[5] Dick, AVM Ron; *The View from BDLS Washington* in RAF Historical Society Journal No 30, pp25-35.

[6] Flown in 'flat-packed', at night, in USAF C-141s and C-5s.

[7] Wikipedia article 'British Antarctic Territory', 13 October 2019.

[8] MoD Global Strategic Trends – Out to 2045, 5th Edition, available on-line at: https://espas.secure.europarl.europa.eu/orbis/sites/default/files/generated/document/en/MinofDef_Global%20Strategic%20Trends%20-%202045.pdf

[9] Southby-Tailyour, Ewen; *Exocet Falklands* (Pen & Sword Maritime; 2014).

[10] Brown, Jeremy; *A South American War* (Book Guild Publishing; 2013).

[11] Author's discussion with Graham Finch, one of the Hercules captains operating in Chile.

[12] The FARP procedure involves a Hercules, on the ground, using its refuelling system to transfer fuel another aircraft parked nearby.

[13] Declared on 30 April 1982, the FIEZ was an area defined by a 200 nm radius from the centre of the islands; it covered the same area as the Maritime Exclusion Zone declared on 12 April.

[14] The maximum normal operating weight of the RAF's Hercules C1/3 was 155,000 lb; this could be increased, in exceptional circumstances, to 175,000 lb.

[15] This writer was personally involved in this process, initially as No 47 Sqn SF Flt's EWO (Electronic Warfare Officer) and later, for seven years, at the MOD.

[16] The 'customers' comprised JHQ Northwood and the UK's SF units (22 SAS and the SBS).

[17] The steerable GQ 360 parachute was under trial but not yet released to service; it could be used in much higher surface wind speeds than the conventional PX4 round parachute but it required a higher drop height.

[18] Southby-Tailyour, *op cit*, addresses this in greater detail.

[19] The Victor needed a 'high speed' basket for AAR operations with the Vulcan, Nimrod and other Victor Tankers.

[20] One-ton loads that were ME – manually extracted – from the Hercules.

[21] The ODM for a particular type of aircraft contains the target figures for aircraft operation in all authorised configurations and at all weights, in all phases of flight, from take-off to landing.

[22] The SAS wore wet suits; the SBS used dry suits for such ops.

[23] A SARBE (Search And Rescue Beacon Equipment) is a personal locator beacon, intended for use by aircrew who have been obliged to abandon their aircraft; it transmits a signal that permits a search aircraft to home to its location. A McMurdo light is another item of personal survival equipment, normally fixed to a life-saving jacket, it is activated by seawater.

[24] The early landings used only the northern side of the runway.

[25] The load classification number (LCN) of a runway indicates its ability to support aircraft wheel loads without the surface cracking or becoming deformed.

[26] A RHAG is an array of steel cables laid across a runway to be engaged by a landing aircraft's tail hook, as used on aircraft carriers. The tail hook engages the wire and the aircraft's kinetic energy is depleted by hydraulic damping systems. Portable

RHAGs are used for landing aircraft on short or temporary runways, or for emergencies in which using the full length of the runway is not available.

[27] MRR – low-level maritime reconnaissance using a combination of radar and visual surveillance to locate and identify shipping in the Falkland Islands Protection Zone and, occasionally, around South Georgia and the South Sandwich Islands. The task was conducted by No 1312 Flt, occasionally supported in the inner sectors by RN Sea Kings.

[28] The 'Coastel' comprised oil rig domestic accommodation mounted on barges in Port Stanley harbour.

[29] Travellers Hill is RAF Ascension's domestic site located above the airfield, inland near the Two Boats civilian domestic site.

[30] Island holding fuel (used when no diversion airfield was available) for the Hercules was 4,000 lb in addition to the 5,200 lb of minimum landing fuel.

[31] The Ascension-based tanker and helicopter crews were stranded at Traveller's Hill by floods and unable to reach the airfield.

[32] Cmnd 8758; *The Falklands Campaign: The Lessons* (HMSO, December 1982) pp37-40.

The long-tern airbridge was all about AAR. The link was maintained for four years and they did it 650 times.

MARSHALL OF CAMBRIDGE – THE 'ACCIDENTAL' RAF C-130 SERVICE CENTRE

Alan Paul

Alan Paul learned to fly with Liverpool UAS in 1974-77. Following IOT at Cranwell, he transferred to the Army Air Corps and accumulated some 2,000 hours flying Gazelles and Scouts, seeing service in the UK, Germany, Canada and the Falklands. In 1983, he joined Marshall Aerospace as a project manager, later becoming head of Programmes and ultimately IT Director. Following retirement in 2014, he still works part time as the company historian.

Introduction to Marshall of Cambridge

The Marshall company was founded by David Marshall in October 1909 as a chauffeur drive company in Cambridge for undergraduates and dons. It grew rapidly into a garage, selling and servicing cars in addition to the original chauffeur drive business.

The founder's son, Arthur Marshall, learnt to fly in 1928 and bought his first aeroplane, a DH 60G Gipsy Moth in 1929. Needing somewhere to keep it, he had 45 acres on the outskirts of Cambridge seeded to create a landing strip where he built a small hangar. The aviation business grew rapidly, like the car business, with people wanting to learn to fly, buy an aeroplane and have it hangared and serviced. The first airfield soon became too small for larger aircraft and in 1937 Arthur relocated to the current site of Cambridge Airport.

The war years and aftermath

The company grew rapidly during the war, repairing more than 5,000 aircraft as part of the nationwide Civilian Repair Organisation run by the Ministry of Aircraft Production. In addition, while the company-run No 22 ERFTS was mobilised in 1940, its *de facto* management remained with Marshall. Having adopted an innovative and highly efficient approach to *ab initio* training, the Cambridge school produced more than 20,000 prospective pilots for the RAF, greatly exceeding the output of any of the other elementary flying training schools.

After the war, work dropped off the edge of a cliff as the country

The first, unpainted, C-130K, XV177, arriving at Cambridge, 19 December 1966.

faced bankruptcy and all war-related contracts were cancelled. The workforce dropped from over 3,000 to about 1,200. Arthur Marshall approached all the major aircraft manufacturers, offering his services to do all the small jobs that they were not interested in doing themselves. This was at a time, in the 1950s, when British aircraft manufacturing entered a boom period. Marshall worked on many of the new aircraft types, including Vampires, Canberras, Viscounts, Britannias, Valiants and VC10s.

The RAF C-130 contract

By the mid-1960s, work was beginning to dry up again. Although initially not invited to tender for C-130 work, much lobbying was done by the company and in October 1965 Marshall received an invitation to tender.

The tender document contained, what turned out to be, two remarkable understatements:

- Not much work was expected under the contract.
- The C-130 was expected to stay in service for 10 years.

Half a century later, and with 1·7 million flying hours and a lot of ‘not much work’ completed, this is a remarkable testament to the endurance of Fat Albert!

Also remarkable, in today’s climate, is the speed of decision making at both Marshall and the Ministry.

RAF C-130s in a Marshall hangar circa 1975.

- Invitation to tender received – October 1965.
- Tender submitted – November 1965.
- Contract awarded – January 1966.

Entry into service

The first aircraft, XV177, landed at Cambridge on 19 December 1966 for a series of modifications and painting. Over the next 18 months, all 66 aircraft entered RAF service via Cambridge. Two months after it had arrived, XV177 was ready and it was delivered to Boscombe Down on 18 February 1967. The initial paint scheme was 'sand and stone' desert camouflage with black undersides and a distinctive white cap above the cockpit.

Wing Corrosion

The first batch of 'not much work' started only two years after the aircraft had entered service. An inspector at Marshall noticed fuel weeping under a wing and, after wiping it dry, the weep reappeared. He then examined the underwing surface and his probe went through the wing skin and into the fuel tank.

An immediate inspection of all aircraft was carried out and eleven needed major repairs. The damage had been caused by fungal contamination due to the use of fuel without a fungal inhibitor added. The Americans had not experienced this problem, presumably because they had been using an appropriate inhibitor.

Major and Minor servicing

Beginning in the early 1970s, major and minor servicing was

The one-off Hercules W2, XV308, aka *'Snoopy'.*

contracted-out to Marshall. The company became world experts in this type of work and ultimately attracted similar contracts from more than forty other nations that operated C-130s. This breadth of experience served to increase the company's expertise and knowledge-base while, the resultant economy of scale also helped to keep costs down – for the RAF.

At times there were more Hercules in the Marshall hangars than the fourteen the RAF have in service today!

For the first fifteen years, Marshall was awarded the servicing contract without having to tender, but from the late-1980s the firm has won the repeat contracts on a competitive tender basis.

The Hercules W Mk 2 'Snoopy'

Carried out on behalf of the Meteorological Research Flight, the conversion of 'Snoopy' was the first major modification undertaken by the company. The aircraft, XV208, returned to the UK from Changi in 1973 with a damaged main spar. It was repaired at Cambridge and modified to become 'Snoopy'. It was based at the Royal Aircraft Establishment at Farnborough from 1974 until experimental flying ceased when it moved to Boscombe Down to be operated by DERA until the aircraft was taken out of service in April 2001.

As well as the obvious 18-foot sensor probe, and the weather radar relocated to a pod above the cockpit, there were many other major mods including:

- Drop sonde ejector.

The A400M's Europrop TP400-D6 engine fitted to XV208.

- Air sampling sliding boom.
- Hygrometer.
- Air sampling pipes.
- Temperature sensors.
- Pressure sensors.
- Radiation sensors.
- Rain research radar.
- Cameras.
- Interior modifications for the research crews.

A400M flying test bed

In 2005, XV208 was purchased by Marshall for use as a flying test bed for the A400M. This involved extensive modifications to install a Europrop TP400-D6 engine at the No 2 position. The TP400 delivered over 12,000 hp, compared to the 4,000 hp of the C-130's standard Allison T56s – so the single engine on test had the same power as the other three combined! On engine runs, XV208 had to be tied down as the brakes alone were unable to stop the aircraft moving.

Reduced to its major components, and stripped down to bare metal, a Hercules, with its dissembled wing centre section lying alongside on the hangar floor.

The TP400-D6 was the largest engine ever fitted to a Hercules and it completed over 50 hours of test flying in 2008-09. Sadly, XV208 met its end in 2015 at the hands of the crushers after engines, wings and other components had been removed and sold.

Wing Repairs

In 1975, less than ten years after the aircraft had entered RAF service, Lockheed's discovered fatigue problems in the centre wing of a test specimen. The entire fleet had to be retrofitted with an improved centre wing section. This was the first major fleet-wide modification and involved a complete teardown of the aircraft. Could that have been why the planned fleet life was expected to be no more than 10 years?

The new C-130J subsequently required a similar replacement of the centre wing after twenty years' service, beginning in 2019 – twice the length that the old models centre wing lasted. The first of the C-130J centre wing replacements is currently underway at Cambridge and the rest of the fleet will follow.

After the centre wing replacements, problems were discovered in

The 15-foot stretch was achieved via the insertion of two plugs.

the outer wings in 1977. This required modifications to the outer wing sections, wing joints and engine mounts. All the aircraft were progressively rotated through Cambridge for this work to be carried out. This was a major job completed over five years and a whole hangar was devoted to this task.

The first major repair scheme – XV181

XV181 crashed after a practice asymmetric overshoot at Thorney Island in 1975. The company was tasked to repair the aircraft and notes from the time in Marshall's archives record that the company viewed this as 'a useful exercise for the future in preparing major repair schemes.'

The 'stretch' – 1980 to 1985

The RAF required more cargo space on the fleet, so 30 aircraft were stretched. The first modification was carried out by Lockheed, with Marshall's engineers assisting, after which the remaining 29 aircraft were 'stretched' at Cambridge. The fuselages were extended by 15 feet by the insertion of two plugs. This provided a 37% increase in cargo compartment volume – the equivalent of adding nine aircraft to the fleet. The aircraft were redesignated as Hercules C3s.

1982 – the Falklands and an in-flight refuelling capability

On Thursday, 15 April 1982, Marshall was tasked with providing

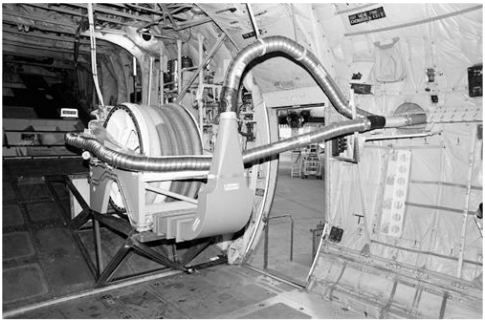
The C-130K-style probe and external pipe run.

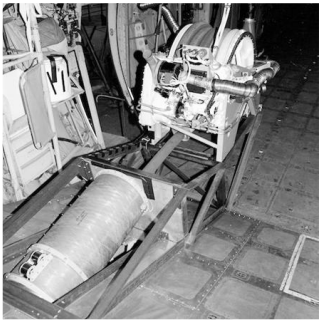
an in-flight refuelling capability on an urgent basis. Round the clock shifts ensured that the first modified aircraft, XV200, was delivered to Boscombe Down within 14 days of starting work. With procedures devised and tested, crews familiarised and the aircraft cleared for operations, XV200 deployed to Wideawake on 14 May. The modifications included fitting a probe on top of the fuselage, on the right hand side, above the co-pilot, pipe runs along the fuselage spine and into the wing tanks plus numerous minor changes to the fuel system and electrics. At the same time, most of the aircraft were being fitted with the Omega long range navigation system.

As an emergency job, the 'workmanlike' probe installation may have lacked something in terms of aesthetic refinement, but it proved to be robust and it stood the test of time. Thirty aircraft were eventually fitted with a probe, using the same wooden fairing and external fasteners as had been fitted to the prototypes during the Falklands War.

Tanker modifications

On 30 April 1982, shortly after starting work on the probe





Left – The HDU installation, with the ram air cooling system which proved to be a major problem during the flight test phase, requiring many adjustments to get it right. Right – The HDU installation, from the rear, showing the hose entering the drogue tunnel.

installations, the company was instructed to convert four aircraft to the tanker role. The modification included fitting a pair of ex-Andover ferry tanks in the hold and a Flight Refuelling Hose Drum Unit (HDU) with an 80-foot hose on the cargo ramp. The first aircraft was ready for testing on 8 June and declared operational on the 30th. All four aircraft were completed in 76 days and they remained in service until the early 1990s.

Test rigs

A complete, 'tip to tip', wing test rig was operated for 20 years from 1982, keeping the flying hours one jump ahead of the fleet to detect any fatigue problems early. The wing is put under considerable strain during testing. When the C-130K's life was extended, the company also ran a complete fuselage test rig which was repeatedly pressurised and stressed to ensure that any problems were picked up well before they occurred in the fleet at large. This ran from 2002 until the fleet was retired.

The introduction of the C-130J

In 1994, Marshall worked with Lockheed to carry out risk reduction flight trials on the new C-130J's engine. An RAF C-130K was converted to carry the new engine at the No 2 position and was instrumented for the trials programme. This paved the way for the introduction of the new model into RAF service and the first of the new aircraft arrived at Cambridge in 1998, unpainted (as had the

The first C-130J awaits delivery in November 1999.

C-130Ks in 1967), for storage and preparation.

After painting, a refuelling probe was fitted. Designed and manufactured by Marshall, the new probe was an altogether more streamlined affair than the one devised in 1982. The original starboard side installation had been driven by engineering expediency in the interests of achieving a timely solution, but it was less than ideal when the captain was attempting to line-up with the drogue from the left hand seat. The probes on the J-model were mounted above the port side of the cabin.

ELINT and defensive aids mods

Marshall installed a version of the ORANGE CROP ESM system, called Maroc (Marshall Orange Crop), which was fitted on the 1312 Flight aircraft of the Falklands garrison. The company also installed Directional Infra-Red Countermeasures (DIRCM) equipment on many aircraft to provide additional safety in operational areas against the increased ground based missile threat.

Afghanistan

The use of unpaved landing strips in Afghanistan imposed significant wear and tear on the aircraft. This included belly and

fuselage skin repairs and the replacement of panels, the damage being caused by stones thrown up both by the wheels and by the propwash.

In 2013, five aircraft were severely damaged by a large hailstorm at Kandahar airfield – some of the hailstones being 2 inches in diameter! A team from Marshall assessed the damage and carried out on-site field repairs before the aircraft were ferried back to Cambridge for permanent repairs.

DIRCM installation on a C-130J.

Aircraft painting

Surface finishing has always been a major part of the depth maintenance programme. This is not a mere cosmetic procedure; it also involves a detailed inspection of the entire aircraft structure. That said, there is a cosmetic dimension in that, from time to time, several aircraft have had their fins painted with bespoke designs celebrating notable events such as the 100th anniversary of the formation of 47 Squadron and the 25th and 50th anniversaries of the Hercules in RAF service.

Summary

Marshall Aerospace has been proud to support the RAF's C-130 fleet over the last 53 years and looks forward to continuing this excellent partnership well into the future.

Note. All images courtesy of Marshall Aerospace and Defence Group.

QUESTIONS AND DISCUSSION

Wg Cdr Bob Turner. I'm a helicopter pilot and have only flown in a Hercules as a passenger. In 1982 I was the PSO at 38 Gp working for the AOC, AVM Donald Hall, when the Falklands affair blew up. I had just come back from an exchange tour in the States, where I had spent three years refuelling my HH-53 from a Hercules using the probe and drogue system. So, I couldn't understand why we were redesigning – virtually reinventing – a new system, when one already existed. The Americans had dozens of C-130s with pods and drogues, which we used, day and night, on a daily basis.

Wg Cdr Paul Shepherd. We were not really reinventing a system, so much as adapting, what we already had. The Victor's probe and drogue system was already in use routinely – for fast jets, of course. The first priority was to modify the Hercules to be able to receive fuel from a Victor. So it was a question of installing the standard probes – and it had to be done urgently.[1]

Turner. I was thinking more of the drogue system – for dispensing fuel.

Shepherd. Again, they were standard Victor hose drum units (HDU) from stock. It did involve modifying the airframe to accommodate the HDU on the ramp, of course, but installing US-style underwing pods would also have required a modification to provide the associated plumbing. Both options could have been realised, but time was the critical factor and a HDU on the ramp was, presumably, the easiest/fastest way to go.

Gp Capt Jock Heron. I think that there was an overriding handling consideration too – a Hercules refuelling from a wing pod would have been a problem. You can do it with fighters, of course, but with big aeroplanes it has to be done nose-to-tail on the centreline.

Al Hill. Going back to the early days – I was on No 11 Course at

[1] Probes were a relatively scarce commodity, because we were also modifying Nimrods for AAR at much the same time. Many were harvested from retired Vulcans that were awaiting disposal and/or had been presented to various museums. Four were actually clawed back from Vulcans that had recently been gifted to institutions in the USA and Canada. **Ed**

Thorney Island – it has been mentioned that, the first aeroplanes didn't have an autopilot and I, for one, think that was a very good thing – because, in those days, the American autopilot simply wasn't up to the job. So, I commend whoever it was who decided that we wouldn't use them!

Moving on, as a co-pilot on 24 Squadron, I recall some problems with the 'Changi Slip' – Operation BERSATU PADU I think it was called. With little freight and a tailwind, we went outbound in two legs, staging through Bahrain, but homebound from Singapore, with a load, we had to stop at Gan, Bahrain and Cyprus. Because the outbound and inbound stages were different, this could cause delays because crews weren't in the right place to handle a slip, so you had to double-stage, which could clash with crew duty time, hence delays. That said, it wasn't all bad because, wherever you had to stop over in those days, there was a Neddy's Bar – remember those? (*Ripple of recognition*) – where you could always get a can of Tennants and a 'donkey-dick' sandwich! [2] (*Laughter*)

A word about low-flying. We haven't, today, spent any time on the air drops in Ethiopia, which was, I think, an omission, because they were very important. There were others, of course, but Ethiopia was particularly high-profile – remember Bob Geldof and 'Do they think it's Christmas'? When my crew joined the detachment, we were briefed by the CO, Jerry King. He said, 'I'm not allowed to authorise you below 250 ft. However, if you transit to the drop zone at 2,000 ft you will get hit by all the big birds, which can do some damage. On the other hand, at 250 ft you *will* get all the little birds – smaller, of course, but a lot more of them. So, most crews find that the best thing to do is fly around at 50 ft'. So we did – for two months. (*Laughter*).

I was also lucky enough to spend some time flying 'Snoopy' and that involved routinely flying down to 50 ft on the rad alt on every sortie to calibrate the instruments down the back – so that was another bit of low-flying that wasn't often talked about . . . On one occasion, when I was flying as co-pilot to the late Colin Barter, the Snoopy boffins asked us whether we could fly for an hour at 100 ft. We were prepared to give it a try and they came up with a racetrack pattern,

[2] 'Neddy's Bars' were a wide variety of informal facilities located 'down the route' where hot, tired and thirsty aviators could always find much-needed refreshment.

with one-hour legs, to be flown over the North Sea. But they wanted it at +/-10 ft and It turned out that we couldn't actually manage that – not for an hour. So we used the autopilot, taking it in turns to fly with our hands on, but not using, the control column – just in case it became necessary to climb out – and all we had to do was adjust the pressure setting to maintain 100 ft. It worked fine – so thank you for *not* buying the American autopilot! (*Laughter*)

Sir John Cheshire. Thank you for those anecdotes Al. Just for the record, BERSATU PADU wasn't the name of the routine 'Changi Slip', it was a specific major reinforcement exercise held in 1970, intended to demonstrate that, although we had withdrawn from the Far East, we had not abandoned our allies in the region.

I take your point, about our not having dealt with Ethiopia, KHANA CASCADE and the many other humanitarian ops – in preparing for today, I stopped counting at forty-one. But it was a question of what we could and couldn't get into an exercise in which we were attempting to cover half-a-century in just four hours, but I am sure that they will be acknowledged when today's proceedings are eventually published.

Wg Cdr Jeff Jefford. Following the withdrawal from East of Suez we eventually finished up with all six Hercules squadrons at Lyneham but in 1976 there was a major cut back in the air transport fleet when we lost the Britannias, the Belfast and two of the six C-130 squadrons, Nos 36 and 48. Was that just a 'paper cut' – the loss of two squadron number plates – or did we actually withdraw a third of the fleet?

Sir John Cheshire. Just the number plates – the whole fleet was retained, the surplus as 'in use reserves'.

Sqn Ldr Tony Evans. In the context of the Falklands, mention was made of the snatch technique used before the runway was restored to use. But it soon was and, before it was later lengthened, we were using its 4,100 feet, well above our normal landing weight, at tac speeds, breaking out of cloud at 200 feet – and if you didn't touch down in the first 200 feet, you *would* run off the far end. Taking off at 155,000 lb was equally marginal – you were hoping that your wheels would leave the ground just as you ran out of asphalt. I just thought that was worth mentioning.

Sqn Ldr Harry Burgoyne. Yes, having just spoken of taking off at 180,000 lb, we did tend to push our luck in all sorts of directions.

Wg Cdr Gerry Pye. I'm a former RAF engineer officer. I was fascinated by the description of the AW 681. I just couldn't see how anyone could have thought that that was a practical proposition. But I was interested to learn, if I understood this correctly, that the Belfast hold had the same internal dimensions as the A400M. If that's correct, and we had developed the Belfast as a response to OR351, might we have had something that we could have sold to the Americans? (*Laughter*)

Shepherd. You are right, the dimensions of the A400 freight bay are within centimetres of the Belfast's, which was something that was observed on in the early days. The A400 can go a lot faster and a lot higher, of course – if it can get into the upper airspace. But it often can't, so it's stuck in 'Hercules territory' because it's not quite fast enough to play to the upper air rules. That can be a bit of an issue on some major routes. I actually campaigned against the A400 when I was in the Air Transport Policy office at the MOD. I thought we needed something bigger – the C-17 – as an outsize airlifter and more Hercules, including dedicated SF Hercules – in effect, we wanted our own COMBAT TALONs.[3] But, that said, the A400 does have a useful freight bay.

Roy Harper. The Belfast. Why do you think that an aircraft that was originally going to be the Britannic, with four turbofans and a high swept-back wing, was side-lined by the Government so that we eventually finished-up with four Tynes on a Britannia wing, instead of what could have been a C-17-equivalent back in the 1960s?

Air Cdre Brian Poulton. Reading up on Armstrong Whitworth's 681 in preparation for today, it became apparent that the mood at the time was for something radically different and 'modern' – and the Belfast, even a STOL version, simply didn't appeal – whereas something as whacky as the 681, with vectored thrust and the eventual prospect of VTOL, hit the spot among the folk at the Air Ministry at

[3] The COMBAT TALON is one of a family of dedicated special mission variants of the MC-130 used by the USAF's Special Operations Command (AFSOC). **Ed**

the time. That said, the Belfast did serve us well and the A400 is, surprisingly, much the same size – just a bit faster.

Brian Wildey. On the very early courses we did co-pilot solo training; we certainly did on No 4 Course – two co-pilots up together. It stopped some time afterwards. Do we know why?

Sir John Cheshire. That's a good question. As an erstwhile Hastings driver, an aeroplane that was notoriously difficult to land gracefully – and not end-up in the minefield at El Adem – we used to do co-pilot solo at Thorney Island, and at Colerne. I've no idea *why* we stopped it, but it had certainly stopped by the time I reached the Hercules OCU. Does anyone else know?

Air Cdre Brian Poulton. I survived many a co-pilot solo exercise . . . I can't recall why it was stopped. Perhaps someone asked *why* a co-pilot *should* go solo? What did it do for his skills, his confidence? I don't know the specifics, but after about a year on the Hercules, it stopped – and we navigators rejoiced. (*Laughter*)

Gp Capt Stan Hickey. Two observations – and two questions. First, before 48 Squadron was disbanded, we managed to fly a Hercules right down to the South Pole where we landed – we had barrels of Bass beer on board as part of a deal with the brewery.[4] Secondly, coming out of Kingsfield (Cyprus – **Ed**) with John Stappard, sadly no longer with us, we had 138 passengers down the back – literally standing room only for some of them.

My first question was originally asked by an American exchange officer, J J Smith, again, no longer with us, who wondered why, after the first accident at Fairford, we continued doing asymmetric flying. Secondly, why did we fly around burning the hell out of the engines, whereas the Americans used a lower TIT? I never got the answer to either of those.

Shepherd. Before answering your question, I would just register that we beat your record of 138 passengers when Harry Burgoyne and I

[4] The badge of No 48 Sqn features the head of a bird, a petrel, superimposed on the trademark of the Bass brewery – a red triangle. This reflected a practice during WW I when the squadron's airmen reportedly stuck beer bottle labels on their Bristol Fighters. **Ed**

took 190 from Maputo, in Mozambique, back to Salisbury on Operation AGILA. But I will leave comment on engine temperatures to a pilot . . .

Wg Cdr Tony Webb. We used to cruise with a TIT of 1010°C, as you will probably remember, but in about the mid-1980s, I think, we changed to 985°C, which was roughly in line with what the Americans were doing. As to the asymmetric accidents, I think that it just took us a long time to appreciate that shutting down engines for real was simply dumb!

Poulton. I recall that it was the Canberra that really suffered from the shutting down engines business. They lost a lot of crews in asymmetric training accidents before it was stopped. I think it was rooted in some kind of tradition – and it was about the end of the '80s before it was finally stopped. I always thought it was stupid, and I've no idea why we kept it up for so long.

Sqn Ldr Howard Chandler. The snatch system used at Port Stanley was derived from the method used to pick-up gliders, which might, incidentally, have been one of the reasons why the Hastings had a tailwheel.

Shepherd. I think it was probably more to do with the Fulton recovery system used by the COMBAT TALON – a fork on the nose of the aircraft that captured a cable held up by a balloon.

Gp Capt Chris Le Bas. I'm not sure where the snatch originated, but it certainly wasn't new. The winch we used was from the Fulton system. We had a lot of problems with development. For instance, there was a tendency for the grappling hook, which dangled at an angle, because of its weight, to part company with the rope when it was engaged. Along with the engineers at JATE, we eventually cured that by making the shaft of the grapnel longer, and hollow – a tube – and running the rope through that, rather than tying it directly to the hook.

Pete Edgington (ex-47 AD). We originally laid out the load and the cable in a straight line on the ground, which was the wrong answer. We eventually learned to lay the cable in a U-shape, which reduced the shock-loading when the hook took the strain.

This picture illustrates well the 50 ft snatch procedure. The lone figure is an intrepid Army officer, determined to get an impressive photograph, regardless of the hazard, which was surely significant. (Jim Rice; UKMAMS Old Boys Brief #0527160)

Gp Capt Peter Bedford. The snatch system had been used by the Army Co-operation squadrons in the 1920s and '30s, back in the colonial days, and there was recently some D-Day footage on TV showing troop carrying gliders being recovered using a snatch system. So it is a well-established concept that has been adapted and refined repeatedly over the years. (*For a first-hand impression of what was involved, see page 112*. **Ed**)

Wg Cdr Mike Westwood. I was on 10 Squadron when AGILA was going on and we used to fly into Salisbury in VC10s. We were briefed on the SAM-7 threat and our options, on departure, were to spiral up over the airfield or to leave at low level on a random heading. Some of my colleagues thought that flying at 100 feet and 300 kt in a VC10 was good entertainment – I'm not sure that the passengers would have agreed (*Laughter*) but I preferred the idea of

climbing out. With a virtually empty aeroplane, fuel only for Nairobi and full power a VC10 would go up at about 10,000 feet per minute, so I reckoned that we could give a SAM-7 a run for its money! But, Tony, as residents, you would have been given a more thorough Int briefing. Did no one come up with a more specific method of avoiding the SAM-7 threat?

Webb. No, because, we simply didn't have any Intelligence. It was done on a 'need to know' basis, which worked very effectively because those who needed to know were never told . . . (*Laughter*) We arrived with no Intel at all and the decision to spiral up and down was simply based on common sense – we had nothing concrete to go on. The only modification, as I explained, was that we did a trial against a captured SAM-7 to establish just how good a target we were – which confirmed that we were quite a good one – but it didn't alter our procedures. Climbing out, rather than staying low, also minimised the flight time – rather than flying all the way to our drop zones at 50 feet, we preferred to transit at 20,000 feet before dropping down to do the business.

Shepherd. My secondary duty was to perform as the 47 Squadron SF Flight Intelligence Officer. While deploying for Operation AGILA, we were held for several days in Cyprus and I took myself off to HQ BFC to see what I could find out in the way of crew briefing material. Nothing – absolutely diddlysquat. What coloured our appreciation of the situation in-theatre, however, was the knowledge that two Viscounts had been brought down by SAM-7s. They had been flying at about 15,000 feet. Since our standard route, Salisbury-Bulawayo, was about 220 miles, the equivalent of London to Glasgow, it made sense to climb up rather than transit all the way at low level.

Burgoyne. I had an informal brief from a Rhodesian Air Force officer, on Boxing Day, just before I was about to depart. He said that we would all be dead by New Year's Day! The ceasefire notionally came into effect on 28 December, but fighting went on after that.

Webb. During the first week or so we would frequently land at somewhere like Umtali and find that there was a fire-fight going on at the other end of the runway – there were a number of incidents like that.

Sqn Ldr Ken MacLennan. Can anyone explain to me the metrification of the Hercules – why did it happen? I think that we were the only air force that did it – and the aeroplane had actually been designed in, and for, Imperial units. There seems to have been no logic behind it – and the cost must have been considerable, because all the documentation and publications had to be changed – and for a long time many of us had a lot of trouble converting pounds into kilos!

Burgoyne. I was around at that time, and I was as mystified as Ken was. All the numbers that I had needed to know used to be nice round ones. Now I had to remember things like 70·3 tonnes – because the system had done a straight read-across conversion, everything now involved decimal points. I believe that it was driven by standardisation among the Movers. I think we have one with us today? There he is – Bob Dixon – a lamb among wolves! (*Laughter*)

Gp Capt Bob Dixon (ex-OC UK MAMS). The metrification came, I believe, from elsewhere – the other Services. The Movers, until my last day in charge, were still using Imperial measurements. They would load the aircraft in the old fashioned way, using chains that had so many pounds capability, and then leave it to the Trim Clark to change everything into metric to keep the crews happy. But I'm pretty sure that it wasn't the Movers who drove the change – standardisation on metrification came top down from the MOD.

INTRODUCTION TO THE AFTERNOON SESSION

Air Chf Mshl Sir John Cheshire

This morning we covered, in great haste, the activities of the Hercules fleet in the 1960s, ‘70s and ‘80s. Maintaining that pace, we will now attempt to cover the next 30 years.

It is worth bearing in mind that, for its first 25 years, our Hercules had the most rudimentary navigation aids – operations were heavily reliant on hand-held maps, stopwatches, the Mk I eyeball and very competent navigators. Even night vision goggles were in their infancy at that stage. Moreover, our aircraft, and everyone on board, were vulnerable to ground and air threats as ECM protection was still to come. I make these points because things then changed.

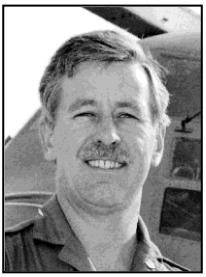
In November 1989 the Berlin Wall fell, the Soviet Union unravelled and politicians in the West promptly began to seek, what they labelled as, ‘peace dividends’ – defence cuts by another name. But, at the same time, the Hercules began to face more challenges over hostile territory than had been the case in the whole of the previous quarter of a century.

Our speakers this afternoon will cover the 1990s, the millennium and beyond. The operations that they will outline were ultimately conducted in better equipped and protected aircraft – and so they needed to be. We will also hear the saga of the procurement of the Hercules replacement.

Our first speaker will cover in-theatre operations during Gulf War I – Op GRANBY – and, since he spent ten weeks at KKIA in Riyadh commanding the AT detachment during the air and ground war, Gp Capt Peter Bedford is eminently qualified to tell us what happened.

OPERATION GRANBY (GULF WAR I) – IN-THEATRE OPERATIONS

Gp Capt Peter Bedford



Having joined the RAF via Cranwell in 1964, Peter Bedford trained as a pilot. Apart from QFI tours at Cranwell and on loan service with the Singapore Air Force, his flying career focussed on the Hercules, including involvement with Special Forces and pioneering the introduction of AAR in 1982. He commanded No 242 OCU from 1988 and the Air Transport Detachment at Riyadh during Gulf War I. Staff appointments included a stint with HQ NATO and on leaving the service in 1999 he filled a civilian post at SHAPE until 2010, since when he has been involved with the Air Cadets.

Introduction

Gp Capt Jerry King gave an excellent presentation on Operation GRANBY to the RAF Historical Society in March 2013, covering the whole spectrum of Air Transport (AT) operations, from the invasion of Kuwait in August 1990, up to the end of hostilities in February 1991. I will not retrace his steps and cover the same ground; suffice to say that this whole period was frenetic, and a major undertaking by the entire AT Force.

The ORBAT of the Force during GRANBY is at Figure 1. The total flying hours by all types, from the start to the end of hostilities, are shown at Figure 2.

The VC10s and TriStars of RAF Brize Norton were essential in the particular roles they played, although the bulk of tasking was conducted by the Hercules force, with in-theatre operations as from November 1990. It is that latter element that I will be focusing on, the involvement of the Lyneham-based Hercules force during the air and ground wars of Operation

ORBAT ATF (Strategic) Brize Norton	
VC10 C1	13
TriStar KC1	4
TriStar C2	2
ORBAT ATF (Tactical) Lyneham	
Hercules C1	26
Hercules C3	30

Fig 1. ATF ORBAT.

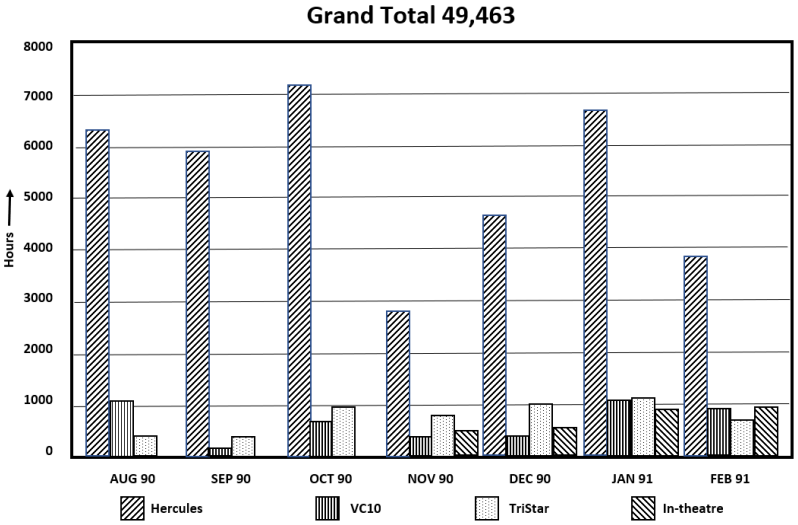


Fig 2. Operation GRANBY – ATF Flying Hours.

GRANBY, otherwise known as Operation DESERT STORM.

At the time, I was serving at RAF Lyneham as OC 242 OCU, having been in post since October 1988. Like all aircrew at Lyneham, from August 1990 we flew intensely on the GRANBY routes through Cyprus and further east. I moved at short notice, on 13 January 1991, to command the AT Detachment at Riyadh/King Khaled International Airport, Saudi Arabia, known as KKIA, remaining in post for 10 weeks until 23 March.

Air Transport Detachment Riyadh

The AT Detachment was formally established on 1 November 1990, based at the unfinished Terminal 4, although the aircraft had arrived some days previously. When formed, it consisted of three Hercules and six crews, plus engineering, movements, and support staff. Daily TrisStar flights fed this hub, with the three deployed Hercules providing the in-theatre spokes around the Gulf, resupplying British forces at a wide variety of locations. The initiation of the hub and spoke system was pushed hard by the AT Detachment, in order to rationalise the multiple tasks that were being undertaken. On 23 December 1990, the Royal New Zealand Air Force provided a welcome addition, with two aircraft and three crews, plus support elements, from No 40 Sqn,

Whenuapi, Auckland. They operated with us seamlessly, but with their own internal command chain.

As further UK deployments into theatre continued, in mid-January the detachment at KKIA was increased from three RAF Hercules to seven, and from six crews to fourteen, with a commensurate increase in engineering, movements, supply and support staffs, primarily to meet the increasing Army task and to assist with the outload of 1 British Armoured Division. Our own strength was around 200, and when the RNZAF provided a fourth crew, plus support elements, this brought the overall combined detachment numbers to around 260.

Ramp Space

One of our early problems at KKIA was ramp space, since we were just one of many operators using the facilities. During our time there, we shared the space not only with other RAF aircraft, but with civil operators, and military aircraft from many nations, including the United States, Belgium, Norway, Portugal, Sweden and France. I arrived to find that we had not had much success with our French colleagues in trying to sort out a conflict of use on ramp space between our Hercules and their C-160 Transalls. Thus, an urgent meeting was arranged with their detachment commander. One of life's coincidences came to pass, in that in 1980 I had spent a month on exchange with the French Air Force, at Bricy, near Orleans, flying their Transalls, whilst detached to *L'Escadron de Transport 1/61 'Touraine'.* The French boss at KKIA – Cmdt Bernard – turned out to be one of the captains who had been on that unit at the time, and with whom I had got on very well. The language barrier seemed to evaporate, and in very short order the problem was solved!

Events moved swiftly, and on 16 January 1991, the Canadian Armed Forces Airlift Control Centre at Akrotiri received a message to stop all eastbound flights. Shortly afterwards, Operation DESERT STORM commenced and all out-of-theatre AT Force and civil charter flights were suspended. At the same time, SCUD missile attacks were launched on Saudi Arabia, and then Israel.

Operational Procedures

The AT Detachment at Riyadh was also 'grounded' when the air campaign began, with the likelihood that this could be for 3-4 days. However, within 12 hours, requests for airlift began flowing in to the

Hercules strip operations.

Joint Transport & Movements Staff (JTMS) at HQ British Forces Middle East (BFME). Nevertheless, despite the sheer size and scope of offensive operations, the change from peacetime to wartime airspace procedures, and the need to deconflict the Hercules transit routes from the offensive packages, our first sorties of DESERT STORM were flown on 18 January, just two days after the start of the air campaign.

Much preparatory work had been done prior to this, especially crew training on desert low-level flying and natural strip landing techniques, including at high all up weights. Many crews had been either untrained in such skills or were out of currency.

However, equally important had been the establishment of an intelligence cell, the updating of crew in-flight operating guides and the establishment of Air Transit Routes (ATRs) in the Airspace Control Order (ACO). This latter aspect was vital, since not only did it enable us to operate to all Gulf locations, but it deconflicted these flights from the many thousands being flown by coalition fast jet forces and their supporting elements. A similar planning task was an agreement on low-level contingency routes for aeromedical evacuation flights.

All of this work was conducted by a Mission Planning Cell, made up from an in-theatre crew who became dedicated solely to this task in late December. Of note, this crew was headed by a captain who had completed an exchange tour with the USAF, namely Sqn Ldr Harry Burgoyne, who had flown many exercises such as RED FLAG during his time with the RAF Hercules Special Forces. This gave him a wide understanding of USAF tasking procedures – a familiarity which proved

to be fundamental to our operations during DESERT STORM.

By pure chance, in another coincidence, an American friend from his exchange days was Deputy Chief of the USAF Airspace Co-ordination and Planning team, and he was thus able to have unofficial, but vital, advanced access to the highly classified air campaign maps and procedures. In addition, the mission planners liaised directly with a wide variety of other contacts, including AWACS and the RAF airspace managers. At times, in order to achieve their goals, the odd Squadron T-shirt was donated, along with various other 'gifts', apparently of a liquid nature, to ensure that our bid was moved from the bottom of the pile to somewhere nearer the top!

Tasking

Our tasking was originated via the JTMS cell at HQ BFME. Details were then passed to the Detachment Operations for an iterative process, which included referral to the Mission Planning Cell, studying aspects such as heights to fly. For example, on the ATR to Tabuk, in north-west Saudi Arabia, the highest westerly level available early on in the campaign, allowing deconfliction from offensive missions, was 5,000 ft above mean sea level. Taking into account the highest ground along the route, this effectively meant that crews would be flying at times at 180 ft above ground level. This was a problem, especially at night, so the team used all of its available persuasive powers, and managed to raise the height to 5,500 ft, and the problem was solved.

Obtaining and using the Air Tasking Order

A copy of the Air Tasking Order (ATO) and ACO was obtained every day by the Mission Planning Cell, in order to check the daily special instructions – or 'spins' – which were, in effect, the equivalent of NOTAM updates of the monthly and weekly spins. An abridged version of the ATO, known as an 'extract', was also used and contained only the section dealing with RAF Tactical Airlift and the daily spins. The point here was that the Mission Planning Cell then checked through the 70 pages of daily ACOs and hundreds of pages of ATOs/spins – a job which would have taken each crew 5 hours or more of flight planning – and then updated the information in the aircrew intelligence folders and prepared planning pack-ups for each sortie. Thus, the team was performing a vital task on a daily basis.

Aircrew procedures

As regards aircrew procedures, the use of ATRs was the major change affecting the aircrew after the transition from peacetime to wartime procedures. The ATRs were operated under visual flight rules only, with strict limitations on navigational accuracy to remain within the necessary lateral bounds of +/- 2 nautical miles. A further complication was that they were available at one level only, with two-way traffic separated only laterally, on a left-right basis, including at night.

Poor en route weather would have meant a turn through 180 degrees and a lost mission. However, throughout DESERT STORM we lost only one sortie due to weather, out of more than 1,300 flown. Another saving grace, in the event of bad weather, was the availability of the previously mentioned low-level aeromedical evacuation routes, which gave us another option, when conditions at medium level were unsuitable. In fact, on many occasions the weather was not that good, and certainly not eight eighths blue. And low level did not automatically mean 250 ft, perhaps it was up to 1,000 ft.

Avionics Fit

Life was not made easy at the beginning of the air campaign, due to the limitations of our avionics fit. All navigation aids had been turned off north of 27°N; the aircraft had no suitable internal aids and was not fitted with Mode 4 IFF. This last limitation was an area for concern on safety grounds, since Mode 4 was the primary means of identifying friendly assets and we were one of the few aircraft without it. Indeed, there was naturally an ongoing concern about the possibility of 'blue on blue' engagement, and this must be set against the intensity of overall air operations, with more than 100,000 sorties being flown during the entire 6-week air campaign, an average of over 2,000 per day.

Our internal navigation fit was improved in mid-January with the arrival of LORAN C, which was fitted progressively over a one-week period. Despite initial teething troubles, this gave an accuracy of between 0·25 and 2·0 nautical miles, depending on the area of cover, but was still prone to error. Thus, the overriding principle was the continued use of the basic technique of map, compass and stopwatch. Indeed, it was not until the mid-1990s that the Hercules fleet was fitted with an independent, self-contained navigation system.

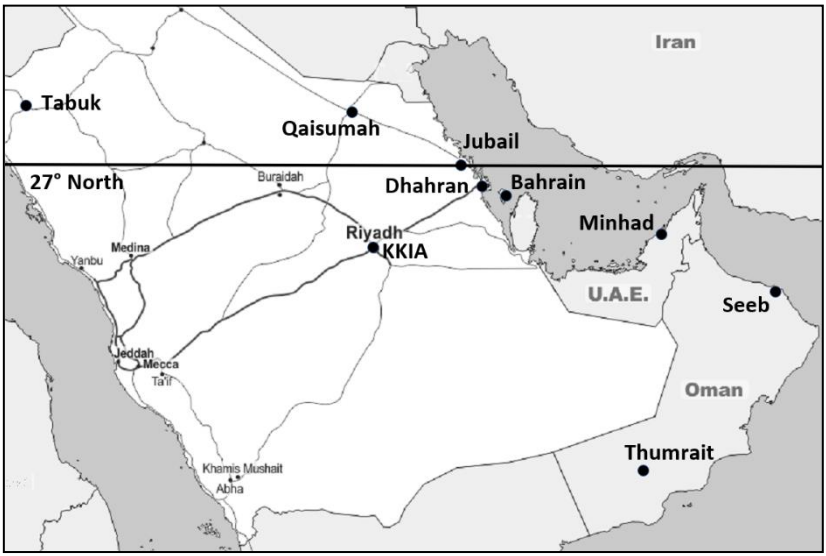


Fig 3. Area map showing locations of particular significance to the Hercules Force.

Overall operations

The AT detachment operated to a wide variety of locations in the Gulf, such as Seeb and Thumrait in Oman, Minhad in Dubai, and Bahrain. Within Saudi Arabia, destinations included Dhahran and Jubail, in the east, Qaisumah, south-west of Kuwait, Tabuk in the north-west corner, and many lesser-used airfields. See Figure 3.

In addition, early use was made of the strip at Abu Hadriyah, north-west of Jubail – see Figure 4. This was an old oil company semi-prepared strip, 4,000 ft long and 60 ft wide, with a tyre-consuming flinty surface. However, it enabled us to provide a convenient lifting-off point for over 7,000 troops of 1 British Armoured Division, moving them towards their forward location via Qaisumah, whence they were transported by Chinook.

During this move, which lasted about ten days, we were able to trial 'combat loading', a procedure whereby the freight bay was left empty of seats and the troops sat on the floor like eggs in a tray. Restraint was provided in the form of strops across the aircraft, which the troops pulled over themselves as they sat down. This technique, borrowed from the RNZAF, proved highly successful, enabling the customers to emplane

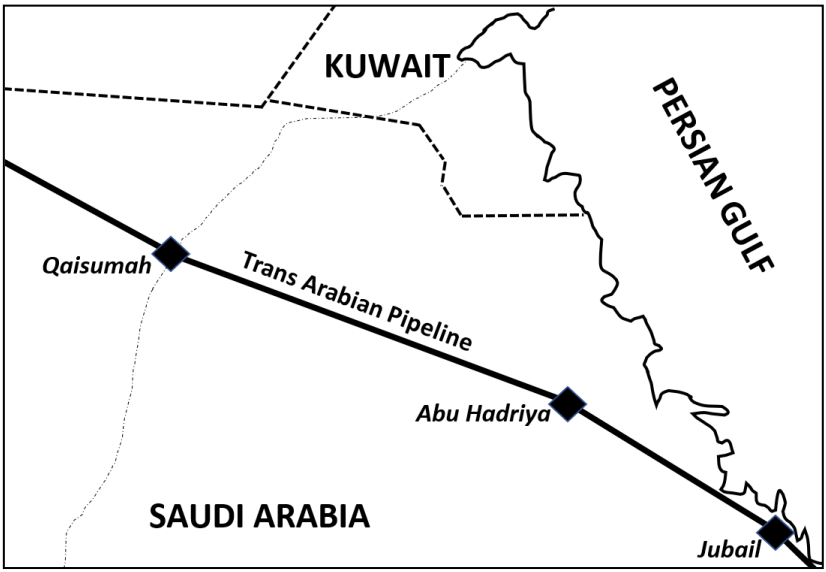


Fig 4. Pipeline route map.

and deplane with the minimum of delay, and the lack of fixed seats gave us the flexibility to load vehicles and other freight on the same or subsequent tasks.

Low level flying became a way of life, operating on the 'pipeline route' from Abu Hadriyah to Qaisumah, and, given our strip operations and the demands exerted by bad weather and sandstorms, the in-theatre crews became expert in a wide variety of skills they had been unable to use since the invasion of Kuwait in August. This was certainly a major, and welcome, change from the 'airline flying' carried out over the previous five months.

Aircrew rotation

After hostilities broke out, it rapidly became evident that all Hercules crews in that environment should be low-level and strip qualified, and the aircraft had to be strip-prepared, for example with underbody protection and reinforced tyres. We settled into a rotation pattern of one aircraft per week, and we rotated the crews on an as-required basis, in close co-ordination with Lyneham. There was, of course, a trade-off between the need to keep expertise in theatre, and the requirement to avoid crews becoming burnt out, bearing in mind the regular 19-hour

crew-duty days. And once hostilities commenced, we could not be in the business of training crews from scratch in totally new procedures. I was under quite a lot of pressure at times, to be more flexible as regards crew selection, and I fully understood the dilemma back at Lyneham, but at one time we were faced with the strong possibility of having to fly low-level operations into Iraq, in and out of newly-prepared strips. In the event, that situation never came about, with the rapid end of the ground war, but until then we were always conscious of potential operations in a hostile, low-level environment, with a high workload, often poor weather, and no navigation aids.

Aeromedical evacuation

In parallel with the flying was the build-up of expertise on the aeromedical evacuation front. Downstairs in our No 4 Terminal at KKIA was No 205 General Hospital and No 4626 Aeromedical Evacuation Squadron, RAuxAF. They arrived in theatre in mid-January, just before the start of DESERT STORM, and formed part of a large casualty treatment organisation which spread from the UK to the Gulf.

The plan revolved around Qaisumah, which was selected as the main casualty evacuation airhead and was adjacent to the sites of both Nos 22 and 32 Field Hospitals. Patients would reach the field hospitals via dressing stations and forward surgical teams, having been transported by support helicopters and/or surface means. Casualties were then to be flown by Hercules from Qaisumah to the two general hospitals at Riyadh (No 205) and Jubail (No 33). Following treatment at these locations, casualties would be flown to the UK by TriStar or VC10. This plan would have catered for 1,000 allied casualties per day and was but part of the aeromedical plan for the coalition forces as a whole.

A large amount of hands-on training was done in theatre, including on static aircraft and in the air, with the involvement of the air loadmaster and air engineer of the Mission Planning Cell. Areas for attention included the importance of reliable air to ground communications, the confirmation of aircraft stretcher fits (for example, fits more than 3-high caused major fatigue to the loading teams), the provision of suitable stretchers compatible with all aircraft types, and the question of enemy prisoner of war casualty guarding. Trauma briefings for all concerned were given by an RAF psychiatrist attached to 4626 Squadron.

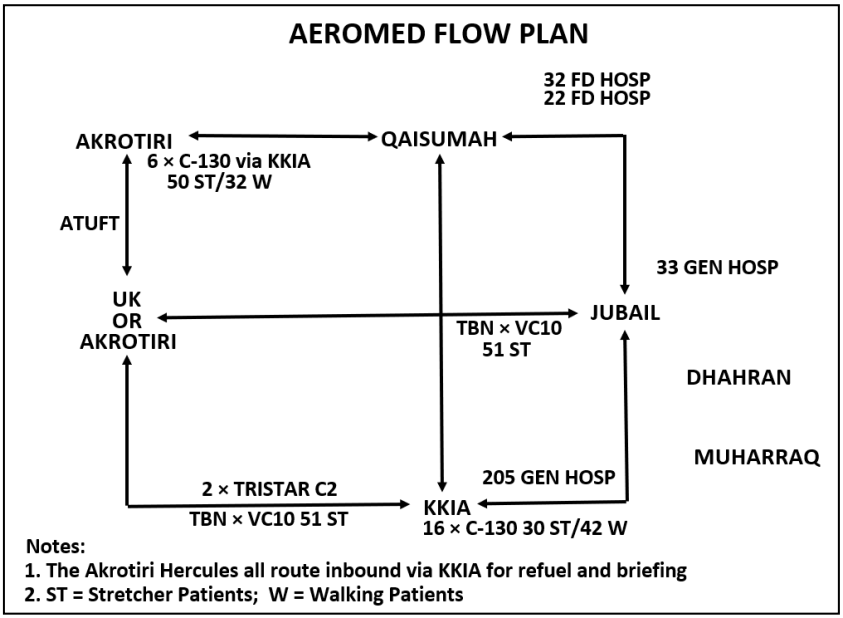


Fig 5. The Aeromedical flow plan.

In all, by the time the ground offensive started, the casualty evacuation system was well tried and tested, and we were confident that we could have coped smoothly and efficiently with all eventualities. However, we were most thankful that the system was little used. Indeed, the master plan for 24-hour casevac was never activated, and all such tasks were dealt with on a reactive basis, numbering less than a dozen flights in all.

Other operations

Partly connected with the possible aeromedical evacuation task, was the trialling in mid-February of two more dirt strips, one adjacent to the aforementioned Nos 32 and 22 Field Hospitals east of Qaisumah, and the second, north-west of Qaisumah, close to the rear elements of 1 British Armoured Division. This second strip, codenamed landing zone REAY, became the scene of hectic movements for over a week, overlapping the ground offensive by two days, as last-minute supplies were flown in from Jubail. We also conducted a trial air drop just a few hundred metres to the west of this strip, although this capability was never used in

Hercules XV205 at low level over the desert.

anger. On the last day of the ground campaign, shortly after the provisional ceasefire, we flew two of the first fixed-wing missions into Kuwait airport, the first bearing the keys to the British Embassy and the second carrying the Ambassador himself.

Special Forces Hercules

The Special Forces (SF) Hercules crews of No 47 Sqn deployed into theatre early in the operation and were independent of the AT Detachment. These *were* fitted with Mode 4 IFF, and some self-protection equipment, but they did not have a sophisticated avionics fit – they, like us, had very good navigators!

They trained with their SF ground-based customers, and practised other skills such as strip landings, by day and night, fighter evasion, and the rapid onload and offload of troops and vehicles. Ultra low-level flying was another aspect, and was conducted also at night, but this proved difficult over desert terrain, since starlight gave insufficient illumination, whereas the reflections from a full moon were too bright. Thus, the useful period for safe night vision goggle operations was limited.

However, they did conduct numerous resupply runs, and conveyed

Smoke from the oil fires turned day into night.

the first of the Iraqi prisoners of war back to Riyadh. They were also involved in the retaking of Kuwait, carrying troops and communications equipment to Kuwait airport. Routing at low level and through the burning oil fields, the first crew arrived to find the runway completely undamaged.

However, fuel supplies at the airport were contaminated, and the crew were quickly involved in Forward Air Refuelling Procedures, or 'farping'. Over the course of a few hours, the crew dispensed fuel to more than 20 coalition helicopters, enabling them to continue with ongoing operations. In all, the SF crews were able to perform a wide variety of demanding tasks, and they were a key element of the Hercules' involvement in Op GRANBY.

Wrecked Kuwait Airport

Of course, anyone who flew into Kuwait immediately after the ceasefire would have been met by the nightmarish scenes of burning oil wells, and then the wanton destruction on the ground. Descending below 5,000 ft we went suddenly from clear blue sky into pitch black. Day turned to night and we had to turn on all the cockpit lights. We broke through at around 3,000 ft, and there lay all the oil fires.

The ferocity with which they were burning, the amount of smoke that was being pushed out, and the sheer number of fires, right across the horizon, was almost incomprehensible. Indeed, over the coming weeks, the pollution became much worse, and at times we did not see the runway until very late on finals. On the ground, everything in and

around the terminal that could not be taken was either broken or vandalised.

Post-Conflict Discipline

Of course, there was a great danger of unexploded ordnance, and there were issues also amongst our own forces regarding 'trophies'. Indeed, there were tales of live hand grenades being sent back by the troops, to Germany, via the BFPO! Not surprisingly, General Sir Peter de la Billière, Commander-in-Chief, British Forces issued a strict edict that trophies were NOT to be brought back from Kuwait or Iraq. Just after the ceasefire, we flew him into Kuwait City airport, along with the UK Defence Secretary, Tom King. After conducting his business, Sir Peter came back in one of the New Zealand Hercules, and as he stepped onto the aircraft, he looked into the back, and what did he see strapped down, but a huge Iraqi anti-aircraft gun! Somehow the Kiwis managed to talk themselves out of this 'offence', and I found out earlier this year, during a trip to New Zealand, that they had managed to hide that gun at Riyadh, aided and abetted by UK military forces!

Lessons Identified

Moving now to 'lessons identified', many of these were reiterations of past lessons, such as the vital need for good communications. Bearing in mind that this was almost 30 years ago, much has changed since. However, the really key issues at the time were the following:

1. The formation of a Mission Planning Cell was essential.
2. All crews should be versed in USAF ATO and ACO procedures.
3. All Hercules crews should be low-level and natural-strip qualified.
4. The Hercules fleet should be equipped with accurate and self-contained navigation equipment, and Mode 4 IFF.
5. Aeromedical evacuation units must be involved in peacetime exercises with live aircraft and patients.

Conclusion

In conclusion, the overall achievements of the combined RAF/RNZAF detachment at Riyadh were impressive, as illustrated at Figure 6.

Those figures reflected great credit on the detachment engineering, movements and support staff, who did a marvellous job in sustaining the work rate, both in maintaining the airframes and coping with the vast

	Hours flown	Sorties flown	Freight handled (M lb)	Passengers handled
Pre-DESERT STORM				
1 Nov 90-15 Jan 91 (11 weeks)	1,347	956	12.5	8,915
DESERT STORM				
16 Jan-28 Feb 91 (6 weeks)	1,693	1,309	7.4	14,029
TOTAL	3,040	2,265	19.9	22,944

Sorties lost: pre-DESERT STORM 2
during DESERT STORM 1

Fig 6. Task achievement by the combined RAF/RNZAF AT Detachment.

flow of passengers and freight. The operations staff and aircrew showed great flexibility in coping admirably with a wide variety of tasks, often under very trying circumstances.

Indeed, this was a team effort through and through, and co-operation between all elements was outstanding. Morale was high and the team responded tremendously well to the many demands placed upon it. And finally, the Royal New Zealand Air Force element performed superbly, and integrated effectively, wholeheartedly and with boundless enthusiasm.

HERCULES REPLACEMENT DELIBERATIONS 1991-92

Wg Cdr Peter Harborne

Peter Harborne joined the RAF as a Cranwell flight cadet in 1968. Having flown the Vulcan with Nos 101, 50 and IX Sqns, he switched to the Hercules in 1979 and spent nine years with No 70 Sqn. Ground tours included P Staff appointments with HQ 1 Gp and at Innsworth, and in OR at the MOD. Better late than never, he became a QFI in 1995 and, after a short stint with ULAS, commanded the Air Cadet Central Gliding School at Syerston. After leaving the service for the RAFVR in 2002 he continued to fly with No 6 AEF and No 616 VGS.

After three tours on the Hercules fleet as co-pilot, captain and Flight Commander on LXX Squadron between 1979 and 1990, I was posted to the Operational Requirements (OR) Department of the Ministry of Defence in London in January 1991. I took over from Sqn Ldr Matt Busby who had secured his escape from Main Building by transferring back to the Hercules as Specialist Aircrew.

In those days Air Staff Requirements were generated by the central Defence Systems element of MOD rather than being specifically RAF and, although we did liaise very closely with the RAF elements upstairs, my immediate bosses were insistent that we were a *central* function and should therefore stand somewhat separate from the operators. My desk dealt with air transport and air-to-air refuelling systems, airdrop systems, airborne forces liaison, future minor equipment procurement and, lastly, but perhaps primarily, Hercules replacement.

First then let me amplify why a Hercules replacement was becoming urgent.

You heard this morning from Tony Webb and Ollie Shepherd what the Hercules fleet had been up to in the years since they became the primary RAF tactical transport. Although the majority of Hercules hours were expended on the more routine task of route flying, delivering what the rest of the RAF, and the Army and Navy, wanted flown to their busier parts of the world, Operation AGILA, Op CORPORATE, Op BUSHELL and the then-ongoing Op GRANBY

had seen the airframes performing at rates, and weights, well in excess of what the designers had anticipated. Field landings in very rocky fields at high weights, very low flying in bumpy conditions, landing on short runways at weights higher than the normal peacetime maximum take-off weights, air-to-air refuelling with very cold fuel from Victor tankers to top the tanks up with more pounds than they were used to and then converting some RAF Hercs to tankers to replace ageing Victors in the AAR role were all very necessary but obviously deleterious to the airframe fatigue life. There was, of course, the occasional mix-up between pounds and kilograms from younger staff who didn't know the difference, but such occurrences were fortunately rare and usually overcome by skilled crews who coped. 'Albert' in RAF service was therefore getting tired, becoming a bit less reliable and certainly more costly to maintain.

The need for a Hercules replacement was already in the public domain when I got to MOD and numerous aircraft companies were lobbying for their various products. As a guide to what might be available in the tactical transport world, we looked at the existing and likely market.

a. The Antonov An-70 was about to be built and was forecast to carry 37 tons for 1,600 miles or 20 tons for 3,000 miles but it looked a bit big for tactical use, hadn't yet been built or proven and was in any case a Russian and Ukrainian collaboration; buying a Soviet bloc aircraft wasn't likely to be politically acceptable but did show the sort of capability that we were looking for.

b. The C-160 Transall could carry 16 tons about a thousand miles but was then already an old aircraft. Although the French government had upgraded the airframe and cockpit systems in the early 1980s, and the cargo bay was slightly wider than that of the Hercules, the C-160 had only two engines, which made an engine-out emergency take-off from some dangerous corner of the world impractical.

c. The BAE 146, Fiat G222 and An-72 were considered too small for the required role, although the An-72 showed that turbojet engines, if mounted above a high wing, were not out of the question for short-strip, rough-field operation.

The Future International Military Airlifter group was set up by Aerospatiale, British Aerospace, Lockheed and Messerschmitt-Bolkow-Blohm in about 1982 to develop an airlifter to replace the Hercules and C-160 Transall. Both fleets were ageing, and industry is always on the lookout for opportunities. The defence ministries of the UK, US, France and Germany were all keenly interested in the industries' plans and a joint committee had been formed to assist in defining the European Air Staff Requirement. Like most international co-operative initiatives, there was a good deal of talking and a lot less deciding. Each country had its own ideas of precisely what capabilities were required and perhaps the only common attitude amongst the committee members was that their country should get a big part of the design and manufacture but only pay a small part of the cost. I am told that it was very gentlemanly bickering but, with no consensus emerging, Lockheed left the consortium in 1989 and started developing (or perhaps continued developing) the C-130J. The Defence Ministries of Italy, Belgium, Luxemburg and Turkey had by now joined the military headquarters committee which had been re-branded the Future Large Aircraft Exploratory group and then, after Lockheed withdrew, the industry association became the European Future Large Aircraft Group or EuroFLAG. The UK had chaired the defence ministries committee for some time but with the US no longer actively involved, industry clamouring for firm expressions of intent on numbers and the UK government Options for Change paper being worked up, MOD UK decided to take a step back and become observers rather than active participants. Italy therefore took on chairmanship of the military group committee and the manufacturers continued to promote their ideas of what the future military airlifter should be. Although I attended as the UK representative every 3 months or so whilst in MOD, I couldn't see any serious consensus appearing, although a European Staff Requirement did eventually appear some years later.

There was also the option of re-furbishing, at least part of, the existing Hercules fleet which could carry 20 tons about 2,000 miles but that was likely to prove expensive in the long term, even if reliability and serviceability would be improved for a period. It also offered little prospect of cheaper maintenance, better fuel consumption, reduced turn-round times or incorporating more modern

systems control architecture such as the new networking databuses.

This then was the background against which we in OR picked up Matt Busby's skeleton UK Requirement paper and started filling in the boxes which defined what we wanted. Options for Change was intended to save money now that the Cold War was over and reductions in RAF assets, perhaps more realistically referred to as Defence Cuts, had been under way since July 1990 (just before Saddam Hussein made his play for glory). However, while the projected airlift requirement was not really affected by the proposed 'changes' – indeed the airlift requirement could be seen as increasing with the introduction of more mobile forces – the financiers saw only the opportunity to reduce expenditure. In most departments of government there was a small embedded section called Resources and Programmes (RP) which monitored projected expenditure – they were funded by the various ministries in which they worked but reported directly to the Treasury. Quite rightly, they examined all programmes for efficiency and value for money and they were the main focus of almost all the deliberations in our Ministry – if we could persuade RP(Air) to accept that the need for a specific capability was valid, getting each successive level of our own command chain to sign up to it was much more likely. Our target was to get the Air Staff Requirement paper signed off by the Equipment Approvals Committee at the top level of MOD. Once we had achieved that, our job was done and the Procurement Executive and the Air Staff would then get on with purchasing whatever new airlifter best met the specification.

What then did we want?

The trend for multi-engined aircraft crews at that time was for two pilots to work at the front with glass cockpit instrumentation and with computer assistance to manage the navigation and aircraft systems. To look after the back of the aircraft a loadmaster was required who supervised loading/unloading and maintained a watch on the cargo (whether human or inanimate) as well as on any equipment in the rear compartment not computer-monitored. The reduction of the minimum crew from five to three had a substantial effect on the through-life cost of a new aircraft so RP(Air) were immediately content to endorse this element of the requirement.

The Army's airborne forces had a requirement to drop or air-land a

battalion-sized force together with essential support equipment into a benign (no- to low-threat) air and ground environment. The Hercules C1/C3 met this with seven aircraft in the parachuting role and eight stores-drop airframes. Station Keeping Equipment was fitted to all aircraft in the mid-'80s to allow formations of aircraft to maintain prescribed position and spacing in cloud for en-route flying and descent to low level for the drop phase of operations. The Army had then recently acquired a new batch of vehicles to replace their aging Land Rovers which were an essential element of the air-dropped support equipment; despite RAF prompting, the vehicles procured were still 1·8 metres wide and could not therefore fit two-abreast in the Hercules' 3 metre-wide cargo compartment. In addition, the cargo floor in the RAF Hercules was specific to the UK version of the C-130 (primarily because it carried over from Belfast, Beverley, Argosy and VC10 cargo handling systems) and the considerable stock of air-drop equipment we were using had been designed and tested to fit the UK floor. The airdrop systems in the UK Hercules, despite their aged design, were generally acknowledged to be superior to the US systems and it was desirable that a new aircraft should either use the same floor or be capable of adaption to use the existing equipment. It was certainly essential that any new aircraft should be capable of equalling the current airdrop proficiency. It was also deemed essential that the aircraft had more modern and more adaptable self-protection equipment, be capable of IMC multi-aircraft formation cruise and descent to low level for air-drop operations and have the same, or better, load-carrying and range statistics as the existing aircraft.

In peacetime, the RAF Hercules performed a passenger and air-freight function for many Service units as well as being available to Government departments for use on humanitarian tasks. The standard 88" pallet was ubiquitous in the air-freighting business and made for swift loading and unloading of many cargos; it was, therefore, self-evident that the new aircraft, being expected to fly the same routes and cargos as the current aircraft, should have at least the same range and cargo capacity. It was generally acknowledged that the C-130 in RAF use was rather slow, used more fuel than more modern turboprops, was poorly equipped in terms of navigation equipment, had no flexibility in the use of self-defence equipment and that the cargo compartment would be better if it were wider.

Unfortunately, the characteristics required of the Hercules replacement could not just be ‘we want what the current Hercules does.’ Each part of the specification had to be justified to the financiers and to our higher command with appropriately-endorsed statements in line with the then-current government Defence Policy. The most-recent formal Defence Review before the Options for Change exercise in 1990 had been conducted by John Nott in 1981. His review mandated major cuts to the Royal Navy and concentrated on land-based conventional forces in support of NATO, counteracting the threat to Europe from the Warsaw Pact, backed up by the nuclear deterrent. The Falklands War, just a few months after that review, rather proved Mr Nott’s focus to have been misplaced because the Royal Navy were the lead service for that campaign, and it was fought by the UK alone far away from the NATO area. However, as part of the post-Falklands conflict lessons-learnt study, the Navy got back some of the removed funding and it became government policy to re-introduce a deployable airborne brigade. Options for Change in 1990 was designed to impose cuts in most defence areas but the airlift requirement for the strategic defence reserve of parachute and air-mobile forces was increased. The Resources and Programmes staff were rather annoyed at the incongruity of the RAF transport force getting more money at the same time as the Treasury was trying to reduce expenditure (and the fast-jet empire wasn’t too pleased either). Also, at the same time as we were looking at Hercules replacement, Nimrod MR2 replacement, Tornado upgrades, the EH101 development programme and a number of smaller equipment procurement programmes were also jostling for space in a very tight defence budget.

In the 1970s and ‘80s there were large pools of typists who took our hand-written drafts of whatever we were working on and typed them up for us. When we were happy with their result, we passed the paper to the next stage up the chain. When that level had scrawled all his hand-written corrections on the paper it was typed again, by the typing pool, checked and sent upwards to his next boss. Job done for Squadron Leaders then as soon as it was passed to the Wing Commander. In 1991, we all had computers with bright blue screens and WordPerfect with which to do our work. I passed the paper to my Wing Commander in October 1992 for his comment. He then wrote

corrections and comments to be incorporated and gave it back to me to correct, the pool of typists having been disestablished to pay for the computers. When I had done that, he then passed it to the Group Captain who, unfortunately, sent me a load of comments and got me to amend it all again. The Air Commodore did the same, by which time it had been back and forth quite a lot. Air Vice-Marshal Peter Norriss, our then head of department as Assistant Chief of the Defence Staff (Operational Requirements) still had his own PA/typist so I didn't get to see what finally went on to the Approvals Committee and after 25 years, I'm afraid the precise details of the Staff Requirement as presented and passed by the Equipment Approvals Committee in early 1993 are no longer available to me, although I do remember that the existing Herc couldn't quite reach some of the required numbers.

I made my escape to the Joint Service Defence College course in December 1992 and heard some two years later that the C-130J had won the competition to replace our RAF Hercs, but that the order was for only twenty-five, because some people still believed that the European Future Large Aircraft was just round the corner. In the event, of course, the A400M achieved type certification nearly 20 years later in March 2013, 14 years after the first C-130J had been delivered to us.

There are a couple of things I do remember from all those years ago. I did a calculation of the J-model 'Albert' versus a C-17 on a trip to the Falklands – still a feature of life in those days in case we needed to send reinforcements. I assumed no AAR was available and the aircraft would have to fly 3,400 nautical miles from Ascension to Mount Pleasant plus 1,000 miles to a diversion back up the South American coast.

A C-17, according to the advertising flyer we got from McDonnell Douglas in 1991, could go all the way down to Mount Pleasant, and then back to the diversion if the destination weather was unsuitable, and carry a whole 11,000 lb of freight or about 50 fully kitted soldiers. A J-model Hercules, as Lockheed were promising, could carry 16,000 lb or about 75 soldiers over the same route.

I'm not sure those figures are valid today but they do point out two lessons – one was that the Block 13 addition of the C-17 centre wing fuel tank, as delivered to the RAF, was a very good idea and that removing the external tanks from the new Hercules, as first delivered

Fuel Consumption reduced by 16%
Engine power increased by circa 11%
Take-off Run Reduced by 13%
Initial Cruise Altitude Increased by 18%
1553 Databus – Ability to Add Extra Equipment
'Flip-floor' Enhanced Cargo-handling system

Fig 1. C-130J Improvements over C-130 E/H.

to Lyneham, wasn't so clever.

So how did the C-130J, at a very reasonable $40M a copy, compare with its predecessor?

Figure 1 shows how the C-130J in current service compares with our old C-130E/Hs which finally retired in 2013 and you can see several improved aspects of performance so it seems that the financiers and the operational staffs both got what they wanted – something of a rarity in the Defence world.

An RAF J-model – port-side probe and lots of propeller blades. This one, a 'short fuselage' C5, ZH887 was painted up to celebrate the RAF's Centenary in 2018. (Claire Hartley)

OP CHESHIRE – SARAJEVO and Op BARRAS – SIERRA LEONE

by Gp Capt Martin Cunningham

Martin Cunningham joined the RAF in 1989. Having qualified on the C-130, he subsequently flew it with No 47 Sqn as co-pilot, captain, Flight Commander and, in 2010-13, as its CO, always specialising in SF aspects. After a brief interlude as Deputy Air Commander with the Special Forces Directorate, he managed Project GATEWAY (the enhancement of Brize Norton's capabilities) followed by a tour as Chief of Staff for Air Mobility. He is currently Chief of HQ Allied Rapid Reaction Corps' Air Operations Co-ord Cell at Imjin Barracks, Gloucester.

Operation CHESHIRE

The civil war that followed the break-up of the Federal Republic of Yugoslavia had left warring factions of Bosnian Croats and Croatian Muslims fighting for control of the country, with deep religious, ethnic and nationalist schisms being violently exposed. Sarajevo became the focus of the confrontation and Op CHESHIRE was the RAF contribution to delivering humanitarian relief to the people of that beleaguered city between July 1992 and January 1996. I was a relatively junior co-pilot at the time and the mission was complicated – it was never entirely clear to me who the enemy was! While identifying the various factions may have presented us with a challenge, what was certain was that we were flying in support of the besieged inhabitants of the city. Compared to previous wars of attrition, it was a uniquely unstable situation because the enemy was everywhere, but you could never be sure who was who and who could be trusted. Nevertheless, while it was necessary constantly to reassess the situation, the underlying imperative was never in doubt – get aid into the city.

From an aviator's point of view, severe winter weather meant that getting into and out of Sarajevo could be difficult, especially as the support services at the city's airport were virtually non-existent. In particular, runway snow-clearing and airframe de-icing facilities had

The evolution of the Hercules' increasingly comprehensive tactical fit began in the 1980s when aircraft assigned to the Falklands-based No 1312 Flt were fitted with wingtip ORANGE CROP ESM pods as seen here on a C-130 taking off from Ancona on an Op CHESHIRE sortie 10 years later.

both long since ceased to function. Rapid turnarounds in snowstorms were only achieved courtesy of our accompanying groundcrew and electronic warfare operators using brooms to sweep the snow off the wings.

Having previously flown from a variety of locations, eg Zagreb and Brindisi, we were eventually based at Ancona civil airport in Italy. There we became part of a UNHCR mission – UN406 – that sponsored the airlift for 3½ years. The routine was to fly three missions per day (six days on, one off) with the loads varying from flour, olive oil and clothing to rock stars, film producers and the occasional politician! The criticality of our task became very clear to me on the one occasion that I was allowed to venture off the airport at Sarajevo. The devastation in the city was heart-breaking. Families and homes were being destroyed by the constant bombardment which created, and sustained, the absolutely desperate need for the supplies that we were flying-in each day. It was clear that, whatever the risk involved in mounting the operation, it was amply justified by its purpose – the survival of people who had had no vote in the war but had become its victims.

A Hercules on finals at Gioia del Colle in the course of an Op CHESHIRE-related sortie.

A particular sortie that caught the headlines was 'Operation IRMA' in August 1993. Named by the British press, 'IRMA' involved flying-out from Sarajevo a five-year-old girl, Irma Hadžimuratović, who had been seriously wounded, along with around thirty other casualties, all of whom needed to be treated in a fully resourced hospital if their lives were to be saved. The UK Government decided that a British C-130 would be used for the task, despite significant potential for mission failure as the airport might be closed due to an upsurge in fighting, possibly resulting in the loss of the aircraft along with its crew and the passengers. Fortunately, the UN mission in Sarajevo was able to engage with the warring factions and succeeded in negotiating a ceasefire agreement. Since the payload involved Bosnians and Croats, Muslims and Christians all sides agreed not to fire on the aircraft. The potential tragedy of Op IRMA turned out to be a great success and was but one example of the heroism and selfless disregard for their own safety that the crews of UN406 showed during Op CHESHIRE.

For the record, CHESHIRE was the longest ever humanitarian relief mission. Nearly 2,000 sorties were flown in the course of which 26,577 tonnes of aid were delivered. Remarkably, only three sorties failed to land at Sarajevo and it is, perhaps, worth noting that these

had been flown by ‘guest’ captains, rather than SF-annotated crews.

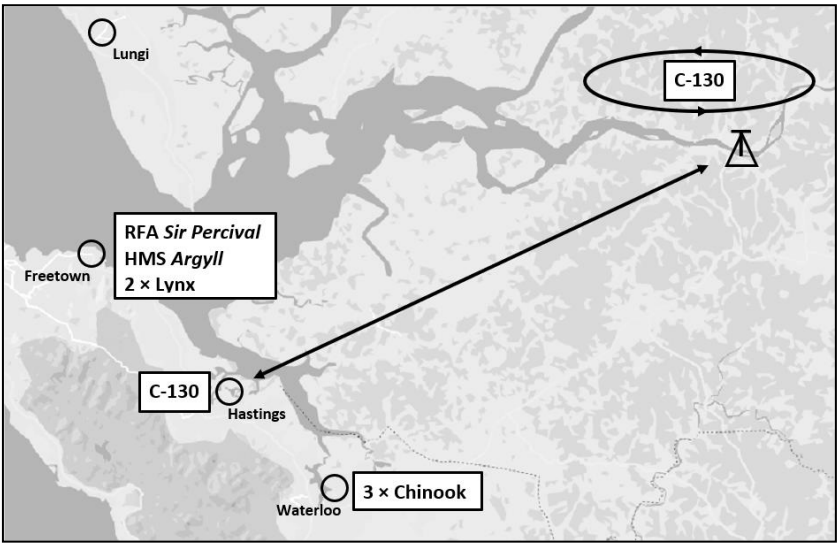
The experience gained during Op CHESHIRE had been extremely valuable in that it had provided the baseline for a properly established SF capability. In short, we needed to add a dedicated electronic warfare operator to the crew, along with appropriate equipment. It was the beginning of a process that would, over time, see the SF C-130s acquire the increasingly comprehensive and sophisticated threat detection, countermeasures, navigation and secure communications fits necessary to ensure their survival in future operations. Op CHESHIRE was the first operation undertaken by what would become today’s SF Flight. It had been a conflict that was neither black nor white in which one did not know who was an enemy and who wasn’t.

Operation BARRAS

My second vignette concerns Operation BARRAS. Mounted in September 2000, it was a hostage rescue mission flown by myself and Flt Lt Steve Bethell from No 47 Sqn in conjunction with the SF Rotary Wing made up of three of No 7 Sqn’s Chinooks and a pair of Lynx Mk 7s of No 657 Sqn, AAC. The aim of the mission was to insert D Sqn of 22 Regt SAS and elements of 1 PARA to recover six soldiers of the Royal Irish Regt who were being held in Sierra Leone by an irregular armed group known as the ‘West Side Boys’.

The task was complicated by distance, urgency and the lack of detailed intelligence. The first move was to deploy the SF Hercules to Senegal so that they were within striking distance of the problem and where they could be held to await developments. Even this was not straightforward, however, because, in the interests of speed, tanker support was required in order to permit the pair of Hercules Mk 3s to fly to Dakar non-stop. In case the situation deteriorated rapidly, a contingency plan was drawn up that would have seen the troops being delivered directly via a tactical landing on a road relatively close to the target area; perhaps fortunately, in the event this was not required.

Meanwhile two SAS observation teams had been inserted by SBS assault boats. They were now dug in on either bank of the Rokel Creek, monitoring the deteriorating situation. On 8 September it was decided that, no matter what, the extraction would be attempted at first light on the 10th. The planners had concluded that D Sqn lacked



The disposition of assets.

sufficient firepower to suppress the enemy as they approached, hence the addition of a substantial contingent from 1 PARA. The success of this combination in executing Op BARRAS, incidentally, led, in 2006, to the formation of the Special Forces Support Group – the SFSG.

The operation began in the small hours of 10 September by which time the AAC Lynx, which been flown to Sierra Leone by C-130s, were temporarily based on HMS *Argyll* at Freetown while the three RAF Chinooks (which were already in-theatre in connection with the ongoing Op PALLISER) were positioned at Waterloo. One of the SF Flight C-130s, mine, was positioned at Hastings airport, to provide a Forward Arming and Refuelling Point (FARP) along with a Forward Field Surgical Team for immediate CASEVAC and patient care, while the other was airborne to provide overwatch and a VHF comms relay facility.

The target was 30 nm north east of Hastings where the on-station C-130 crew began commentating on the situation just before dawn, advising the helicopters to pull back as they could be heard on target. For some reason, the message was misinterpreted by the Lynx crews who continued to close the target whilst the Chinooks withdrew. This inevitably disrupted the integrity of the helicopter element, the

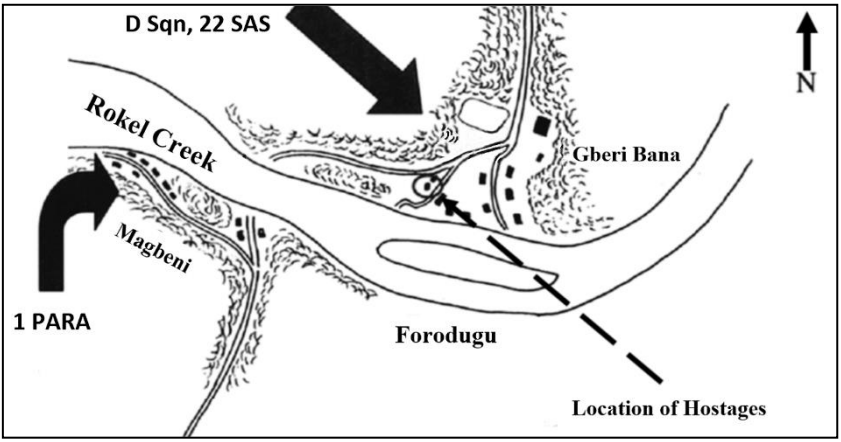
problem being exacerbated by the, not entirely reliable, comms links.

As the sun came up, the village was roused by the noise of the helicopters and at that point the overwatch crew called for the assault to begin as rounds were being fired, and the safety of the hostages was now considered to be seriously compromised. The two Lynx arrived on target first and each opened fire with its door-mounted M3M 50-calibre machine gun on the southerly target with the aim of drawing enemy fire and then neutralising it.

A 0·5 inch M3M machine gun mounted in a Lynx.

During the initial assault, one of the Lynx ingested some debris into an engine and was struggling to maintain height and control. Whilst still firing into the target as it withdrew, the crew began jettisoning ammunition with the aim of recovering to the FARP, where we had a small REME team. The damaged Lynx succeeded in making it back to Hastings where the initial intention was for it land on the runway. We were concerned that if the pilot failed to pull it off with his damaged aircraft and crash-landed, or worse still collided with the Hercules, we would all be stuck. (*Shades of Operation EAGLE CLAW, the spectacularly failed US attempt to rescue American hostages held in Tehran in 1980.* **Ed**) I was able to speak with the Lynx pilot, whom I knew personally, and he agreed to put his aircraft down to the south of the C-130, albeit on ground that had not been examined in advance. The aircraft landed safely, however, and the crew were unhurt. Within four hours the REME team had removed the damaged engine and replaced it with a spare, that a stand-by C-130 at Dakar flew in to Hastings. This C-130 was then drained of all fuel, bar the minimum to get it back to Lungi where it was to wait for the operational extraction and further tasking.

Meanwhile, taking advantage of the suppressive fire from Lynxes,



The assault.

the Chinooks had closed with the target and inserted D Sqn who assaulted the northern village of Gberi Bana, where the hostages were being held, while A Coy, 1 PARA attacked Magbeni, on the south side of the creek. The action was successful; the hostages were safely extracted, along with their Sierra Leone Army liaison officer and a number of civilians. The action had taken 50 minutes and the withdrawal was complete 40 minutes later. The operation was formally declared to be concluded at 1500 hrs. The C-130s were used to recover personnel and equipment, including the Lynxes, and airlift everything out to Dakar, apart from the Chinooks which remained in-theatre.

While there had, of course, been no publicity prior to the operation, real-time 21st Century comms meant that CDS, Sir Charles Guthrie, was able to announce, live on TV, on the morning of Sunday, 10 September that the operation was approaching its conclusion and that all of the hostages were safe.

That evening an operational debrief was held in Dakar, followed by a celebratory meal for all ranks – totalling over 100 – who witnessed their second sunrise in a 24 hr period. It was an uplifting occasion but, despite its success, the mission had cost the life of one soldier, so there was a sombre undertone for those who been directly involved in the action, and indeed, for the supporting participants without whom the operation could never have been mounted.

While a dozen soldiers had sustained injuries, the single fatality had been Trooper Bradley Tinnion, an RA Gunner and a member of D Sqn, who had been earmarked as one of their very best; he was shot as he was fast-roping down from a helicopter. He was recovered from the target area by a Chinook and flown direct to RFA *Sir Percival* where, despite efforts to resuscitate him, he was pronounced dead. In the aftermath of BARRAS, the SF C-130 crews attended his wake at Stirling Lines. When the customary sale of his personal effects took place at the Paludrine Club, the SF Flight bought, at a fiercely contested auction, a pair of 29 Commando Regiment RA lapel pins for £1,000, but it was agreed to split them with the rival bidder – D Sqn – who also paid £1,000, thus doubling the benefit to Brad Tinnion's young family.

QUESTIONS AND DISCUSSION

Sqn Ldr Jim Cunningham. We've heard repeatedly about the lack of equipment; we were always way behind the fast jets of course. Are things any better today – or likely to get better?

Gp Capt Martin Cunningham. No. (*Laughter*) The reason I say that is that I did a tour in RP and OR.[1] The RAF actually emerged from the 2015 Strategic Defence Review with what has been described as a 'catastrophic success'. What does that mean? We are in a great place for equipment. We are getting the Wedgetail to replace the E-3; we have the P-8 coming along; we have Protector to replace our old UAVs – and more of them; we have the F-35 entering service and Typhoon being upgraded. So that's all good – the problem is that we were given only half the money and told to find the rest from within.

So the reality is – is the equipment any better? No. Are we being well represented at the highest level? I'd say, sort of – but perhaps not as well as we could be. We need senior officers who are prepared to have that 'really serious' conversation and it is difficult to avoid being overwhelmed by frustration. Nevertheless, the future is bright*er*. We have the A400, the C-17 – which is the oldest – and the Voyager, with an overall average age, across the transport fleet, of about 10 years. That looks quite good – so long as they all work – and the A400 does have teething problems. It will eventually be sorted, of course, but right now . . .

Tony Evans. Just picking up on some observations that have been made on the lack of Intelligence that tends to be associated with many operations. During Op CORPORATE I was flying with the Americans – on C-141s – and they were just as bad. They used to brief crews inbound to Saudi, to tune into the BBC World Service to get an update on the latest situation! On one occasion I landed at Dhahran with a brand new co-pilot. He rushed down the stairs and asked an American Traffic Officer, 'How will I know if there's a Scud missile attack?' The answer was, 'You see those guys over there? They're Brits playing football. If they stop playing football and run –

[1] RP – Resources and Plans; OR – Operational Requirements.

there's a Scud attack.' (*Laughter*)

Air Cdre Graham Pitchfork. Over the last twenty-odd years we've seen a lot of RAF people decorated for gallantry. What percentage has come to the Hercules Force?

Sir John Cheshire. We did a quick trawl on this the other day. Bearing in mind that the Hercules has been in service for 52 years, we came up with at least five DFCs, eighteen AFCs, four Queen's Commendations for Valuable Services in the Air, two Queen's Commendations for Brave Conduct in the Air, three Mentions in Despatches and something in excess of thirty-one British Empire awards – MBEs, OBEs and CBEs. So, well-earned awards, and, I think, a fair number of them, although some have been made without much publicity.

Two more special paint schemes, both 'standard length' C5s in 2016, ZH883 marking the Hercules' fiftieth year of RAF service and ZH880 celebrating No 47 Sqn's 100th birthday. (Liam J Daniels)

SUMMARY

by Air Chf Mshl Sir John Cheshire

It now falls to me to attempt to summarise what has been a fascinating day.

It goes without saying that the Hercules has been a huge success in RAF service. It was already an operationally proven aircraft when we bought it – well tested in Vietnam and elsewhere. We could have bought it off the shelf, of course, but political and industrial pressure meant that we had to replace some of the tried and tested US equipment with home-grown equivalents. Some of those met with mixed success as you have heard.

For reasons that I cannot explain, we chose to paint all of our Hercules (except Snoopy) with an extraordinary gloss paint which offered no semblance of camouflage appropriate to any of our likely operational theatres. Only later did common sense prevail and Albert's livery become more operationally relevant.

Over the last 52 years, the Hercules' operational successes have, in no small way, been due to the myriad modifications that it has acquired. Particularly notable among these were: the fuselage stretch programme (the addition of two plugs); station keeping radar; inflight refuelling, both as receiver and as tanker; the ECM protection suite. Plus, of course, the special Met research fit for Snoopy – which Marshall Aerospace eventually acquired as a test platform. Indeed, Marshall, and others, deserve great credit for installing many of those modifications.

As the years went by, the Hercules became the RAF fleet leader in many areas, not least total flying hours – in excess of 1·75 million of them. The ever-increasing burden of operations meant that the hours flown, and the fatigue life consumed, particularly during Op CORPORATE and its aftermath, and Op CHESHIRE in Sarajevo, later compounded by Op HERRICK in Afghanistan and Op TELIC in Iraq, grossly exceeded the assumed and budgeted rates.

Those high intensity operations accelerated the demise of the C-130K and triggered the acquisition of the second-generation Hercules, the C-130J, the first of which arrived at Lyneham on 23 November 1999. Superficially similar to the original C-130K, the new model was actually a very different animal, technically and

electronically superior in many ways. Its minimum operating crew was reduced from five to three. All aspects of the J's performance – take off run, rate of climb, range, speed and so on – improved on those of the old K-model.

As of today, SDR 2015 still applies and calls for fourteen J-models to remain in service until 2030. It remains to be seen whether that will survive a post-BREXIT SDR! By the time that this appears in print, we may know the answer to that one.

A significant amount of vital equipment for the Hercules has been procured to satisfy Urgent Operational Requirements (UOR), which meant that the financiers were obliged to give grudging approval for life-saving, or otherwise essential, equipment that they would have doubtless resolutely denied via the routine budgetary process. I fancy that this age-old problem is one that is unlikely to go away in the future. Tomorrow's J-model operators will still have to live with the old adage: 'You go to war with what you have, not what you want.'

I mentioned in my Introduction, that time prevented us from covering a multitude of operations – particularly those in the humanitarian field. Gp Capt Cunningham did cover Op CHESHIRE in Sarajevo 1992-96 and Op BARASS in Sierra Leone in 2000, but it would be remiss of me not to acknowledge that there were many others in this category. It is a fact that the RAF's Hercules have been responsible for saving lives in many countries that suffered both natural and man-made disasters. As I observed earlier, I attempted to compile a list of humanitarian tasks, but at 40+ it was clear that there would not be time to address this topic today. I hope, however, that in slow time, we will be able to prepare something for the printed record. Suffice it to say, that the locations ticked almost every letter of the alphabet from Aden to Upper Volta, taking in Iran, Phnom Penh and Saigon along the way.

In short, the Hercules community, represented by many in this audience – aircrew, engineers; technicians; air despatchers; MAMS teams; aero-medevac teams – has saved countless lives in those operations. I salute you all.

I should also mention that the collective skill and courage of the Hercules community has been recognised by a considerable number of national honours and awards over the years. I did list these in response to a question, but I have no hesitation in repeating that list. It

comprised at least: 5 DFCs; 18 AFCs; 4 QCVSAs; 2 QCBCAs; 3 MiDs; and 31 British Empire awards. Those are hugely impressive statistics and I would add just two other notable achievements. First, a Hercules crew won the 1979 RAF Escaping Society Trophy for the way in which, on 18 July that year, it had successfully handled an attempted hijack of their aircraft in Nicaragua. The second is the fact that Lyneham won the annual RAF Wilkinson Sword of Peace on a remarkable five occasions while it was home to the Hercules fleet.

What of the Hercules itself? It was – and still is – robust, rugged and adaptable and it is characteristics such as these that have enabled it, and its crews, to survive a number of attempts to destroy an aircraft, both in the air and on the ground.

I should also record that for most of the half-century of RAF Hercules operations, Lyneham was the home of the fleet. The fact that RAF Lyneham is now MOD Lyneham and is in the hands of the REME is a decision that I still have trouble understanding. The more so, because the new home of the remaining 14 Hercules J-models is Brize Norton – which has but one runway to serve seven resident flying squadrons. Is that wise?

My final observation concerns Lockheed. The first, of two, YC-130s first flew in 1954 and the production line has continued uninterrupted ever since, making it the longest, continuous active military aircraft production line in the history of aviation. The fact that the RAF's Hercules have logged more than 1·75 million hours implies that the Service has much to thank Lockheed for – the C-130 is a fine product.

Finally, may I thank all of our presenters who have contributed their C-130 expertise, their time and their skills as speakers to create today's seminar. It has been quite evident that they all have the Hercules in their blood, whether as operators or engineers. My particular thanks to my old friend Jock Heron whose idea it was to create this seminar and to ensure that the Hercules received the airing it deserves. Equal thanks to Simon Footer, who willingly volunteered to act as programme co-ordinator. He too has done a fine job and, not forgetting Jeff Jefford, who now has the task of converting today's proceedings into a published document. To do that, he needs our inputs, so I would urge the speakers to assist by submitting your papers as soon as possible. I will have mine in by Monday!

There are many other folk who deserve our thanks, but time is our enemy. However, I must mention the BAWA staff and committee who have allowed us to use their excellent facilities. We are truly grateful to you all.

I hope that the collective efforts of today's contributors will serve to create a lasting tribute to the Hercules and thus help to secure its place in the annals of the RAF. I trust that you have all enjoyed today, that you have found it as interesting, and entertaining, as I have, and that you are content that we have done Fat Albert justice.

Drive home carefully – and please continue to support future RAF Historical Society seminars.

May your gods go with you.

Yet another special paint scheme, this time on a stretched C4, ZH866, seen here negotiating the 'Mach Loop' in Wales in 2018, with its fin celebrating No 206(R) Sqn's 100th Anniversary, (PRA Images)

CLOSING REMARKS BY THE SOCIETY'S PRESIDENT,

Air Chf Mshl Sir Richard Johns

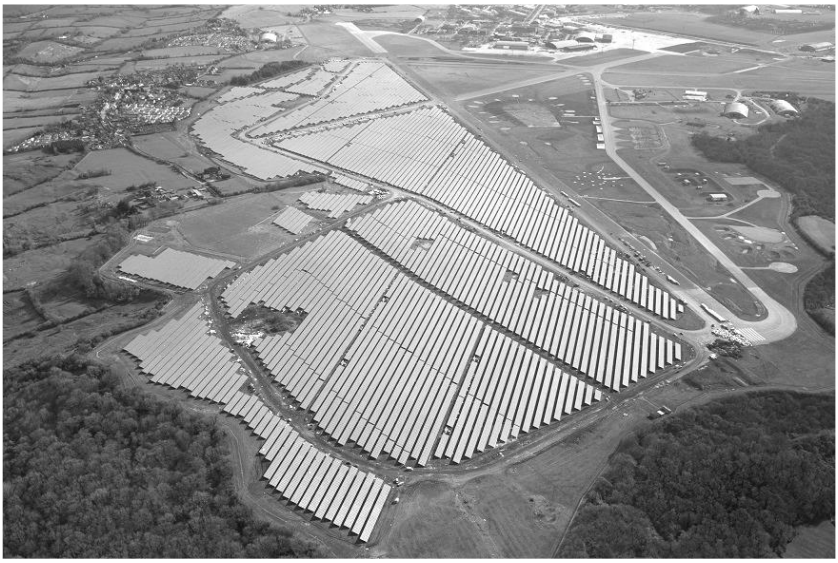
Back in April 1991, I was the recently appointed AOC 1 Gp. As a dyed in the wool mud-mover, I now found myself in command of a lot of 'truckies', air-to-air refuellers, helicopter folk and the like, so I thought that I ought to get to know them. My first port of call was Lyenham where I was ushered into a very large briefing room wall-to-wall-full of aircrew – all ranks, wearing a variety of aircrew brevets and squadron badges and all regarding me with somewhat guarded suspicion. Clearly, I needed to break the ice and I spotted a navigator in the front row whose face looked familiar – I recognised him from somewhere, but where? So I approached him, stuck my hand out and said, 'How lovely to see you again! When did we last meet?' and he said, 'When you chopped from pilot training at Cranwell . . .' (*Laughter*) Nevertheless, it did serve to break the ice! But, that aside, I did succeed in acquiring some understanding of the way that you operate, including a very dodgy captaincy on the C-130 – I hope there's no one here who had to fly with me or tried to teach me! But it was an absolute eye-opener.

What I want to say is that I that listening to accounts of your operations after I had left the Service in 2000 has been incredibly interesting and very well presented. That said, while I was serving there were two Hercules operations that I consider to have been particularly significant – remarkable even. The first was the South Atlantic Air Bridge, started during the Falklands war and afterwards sustained for a further five or six years. The second was Operation CHESHIRE which endured for four years and delivered some 200 tons of supplies a week into the besieged city of Sarajevo – the Hercules Force contributed 20% of the total UN airlift. That we didn't lose an aeroplane in either of those two long-term and demanding operations is testimony to the professionalism of the Hercules Force that got on with the job with no small measure of courage. Neither the RAF nor you have ever received the public plaudits so hard earned or so richly deserved.

Since leaving the Service, I am called upon from time to time to deliver talks and I never miss an opportunity to stress that the RAF is *not* just about fancy fighter jets. It's about a lot of people doing many

other things for which they rarely get much recognition from the great British public let alone our political masters. Meanwhile I am delighted that today's presentations will be recorded in the Society's journal to serve as a permanent record of the Force's achievements as told by those who met every demand placed upon them.

It has been marvellous to have you here to today to listen to such an excellent series of presentations – so thank you for that. And, as a final plug, may I urge you to join the RAF Historical Society to enjoy other days similar to this and the pleasure of reading the Society's journal.



Home of the Hercules for 40 years, the erstwhile RAF Lyneham is now the 69.8MWp Bradenstoke solar power plant, the biggest solar farm in England. (British Solar Renewables)

THE RAF HERCULES C-130K MK 1/3 REPLACEMENT – A 'POLITICAL HOT POTATO'

by Wg Cdr Paul Shepherd

Background

As the RAF entered the 1990s, it faced a real, and undisputed, need to upgrade and reconfigure its entire AT/AAR fleet. Clearly, in resource terms, this would impose an enormous strain on the Defence Budget and often called for innovative thinking.

The end of the Cold War meant that the long-term key AT task – the outload of contingency stocks of weapons and ammunition from the UK to the BAOR – had lapsed. What was needed now was a large strategic-range airlifter, together with a new tactical freighter to facilitate 'hub and spoke' operations. The former needed to be large enough to permit the deployment of outsized loads, specifically including helicopters with a minimal need to dismantle and reassemble them. Both aircraft would require integral defensive aids suites (DAS), enhanced night vision capabilities, the ability to deliver loads by parachute and have sufficient short field performance to permit operation from prepared or, if necessary, unprepared surfaces.

The RAF's Hercules C1s and 3s had been in service since 1967 and had been worked hard in, for example, Rhodesia, the Balkans, maintaining the Falklands airbridge, Ethiopia and, more recently, Gulf War I. By the 1990s, the engineers had concerns about the aircraft's remaining fatigue life and the rapidly increasing cost of maintenance. Needless to say, the operators were equally concerned and wished to replace the first-generation, 1950s-era, Hercules with a more capable, state of the art air transport fleet.

Concurrently, Lockheed were developing the updated, re-engined and much enhanced, J-model of the tried and trusted C-130. Frustrated by the lack of domestic funding for a USAF Hercules replacement programme, despite strong lobbying from the Senate Armed Services Committee (SASC)[1], Lockheed opted to pursue an unprecedented and innovative alternative approach by inviting a foreign nation – the UK – to become the launch customer. In 1989, Lockheed began exploratory discussions with the MOD's AT/AAR Air Staff.

Establishing the UK Lockheed Aeronautical Systems Company (LASC)

Having received a satisfactory response to its initial approach, Lockheed decided to establish a bridgehead in Europe – the UK LASC. They began by 'head-hunting' the then DD AT/AAR, Gp Capt Mike Wood, and inviting him to assume responsibility for running the C-130J campaign in the UK and Europe. Inevitably, Lockheed's initiative provoked considerable opposition from British Aerospace (BAe), its Chairman, Dick Evans, writing to CAS, Sir Peter Harding, to assert that such a move would give Lockheed an unfair advantage. At the time, of course, BAe was one of the industrial partners of the Airbus Future Large Aircraft (FLA) programme, which was still at the conceptual stage.

However, ACAS, AVM C J Thomson, convinced CAS that it would be in the RAF's interest to have Mike Wood 'inside the tent'! Soon afterwards, in 1990, Lockheed set up its UK and Europe 'C-130J campaign HQ' in London's Berkley Square, with Wood at the helm, to run what was to become a 4-year campaign. Lockheed's primary objective was to win the UK Hercules replacement contract; however, this proved to be a significant challenge, as they faced considerable industrial opposition from Airbus/BAe.

Lockheed's campaign strategy

To achieve its aim, UK LASC adopted a multi-faceted campaign strategy that sought to win the operational, industrial, financial and political arguments. To that end, they established a group of UK companies to support the specific bid for an RAF order, but also, and of equal importance, every aspect of the wider sales campaign. Accordingly, Lockheed awarded the participating UK companies contracts to build component parts of the aircraft, not just for any potential UK order (then hoped to be for about 50 aircraft), but also for the first 120 'ship-sets' of global sales.

Known collectively as the UK Industrial Support Group (UK ISG), it comprised thirty-six Tier 2- and Tier 3-level companies and was established in 1991 under Mike Wood's chairmanship.[2] Its membership included:

- Dowty — Propellers
- Westland — Engine nacelle systems

- GEC Marconi Avionics
- Lucas Aerospace control systems
- Aerosystems International Aerospace software systems

One of the priority tasks for the members of the UK ISG was to use their individual industrial and political contacts, constituency MPs for example, to lobby government departments and key industrial bodies such as:

- The MOD.
- The Department of Trade and Industry.
- Her Majesty's Treasury.
- No 10 (including the Prime Ministers' Private Office and the No 10 Policy Unit).
- The Cabinet Office.
- The Confederation of British Industries.
- The Trade Unions.

By adopting this approach, the UK LASC could maintain a relatively low profile, using the UK ISG to lobby on its behalf.

UK LASC's C-130J campaign

The UK LASC/UK ISG campaign was conducted primarily against Airbus/BAe and its FLA project; it was a hard fought, unrelenting and often acrimonious exchange. For example, when the UK LASC funded a six-week, £400,000 advertising campaign, Airbus/BAe responded in kind! Senior politicians, including Malcolm Rifkind, Jonathan Aitken, Roger Freeman, Michael Heseltine and Geoffrey Pattie were all involved as were, in the MOD: AVM John Thomson; Air Cdre John Day (the Director of Air Force Plans and Programmes) and, holding the 'purse strings' as S9 (Air), David Fisher.

The UK LASC campaign concluded successfully in 1995, when the MOD announced that it had decided to award a £3·85 billion[3] contract to Lockheed for the purchase of 25 C-130Js (comprising 10 standard C-130Js and 15 'stretched' C-130J-30s) together with a 25-year support contract. The support contract included an aircraft maintenance package, flight and ground training simulators and OCU training equipment. The package would be provided by Lockheed Martin, partnered with Marshall of Cambridge Aerospace, and Rolls Royce. The announcement of a reduced (compared to Lockheed's anticipated 50) order permitted the UK to demonstrate its continued,

The author and Gp Capt 'Mitch' Mitchell at the C-130J roll-out ceremony in 1997.

and firm, commitment to the Airbus project. In a bid to secure a larger workshare within the A400 programme, the UK had, in common with the other six participating nations, inflated the number of aircraft that it intended to acquire . . .

Although the cost, to the UK taxpayer, of the C-130J purchase was £3·85 billion, it had been a hard bargain which included a unit cost reduction from $45M to $40M per aircraft, representing an overall saving of $125M across the programme. This partially offset the risk factor for the RAF as launch customer. It is reasonable to assert that this saving vindicated AVM Thomson's advice that the UK would benefit by 'having Mike Wood in the tent'. The first RAF C-130J was rolled out in 1997 and the aircraft entered service 2-years later.

The RAF Hercules replacement – 'a priority but not the only AT/AAR game in town'!

The MOD's role specialists[4] considered that a fleet mix of C-17s and J-model Hercules, both available from reliable and proven stables, would satisfy the RAF's future AT needs. They were disinclined to opt for an aircraft that was still only a concept under joint development by seven European nations; moreover, the FLA was at least a decade away. Nevertheless, in an attempt to divert the RAF's interest away from the C-17, Airbus began promoting its FLA as an alternative to both the C-130J *and* the C-17 – it actually lay somewhere between the two.

In 2000, the MOD agreed a 7-year 'lease and support' contract with Boeing and the USAF for four C-17A Globemaster IIIs for No 99 Sqn. The aircraft was already well-established in service with the USAF and it rapidly became a key participant in the Operation HERRICK airbridge operation between the UK and the

Gulf/Afghanistan; even at the peak of Operation HERRICK, the C-17 still had the capacity to service humanitarian and operational commitments elsewhere. After a belated reality check, rather than extending the C-17 lease, the MOD eventually bought the first four aircraft outright and ordered a fifth in 2006. Continued demand saw a sixth ordered in 2007, a seventh in 2009 and the eighth and final aircraft in 2012.

Meanwhile, the Airbus FLA/A400 programme had been formally launched in May 2003 with orders for 180 aircraft from the seven participating nations, 25 of them for the RAF. The prototype was rolled out on 26 June 2008 and the RAF's first aircraft made its maiden flight on 30 August 2014. The in-service date for the RAF's A400 was 23 July 2015, some 16 years after that for its C-130Js.

The balance of the RAF's AT/AAR problem

While the acquisition of the C-17 and C-130J had resolved the RAF's specific AT issues, there remained a need to replace its dual-role VC10 and TriStar AT/AAR fleets. The answer was the Airbus A330 MRTT – the Voyager – but this tale falls beyond the remit of this edition of the Journal.

Notes:

[1] Lobbying was led by Senator Sam Nunn (D), Chairman of the SASC and Senator for Georgia, home of the Lockheed plant in Marietta.

[2] As working definitions, within the aerospace industry: Tier 4 enterprises provide raw materials; Tier 3 creates system elements and components; Tier 2 builds working sub-systems and manufactures large and/or complex components; Tier 1 acts as systems integrator, ie it turns out the end product.

[3] £3·85Bn was the figure used by Lockheed when discussing the UK's overall industrial participation with concerned politicians and Trade Unions Leaders. Understandably, the aim in those meetings was to stress the considerable value of the programme to the UK Industrial Support Group as a whole, and what it would mean to individual members, in terms of long-term workshare, jobs, etc. Conversely, in discussions with the MoD, the Treasury and Cabinet Office officials, that figure was broken down into different Departmental budgets, covering items such as initial procurement (the $1·4Bn that was publicly acknowledged and is more commonly cited) and 25-year aircraft support – including spares, aircrew training, groundcrew training, simulator procurement, maintenance, etc. This methodology was used to highlight the 'excellent Value for Money (VFM)' of the deal.

[4] Gp Capt Wood's successor as DD AT/AAR, Gp Capt M Mitchell, this writer as SO1 AT/AAR, and Air Plans AT/AAR campaigned heavily for a fleet mix of 12 C-17s and 40 J-model Hercules.

REFLECTIONS ON AIR DESPATCH FROM THE HERCULES

by Lt Col Chris Stuart

47 Air Despatch Squadron (47 AD), Royal Logistics Corps

47 AD Squadron started life as the 47th Company of the Army Service Corp in 1900 as a Mule/Horse Transport Company. It was re-roled in WW II as an Air Despatch Coy (749 Coy), operating from RAF Netheravon, it saw action over Normandy, Arnhem and Germany as part of the Cirencester-based No 48 Air Despatch Group. Following Arnhem, all air despatchers were permitted to wear the Dakota insignia that is still worn today; it was granted Royal approval in recognition of the sacrifice that had been made. Since WW II the air despatch units have shared bases with the RAF's transport squadrons and in 2012 47 AD made its final move to RAF Brize Norton. The role remains unchanged after 80 years, it is to receive, rig, load and then fly to despatch stores. The UK remains one of only a few nations that have the same individuals responsible from start to finish of the process, which encourages greater responsibility and accountability. Throughout the history of the trade the personnel have operated in parallel with transport aircrew in all theatres and never more so since the introduction of the Hercules and the centralising of the fleet at Lyneham.

Operation BUSHEL (Ethiopia – 1985-86)

47 AD had prior experience in delivering humanitarian aid during Operation KHANA CASCADE in February-March 1973 when, what became a standard technique – the Nepal Free Drop – was developed (free drop involves a very low level – 25-100ft – airdrop, without a parachute). Subsequent to that, there was an occasional drop in the UK, to snowbound communities in Scotland and the North of England for instance, but these were infrequent events compared to the sheer scale of the challenge and the operating conditions that were to be faced in Ethiopia.

The air despatch community was not actively involved in the Ethiopia's humanitarian crisis until Operation BUSHEL was mounted in November-December 1984. Some pre-deployment trials were conducted on the drop zone (DZ) at Upavon, with Wiltshire farmers kindly donating the grain. Further trials were necessary in-country

An airdrop during Op KHANA CASCADE – Nepal 1973.

and at high altitude, to assess the practical implications of using bags made from local fabric. The trials proved it was necessary to triple-bag the grain and then use heat-activated shrink wrap to hold each consignment together while loading and during the transit flight. A standard load consisted of 16 wooden baseboards, akin to a pallet, with 30 bags of grain per baseboard all held together by shrink wrap as a single unit until the load toppled over the ramp. Once on the DZ, the locals would salvage the baseboards and shrink wrap and put them to good use.

The plan was for four airdrop sorties a day, so a daily rotation was established of rigging loads and flying to deliver them. Every third day half the team was detached for DZ duties. The locations of the DZs were dictated by RAF Ops and the UN representative according to needs and aircraft safety. Aircraft normally dropped to the same DZ between 5 and 7 days at a time.

The AD detachment consisted of one officer, two SNCOs, three 4-man AD crews plus three admin personnel who could be used as AD replacements in the event of illness or injury. One SNCO, accompanied by an AD crewman, would go to the DZ each day. To help with the rigging, locals were employed to assist in preparing the

Left, an Eager Beaver deftly inserting a load into a C-130 and, right, a less successful effort in which the load has fallen off the forklift . . .

loads at the side of the pan where conditions were hot and dusty, and there was no shade – this was a very different experience compared to Lyneham! Among the hired help were some very well-educated individuals, some even holding degrees, but this was the only paid work they could get – triple-bagging the stores and stitching up the sacks. The squadron was run from a few tents at the side of the pans, which also provided the only respite from the sun, so the Ops tent was a popular place to be to get out of the sun. Most air despatch crews rotated every three to four weeks and many undertook four or five detachments to support the flying on Op BUSHEL.

Aircraft loading was handled by Eager Beavers which had been invented by Army's Mechanical Engineers who had, in effect, taken a 4-ton Bedford Truck, cut it in half and welded it back together back-to-front, minus the cab bodywork, and fitted a set of forks. It proved to be a real workhorse.

With two Eager Beavers working, a Hercules could be loaded in about 20 minutes. That was faster than the aircraft could be refuelled, leading to some informal competition between groundcrew, aircrew and the air despatchers! Loads were generally built on 1-ton base boards, or pallets, and arranged so that they could be dropped in batches of four, otherwise known as 'Block 4s'.

Once the Hercules was on station, the Block 4s were moved to the despatch position on the ramp prior to each run over the DZ, the necessary shuffling of loads within the freight bay soon became a well-rehearsed drill. Occasionally Harness Packs (HP – loads ranging from 25-125kg, derived from the saddle bags carried by the mules

The scene at a typical BUSHEL DZ. To ensure that all the dropped stores were recovered and moved into storage, the DZs were policed by AK47-toting local militia, like the chap in the centre of the picture, wearing a light coloured cloak with his back to the camera.

accompanying the Chindits in WWII) were prepared which mainly consisted of welfare kit, lunches or slightly cooler beverages for the DZ Crew working on the ground.

For AD crews flying, it was always an early start to avoid the heat of the day. Although there was a civil war raging on the ground, the crews were unarmed and there did not appear to be any pre-planned procedures in the event of an aircraft being 'obliged' to make an unscheduled landing. The air despatchers reported that it was not unusual to see columns of armoured vehicles on the ground, but the most frequent comment was that it was just hot and unpleasant in the aircraft freight bay, even with the ramp open to create a through draft. That, and the altitude (Addis Ababa is almost 8,000 ft above mean sea level), made life significantly more challenging than on Salisbury Plain.

The folk who were earmarked for DZ duties had the earliest start as they had to make their way over to Addis Ababa's international airport at Bole, which was about a 40 minute drive from the operational airport at Lideta to join a detachment of Polish *Hip*

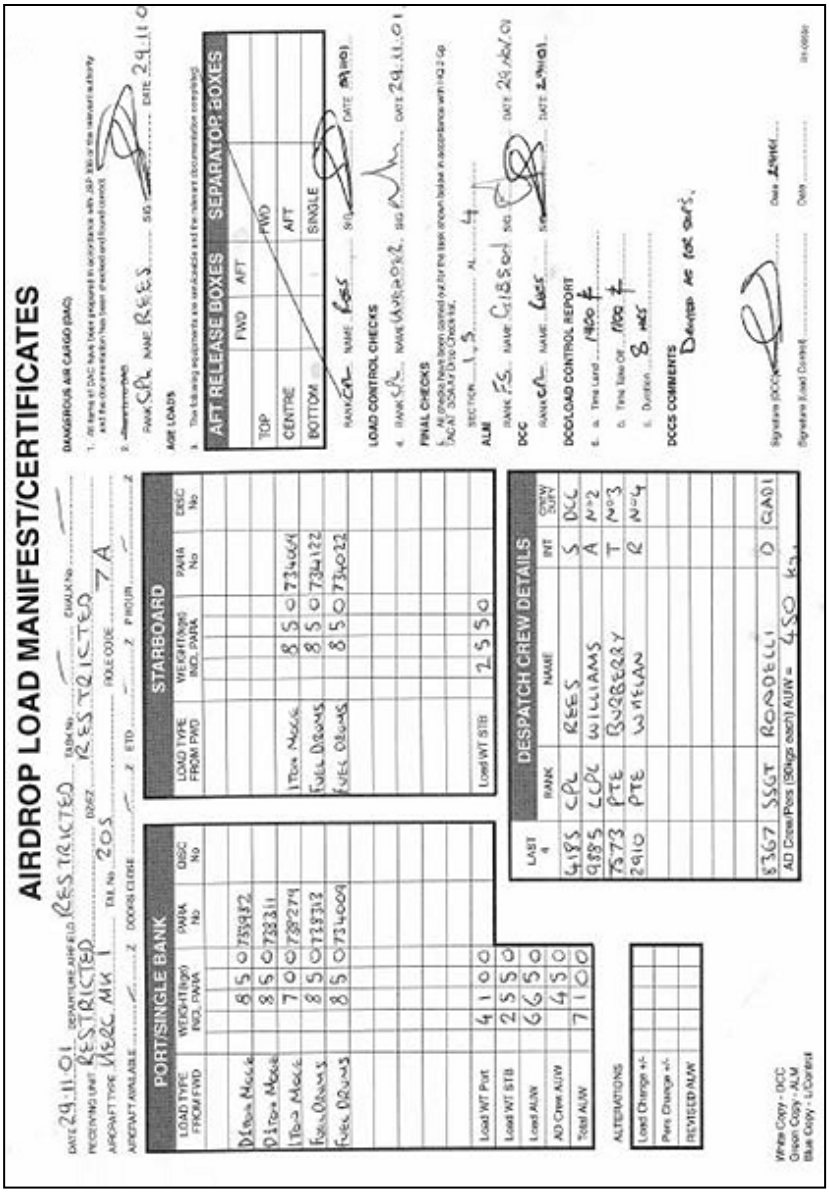
helicopters; there was a Russian detachment there as well. The Poles operated ferry flights taking the air despatchers out to the DZ for the day. Two lasting memories for the despatchers were that the Polish crews' standard breakfast appeared to consist of vodka and that their helicopters reeked of fuel and hydraulic fluid. Once on the DZ the scenes were 'biblical' with hordes of people arriving to secure their share of the drops. Several despatchers recalled the smell on the ground as being unforgettable.

There were lighter moments whilst off duty, including a Brits v Poles football match. It seemed that the Russians had first to grant approval to permit the Poles to play and they then watched from afar. The British also had to obtain Whitehall's permission to play. The early accommodation used was mixed with several solutions being described as 'interesting' and resulted in outbreaks of illness due to the less than hygienic conditions. Eventually, everyone ended up in the same hotel, which seemed to reduce the frequency of stomach and bowel issues. These are an unpleasant inconvenience at the best of times, of course, but their impact is considerably amplified when flying, as the only 'convenience' was a bucket 'down the back'.

True to form, the air despatchers found a few 'watering holes', even one inhabited by Irish females who were prepared to get up on the dance floor. Sadly, however, they were nuns and in Ethiopia on a similar humanitarian mission. After 954 air drop sorties, which had delivered more than 32,000 tonnes of supplies, it was mission complete and back to not so high, nor so sunny, Lyneham to await the next operation.

The Afghanistan Campaign

In September-October 2001 No 47 Sqn's Hercules deployed to Oman with 47 AD teams located in the north and south of the country to participate in a major British undertaking, Exercise SAIF SAREEA 2. It featured the first overseas deployment of Orion, a GPS-controlled parachute system (originally developed to recover astronauts in space capsules) that had close to a 1-ton payload. Sadly, the system did not behave in Oman as it had done in the USA or in UK trials on the Otterburn Training Area where, instead of heading inland, it had flown out to sea and kept going until it crashed, taking all evidence of what had gone wrong with it!



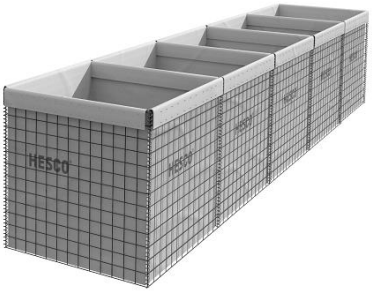
The Load Manifest for the first AD sortie flown in Afghanistan.

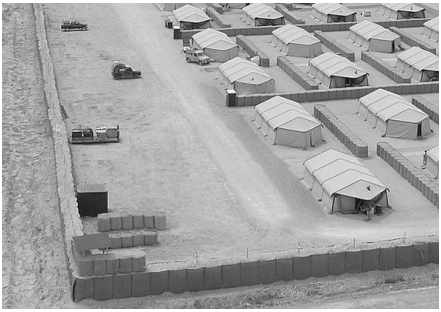
The '9/11' outrage in New York occurred just as SAIF SAREEA 2 began. It had no immediate impact on the exercise, but the long-term effects were, of course, significant. The Afghanistan campaign for 47 AD was relatively quiet to start with but the tempo increased so that, by the end of 2002, it had already airdropped 59,691 kg of stores, using mainly 1-ton containers and Harness Packs/South East Asian Containers to patrol teams out on the ground. The latter – SEACs – were another variation on the Chindit theme, similar to an ammunition box, they could be strapped to a mule. HPs and SEACs were ideal for small mixed loads, eg ammunition, batteries, water, rations, etc and could weigh between 25 and 125kg

Compared to the first year of the Afghanistan campaign, the airdrop tempo declined until 2006 when Operation HERRICK commenced and the British involvement spread beyond Kabul, which posed a logistic challenge. Airdrop is not the panacea for logistics but, over contested, congested and cluttered environments, with extended lines of communications, it has huge utility. This utility was to be exploited to the full in Afghanistan following the first British Brigade's deployment in Helmand.

Airdrops helped established Forward Operating Bases (FOB) by air, dropping HESCO Bastion to help form the outer defences of these outlying bases, often in semi-rural areas. HESCO, a Leeds-based company, even changed the dimensions of their gabions to ensure that they fitted on the 1-ton loads better in terms of tolerances Airdrop subsequently helped resupply some of these bases. One memorable sortie was to try and break a siege at Sangin using a C-130K and a Manual Ejection Block 4 (Manual Ejection meant the Block 4 load was simply pushed out). Unfortunately, the load fell outside the FOB perimeter and could not be retrieved immediately without a significant fire-fight. This incident led to improved accuracy following the introduction of the Drop Sonde. A Drop Sonde looks rather like a 1-litre water bottle. It is dropped before the main load and feeds back to the aircraft the exact wind speed at different heights to refine the Calculated Air Release Point – the optimum point in the sky to release the load in order for it to hit the DZ.

Meanwhile the USAF air delivery community was using the latest GPS-based system called Joint Precision Air Drop (JPADs), which could cope with payloads varying from a few hundred to 20,000 kgs.





Left – lined with canvas and filled with sand, a HESCO gabion is impenetrable by small arms fire. Empty and folded, it is air transportable. HESCO Bastion is a particular variation on the theme that was used to enclose the synonymous camp in Afghanistan. Right – a typical installation – a corner of Camp Marmal, near Mazar-i-Sharif, showing the outer perimeter and the blast walls between the accommodation, all constructed from HESCO gabions. (erebino)

Sadly, despite an Urgent Operational Requirement being raised, the UK, never quite got there.

So was air drop important in Afghanistan? Yes. In some locations it was essential, and each sortie saved a truck and two soldiers having to drive a consignment of supplies through operational pinch points laced with IEDs and/or ambushes. It also allowed patrols to remain on the ground longer and thus become more effective with fewer trips back to the main bases – these journeys not being without risk themselves. The patrols often had serious issues with their vehicles due to the terrain, dust and enemy action, so spare parts, tyres and the like were also dropped when required in order to permit self-help repairs, rather than having to abandon a vehicle and/or summon a recovery team. That said, the Americans made far more use of aerial delivery than we did and were far more reliant on resupply by air.

In the context of the Americans, it became a regular event for 47 AD to visit our US rigger brethren. Ostensibly 'friendly liaison', we were actually only there for one reason – to borrow (acquire might be the legal definition) their pre-pulled/prepared Dufflette. (Duflette is a cardboard honeycomb which is sandwiched between the baseboard and the load and absorbs most of the impact when an airdropped

An Atlas K loader.

package hits the ground). Compared to the British equivalent, the US version was far less efficient in terms of logistics, as it was shipped in containers holding 90% air and 10% cardboard. On the other hand, it arrived ready-for-use, whereas the British system had to be created in-theatre, which could be a relatively lengthy procedure as it could take some time to construct and for the glue to set in temperatures of the order of 40°C. The American rigging set up was across the airfield in Kandahar and it did not take them long to create a far better facility than we had back at Lyneham, but they very generously allowed us to use it occasionally, along with one of their Emerson Condec K loaders or one of our own British equivalents, the Atlas K loader. These visits also allowed us to take a peek at their AC-130 gunships, which, despite their age, were very impressive and could be heard most nights, calibrating their weapons before going on-station. There was serious AC-130 envy, although I believe that the UK did experiment with General Purpose Machine Guns mounted in the para doors at one stage; however, unsurprisingly, it was not accurate enough to be effective.

The peak of 47 AD activity came in 2008-09; one month saw 362× 1-ton loads delivered using a semi-automatic mechanism called the Container Delivery System that no longer required air despatchers to physically push the loads out the back. An incidental issue concerned the consumption of parachutes and getting them back, through the reserve supply chain, to the UK. The parachute packing facility soon had to form working relationships with nearby zoos as several exotic spiders and scorpions were found wrapped in recovered parachutes. As the intensity of operations ramped up, we began to hire Locally Employed Civilians (LECs). One, Abdul Barrie, was with the AD team from almost the start through to the end of the campaign and at

An AD crew plus a pair of dark-clad LECs; Abdul Barrie is the slightly taller of the two.

various times he seemed to have had most of his male relatives working in the rigging hangar.

Slightly unusual load requests came from a number of Army Quartermasters (QMs), in addition to the typical morale-boosting add-ons. One rather large QM rocked up 5 minutes before departure with a dozen large pizzas, to go out with the tyres and MT fuel. That caused a bit of head scratching, because he required them to arrive in pristine condition! Anything less and it was clear that it would not end well for the AD team! Plan A was to blame the aircrew for any damage due to them having thrown the aeroplane around on the way to the DZ. Plan B was to disconnect the parachute and re-rig the load *in situ*, which is what happened, once the RAF loadmaster's back was turned!

Several individuals were recognised for their efforts, not least, climbing over live loads that had jammed on the ramp, dealing with a live enemy rocket that landed on the aircraft pan but fortunately did not explode immediately and input to operations such as EAGLE'S SUMMIT[1] and MOSHTARAK.[2] Interestingly, water airdrops were sometimes made at the Kajaki Dam to resupply a FOB in the vicinity,

because the area around it had been heavily mined as per the 2014 feature film *Kajaki* (aka *Kilo Two Bravo* in the USA). We are all hoping that one of our discarded SC15s (a small utility parachute) is not going make its presence felt one day by fouling-up the hydro-power turbines. There were even a few leaflet drops but, with poor literacy levels, most took the form of cartoons, which was another skill the AD community had not used for several years and had to dust off for Afghanistan.

Other odd moments included flying, mainly in Helmand, and spotting recycled 28ft and SC15 parachutes in local villages and FOBs being used as sunshades or tents! The 47 AD detachment at Kandahar became one of the longest running ever. It started in 2002, in pretty austere conditions, and ran until December 2014, by which time Air Base Khandahar was the size of a small town with air-conditioned concrete buildings. That said, it still had 'Poo Pond' (and a sewage tank, both of which were well worth avoiding) with a variety of unit emblems floating on it. Having flown 520 sorties in Afghanistan, the vast majority with the C-130 force, it was time to withdraw to UK where a new Rigging Hangar had been built for the squadron at Brize Norton – this was the first ever purpose-built AD facility. Needless to say, operations in Afghanistan were just the first, not the only, air despatchers' operational deployments supporting the Hercules in the Middle East.

Notes:

[1] Operation EAGLE'S SUMMIT involved transporting a 220-tonne turbine to the Kajaki Dam in Helmand Province in the summer of 2008.

[2] Operation MOSHTARAK was a 2010 ISAF offensive in the town of Marjah in Helmand Province.

A FIRST-HAND ACCOUNT OF THE GLIDER SNATCH TECHNIQUE

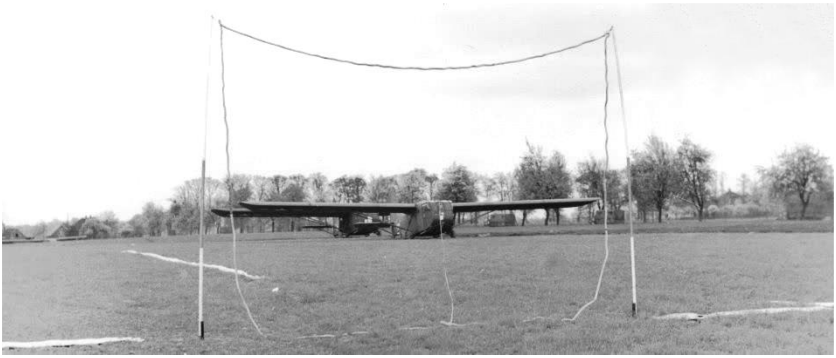
by Wg Cdr Howard Murley

While the use of gliders had been abandoned long before the RAF began flying the C-130, because the snatch technique cropped-up in discussion during our Hercules seminar, and simply because it is of some historical interest, this note is considered to be worthy of inclusion here.[1] ***Ed***

The Hadrians, smallest of the unit's gliders, were often towed in pairs and, as a means of retrieval, were sometimes snatched (one at a time) from a standing start out of a small field. To set the stage for such a retrieval, a loop of good, stout, highly stretchable nylon rope was attached to the nose of the Hadrian and held up ahead of the glider between two poles stuck in the ground like goal posts about twenty feet apart and at right angles to the 'direction of snatch'. The snatcher Dakota sported a long, hooked boom that could be dangled, deck-landing fashion, to catch the rope, the hook at the end of the boom being detachable and connected to a drum of steel wire inside the airplane.[2] A winch operator, crouching inside a steel cage behind the drum, worked a braking system on the cable, arresting and reeling in, in the manner of a rod fisherman playing his line. Our brakeman's lot was not always a happy one; a snapping cable under tension of a snatch had once curled back through the bars of his cage and sliced off a finger. In paying out and arresting that cable, strong forces were involved.

The snatching required the hook-dangling Dakota to make its run low and slow over the nylon between the goal posts. The pilot was in no doubt when the pick-up had been achieved for the Dakota seemed almost to stop dead in surprise before staggering off under full throttle towards the trees at the other end of the field. At the same time, the screaming, tearing noise of the winch, accompanied by clouds of dust, rust and smoke in the cockpit confirmed that we had indeed caught a 'big one'.

The thought of being on the fish-end of the hook did not appeal to me much at first. I was introduced to the art of being snatched as a passenger in the right-hand seat of the glider by my much-revered and



Note that the tug did not fly directly over the glider. The latter was parked, offset to one side, at an angle to the line of flight – hence, presumably, the initial tendency to 'slew' when the slack was first taken up. Before the availability of stretchable nylon, the rope was laid out in a series of 'S's to reduce the shock-loading. (US National Archives)

respected CO, Wing Commander Colin Scragg, who enjoyed the excitement of this exercise as did everyone else. My first experience as a snatchee, however, was in the way of a punishment for the misdemeanour of having beaten the CO out of dispersal and onto the taxiway that morning as we both moved to take off on some exercise. The customary rude sign made to him out of the window froze in mid-gesture as I realised who the other pilot was, but it was too late; my

apology made no difference and I was subsequently passenger-snatched for my sins.

While we waited for the snatch, everything seemed too quiet in the cockpit. Behind a nearby hedgerow a few people sheltered from what was about to happen; the CO was silent as he gave the thumbs-up, held the stick hard back and waited. We pulled on our seat harness straps another notch. The only movement was the grass stirring outside in a light breeze; the only sound the occasional flexing creak from the Hadrian. I sat transfixed, heart pounding a bit, staring out between the goal posts as the stillness was shattered by the increasingly angry buzz of a Dakota, engines at take-off revs, approaching from somewhere behind. Woosh! It flashed overhead; there was a great lurch, our nose pitched down, tail tried to slew round sideways, one goal post flashed over the cockpit canopy. Suddenly we were twenty feet in the air, accelerating through sixty knots at the end of a considerably stretched piece of nylon and following our leader out of the field.

A very short time later everything calmed down, the dust had settled, and we were enjoying a leisurely tow back to base.

All this is past history now; the helicopter has seen to that. Army/air co-operation at that time, though, was varied and full of interest. It was a unique experience for me.

Notes:

[1] This account has been extracted from *A Pilot's Tales* (pp 66-67), the memoirs of the late Wg Cdr Howard Murley DFC AFC* (privately published in 2019, but available via Amazon). At the time, 1947-48, he was a flight lieutenant on the strength of the Transport Command Development Unit at Brize Norton and working with the Army Airborne Tactical Development Centre.

[2] Later in his career the author would become one of two RAF graduates on No 3 Course at the USN Test Pilot Training School at Patuxent River, and he would spend his first fifteen post-RAF years, 1975-90, living, and flying, in the USA – so the Editor will overlook his transatlantic rendering of aeroplane

ROYAL AIR FORCE HISTORICAL SOCIETY

The Royal Air Force has been in existence for more than one hundred years; the study of its history is deepening, and continues to be the subject of published works of consequence. Fresh attention is being given to the strategic assumptions under which military air power was first created and which largely determined policy and operations in both World Wars, the interwar period, and in the era of Cold War tension. Material dealing with post-war history is now becoming available under the 20-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 £18 per annum and further details may be obtained from the Membership Secretary, Wg Cdr Colin Cummings, October House, Yelvertoft, NN6 6LF. Tel: 01788 822124.

THE TWO AIR FORCES AWARD

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

1996	Sqn Ldr P C Emmett PhD MSc BSc CEng MIEE
1997	Wg Cdr M P Brzezicki MPhil MIL
1998	Wg Cdr P J Daybell MBE MA BA
1999	Sqn Ldr S P Harpum MSc BSc MILT
2000	Sqn Ldr A W Riches MA
2001	Sqn Ldr C H Goss MA
2002	Sqn Ldr S I Richards BSc
2003	Wg Cdr T M Webster MB BS MRCGP MRAeS
2004	Sqn Ldr S Gardner MA MPhil
2005	Wg Cdr S D Ellard MSc BSc CEng MRAeS MBCS
2007	Wg Cdr H Smyth DFC
2008	Wg Cdr B J Hunt MSc MBIFM MinstAM
2009	Gp Capt A J Byford MA MA
2010	Lt Col A M Roe YORKS
2011	Wg Cdr S J Chappell BSc
2012	Wg Cdr N A Tucker-Lowe DSO MA MCMI
2013	Sqn Ldr J S Doyle MA BA
2014	Gp Capt M R Johnson BSc MA MBA
2015	Wg Cdr P M Rait
2016	Rev (Sqn Ldr) D Richardson BTh MA PhD
2017	Wg Cdr D Smathers
2018	Dr Sebastian Ritchie
2019	Wg Cdr B J Hunt BSc MSc MPhil

THE AIR LEAGUE GOLD MEDAL

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

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

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