

RAF YEARBOOK SPECIAL



AIR WAR *in the* GULF

UK £2.95 USA \$6.95 CANADA \$7.95 ISSN 0962-9025

COMPETITION
150 FREE TICKETS
INTERNATIONAL
AIR TATTOO 91
RAF FAIRFORD 20-21 JULY



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ISSN 0962-9025



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RAF YEARBOOK SPECIAL

AIR WAR IN THE GULF

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ROYAL AIR FORCE YEARBOOK SPECIAL – AIR WAR IN THE GULF

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Published by the **Royal Air Force Benevolent Fund's International Air Tattoo Publishing Unit**, Building 1108, RAF Fairford, Glos GL7 4DL.
Tel: 0285 713300 Fax: 0285 713268
Telex: 43511 IATFFD G

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Cover Artwork: **Wilf Hardy**
Design and Graphics by **Graham Finch Design**, 17 Jubilee Road, Bristol, Avon BS4 2LR.
Typesetting by **Sue J Bushell/Oxford Air Research** and **Jean Strickland**

Printed by **Chase Web Offset**, Eastern Wood Road, Llangage Industrial Estate, Plympton, Devon PL7 5ET, England.

Newstrade Distribution by **Comag Magazine Marketing**, Tavistock Road, West Drayton, Middlesex UB7 7QE.

Sold for the benefit of the Royal Air Force Benevolent Fund.

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INTRODUCTION

Air Vice Marshal W J Wratten CB CBE AFC RAF

Air Officer Commanding No 11 Group

Formerly Air Commander and Deputy Commander British Forces Middle East

It was quite clear to us all serving in the Gulf during the war against Iraq, that concern and support from home was virtually unbridled. As a result we were all well braced to contend with the difficulties of the unknown, being buoyed up and carried along as we were by such a huge wave of encouragement. This did not merely flow from our own families and friends either, but from thousands of patriotic well-wishers who merely wanted us to know that their hearts were with us. I therefore find this a most welcome opportunity publicly to express the appreciation of all men and women who in the Gulf did their duty in the desert, at sea or in the air in the interests of world democracy.

The success of the air offensive in particular was, of course, fundamental to both a timely victory overall and the mercifully small number of coalition casualties during the eventual short land battle. That the air campaign in its entirety ran so smoothly was in itself testament to the preparation which preceded it, the foresight of those who actually planned it in detail and the professionalism of all who eventually took part; aircrew, groundcrew and supporting elements alike.

Under 'preparation' I include the vital day-to-day peacetime training which encompasses the major flying exercises upon which the very fabric of international understanding and camaraderie in the air depends. It

should also go without saying that adequate equipment procurement is a parallel foundation for any preparation in ensuring a capability to contribute to world peace. From this peacetime training emerged the expertise and confidence with which to 'plan' a highly complex air campaign in the knowledge that it would work on the day. And on the day it did work, because of the professionalism, application and courage of those charged to see it through. Had the coalition air forces not possessed these essentials of preparedness, planning expertise and professional skill, the outcome would, most certainly, not have been so swift and so decisive.

Beyond this, I am also inclined to believe that, for the first time in the history of warfare, air power has realised the potential it has been threatening for many years; it has proved itself an overwhelmingly decisive element in a major conflict. How and why it was able to do this are matters for measured debate; conclusions should not be drawn prematurely as to how procurement and defence policies of the future may be affected. But it is perhaps irrefutable that, without a capable air force and all that means in the way of weapons systems and training, no nation will hereafter ever be able to lay claim to an effective defence strategy. In this respect alone the Gulf war has seen a turning point in the development of warfare.



STRATEGY & TACTICS

Group Captain Andrew Vallance looks at what we did and what we learned from the Gulf air war



The air war opened with an attack by USAF F-117A 'Stealth' fighters against targets in Baghdad.

At 2340hr Greenwich Mean Time on Wednesday 16 January 1991, the first of a wave of singleton F-117A 'Stealth' fighters release its 2,000lb laser-guided bombs against a key communication facility in Baghdad. Shortly afterwards, large Allied air power 'force packages' – which had been forming up outside enemy radar cover – broke through the Iraqi air defences and struck at their targets. It was the start of an air campaign of unprecedented scale and intensity.

The Allied air campaign plan was divided into four distinct phases. Phase 1 – planned to last for seven to ten days – was designed primarily to achieve overall air supremacy and damage Iraqi strategic capabilities. Phase 2 – the suppression of the Iraqi surface-to-air defences within the Kuwait theatre of operations (KTO) – was planned to be brief and lead directly into Phase 3. In this phase the Allies intended to concentrate their attacks against the Iraqi Army in the KTO with the aim of destroying (in just over three weeks) half of its 'battle winning equipment': ie tanks, armoured personnel carriers and artillery. The prime aim of the fourth and final phase was to provide direct support for the Allied land force offensive.

To carry out this plan the Allies had built up a formidable air power force. By 16 January it numbered some 2,430 aircraft based either within the Gulf region or close enough to project air power into it. The RAF contribution was 135 aircraft: 18 Tornado F3 fighters, 46 Tornado GR1/1A attack and recce aircraft, 12 Jaguar fighter-bombers, 17 tankers, three Nimrod maritime patrol aircraft, 31 Chinook and Puma support helicopters, one BAe 125 and seven Hercules transports. The strength of the Allied air forces continued to grow as the campaign progressed, and by the start of the land attack ('G Day') it had reached 2,790. RAF reinforcements during this period included 12 Buccaneers and additional Tornado GR1s.

'No plan survives contact with the enemy', and the Gulf War proved no exception to this well proven military maxim. The weather – the worst ever recorded for the region – obscured many targets from visual and laser-guided attacks, and the air effort diverted into what became known as 'the great Scud chase' was three times that anticipated by the planners. As a result G Day slipped from Day 30 to Day 39 of the war. Moreover, as operations developed, the various phases of

the campaign began to merge and overlap.

The Allies launched between 2,000-3,000 sorties a day throughout the conflict; on average one Allied bombing sortie took place every minute of every day. By G Day, the Allied Air Forces had mounted nearly 100,000 sorties and achieved outstanding success. The Iraqi Air Force had been swept from the sky, its integrated surface-to-air defence system had been crippled and its surviving aircraft had fled either to Iran or been dispersed in woods and villages around their air bases. Much of Iraq's strategic installations – nuclear, chemical and biological weapon plants, oil refineries and power generation facilities, transport infrastructure and high command and control centres – lay in ruins.

In the field, the Iraqi Army had been grievously wounded. Physical losses included 1,560 tanks, 1,508 artillery pieces and 1,210 armoured personnel carriers, representing respectively 37%, 49% and 42% of these equipment categories deployed within the KTO. Of no less importance were the consequential effects of dislocation and demoralisation. Battered day and night from the air, cut off from much of its supplies and with its command and control in shreds, the Iraqi Army had – by G Day – been reduced to a collection of isolated and dispirited units which in many cases were eager to surrender. The subsequent 100-hour so-called 'Ground War' was in reality a highly integrated land-air operation in which the air and land forces operated together as equal partners providing each other with mutual support and mutual opportunities.

When the ceasefire came into effect on 3

Below: Although just a handful of Hercules were based in the region, the remainder of the fleet provided essential supply links with the UK. Dave Fry/API Inset: The RAF's Tornado GR1s had the highest loss rate during their early hazardous night missions at low level. Stuart Osborne



By 16 January the RAF had 135 aircraft in the Gulf region. This mainly comprised Tornado GR1/1A and Jaguar GR1A attack aircraft. Mike Rondot

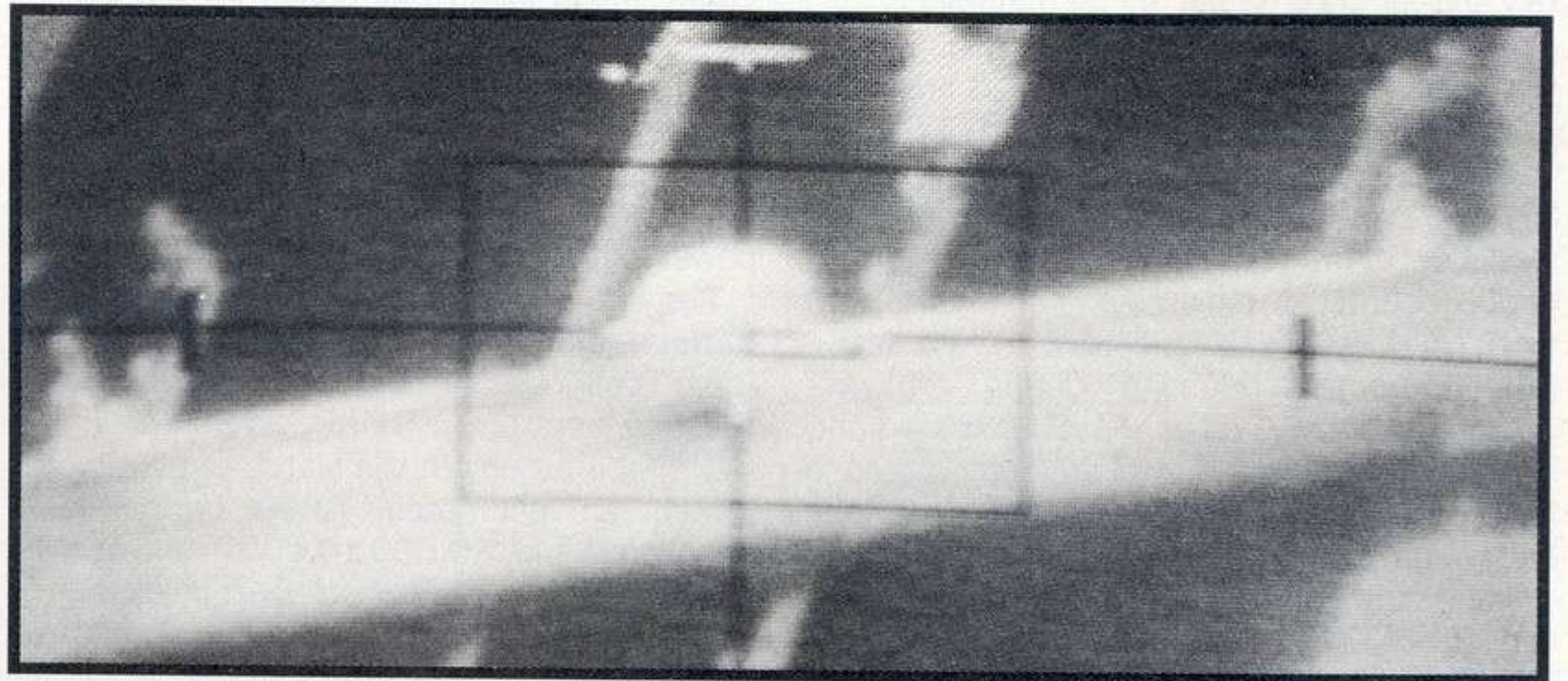


March, the Allied Air Forces had flown 110,000 sorties. Of these the RAF flew over 6,100, the largest number flown by any nation except the US and more than two and a half times that flown by our French friends. Some 88,500 tons of bombs were dropped, of which some 7,400 tons were precision-guided.

The effects were quite literally devastating. Nearly 350 of Iraq's combat aircraft (50% of its total) had been either destroyed or driven into exile. Half of Iraq's airfields needed major repairs to their operating surfaces, while a further number were damaged to lesser degrees; some 64% of Iraq's hardened aircraft shelters suffered major damage. Iraqi nuclear, biological and chemical weapon production plants and the country's electrical generation capacity had been all but destroyed, and a wide range of other strategic facilities had suffered varying degrees of damage. Within the KTO, Iraqi losses included 43 divisions (69% of those deployed), 3,700 tanks (87%), 2,400 armoured personnel carriers (84%), 2,600 artillery pieces (84%), 14 warships (87%) and 11 auxiliary vessels (40%). Human costs remain difficult to assess; the Iraqis may have suffered 100,000 casualties, with a further 100,000 plus being taken prisoner; Allied combat losses were less than 500. By any standards it was a decisive victory.

Like every war in history, the Gulf War will probably prove to be unique. It is highly unlikely that the same type of conflict will ever be exactly repeated, and thus we must be very cautious in trying to draw out 'lessons to be learned'. But that said, the Gulf War was – as General McPeak the US Air Force Chief of Staff pointed out – “the first time in history that a field army had been defeated by air power”. For that reason alone it will inevitably become an important case study for the future.

In terms of strategy, it is clear that air power acted as the primary element of the Allied joint-force, in both crisis and conflict. At the start of the crisis, air power was the only form of military force available to the Allies which had the speed, reach and military muscle to demonstrate political resolve to free Kuwait and deter further Iraqi aggression against Saudi Arabia. For example, RAF Tornado fighters were flying operational missions from Saudi Arabia within 50 hours of the Government's deployment decision, and within a further two days a balanced force with powerful offensive, defensive and combat-support capabilities had been deployed over 3,000 miles from its main



Top: The enormous size of Iraqi airfields, with many runways, made their total destruction almost impossible. Alan Marks Above: 'About 90% of all laser guided bombs achieved direct hits' – like this attack on a road bridge, with the bomb exploding at the focus of the laser designation. Below: The effect of nearly 100,000 sorties against Iraq was devastating. Typical was this scene of destruction along the Basra road. Jeremy Flack/API





bases and was fully operational. Rapid Allied air power deployments were crucial in containing the crisis in its critical early stages. Indeed, had it been possible to predict Iraq's aggressive intentions, then rapid air power deployments before the invasion of Kuwait could well have deterred that invasion and thus avoided conflict.

When crisis became conflict, the dominance of air power continued. The Allies used air power to win the battle for air superiority; they used it to destroy the Iraqi military's ability to sustain the war; they used it to cripple the Iraqi army as a cohesive fighting force; and they used it to spearhead the physical liberation of Kuwait. In the past many soldiers and sailors have seen air power essentially as an auxiliary to surface force action. Yet in the Gulf Conflict, air power acted throughout as the leading element of the Allied Joint Force. The level of air supremacy attained during the Gulf War may never be repeated, but the Gulf War shows quite clearly what is likely to happen if it is. And that suggests that air superiority must be the first defence priority for all nations.

A lasting memory of the Gulf War will be the very great precision of Allied bombing attacks. A panoply of weaponry was deployed – laser, TV- and infra-red-guided bombs and rockets and conventional cruise missiles to name but a few – which struck at targets with unprecedented accuracy. According to General McPeak, about 90% of all laser-guided bombs released during the war achieved direct hits. That achievement, representing as it does a dramatic increase in accuracy in comparison with previous wars, has revolutionary implications.

Increased accuracy obviously allows major reductions in the numbers of aircraft and crews that have to be put at risk to destroy any given target. But of equal importance, it reduces unwanted collateral damage and unintended civilian casualties. Hence, it makes air power a more selective and – politically – a more useful instrument. The experience of *Desert Storm* shows that – thanks to increased accuracy – conventional strategic bombing can be a very important, and indeed an indispensable, element in a theatre campaign. In the wider context, increased precision offers the ability to remove an immediate threat or punish a hostile state for a lower-level aggression (eg state-sponsored terrorism). In short the accuracies that air power can now achieve, allows it to make a far greater contribution to our defence.

The Gulf War also showed that increased air power accuracy has been complemented by increased air power survivability. During the War, the Allies flew nearly 110,000 sorties and lost 42 aircraft in action (with a further 33 lost due to accidents). The overall combat loss rate – ie the number of combat

Above: Bahrain based Tornado GR1s delivered laser guided bombs after the arrival of *Pave Spike* equipped *Buccaneers*. Dave Bolsover Top: RAF Gulf formation. Mike Rondot

aircraft lost per 100 combat sorties flown – was less than one tenth of one per cent. Within the Allied force, the RAF's Tornado GR1 units sustained the highest loss rates, due to the highly demanding nature of their early missions. They flew nearly 1,650 sorties and lost six aircraft in action, a loss rate of little more than one third of one per cent and far lower than that suffered by any Air Force in any previous high-intensity conflict. Extraordinarily low though they may seem, these loss rates confirm a process of increasing aircraft survivability which has been underway since WW2. Clearly, the greater the survivability of aircraft, the greater their cost-effectiveness. This has obvious implications for the contribution that air power can make to our defence in the future.

Perhaps the major reason for the very low attrition rates sustained by the Allies was the rapid collapse of the Iraqi surface-to-air defence system. That system was as developed as any in the world, employing as it did an estimated 7,000 surface-to-air missiles and 9,000-10,000 anti-aircraft artillery pieces controlled by an extensive network of radars of both Western and Soviet origin. Yet three days after the start of the air campaign it had been totally dislocated, and although individual weapons continued to inflict occasional casualties on the Allies, the system itself never regained its former cohesion. Indeed, it never really recovered from the paralysing blows inflicted on its command and control network during the first few hours of the war.

The Allied success in defeating the Iraqi air defence system has important implications for tactical air doctrine and Air Force equipment programmes. Until now, the apparent strength of such systems suggested that – even with massive defence suppression – medium- and high-level operations would not be viable. The Gulf War provides firm evidence that highly centralised and integrated surface-to-air defence systems based on the Soviet model can be defeated in short order, and that control of the middle- and upper-air – with all its inherent advantages (avoidance of AAA, easier target acquisition, greater reach etc) – can be won for little loss.

If air power proved increasingly survivable in the air, it also proved increasingly survivable on the ground. In the 1967 Six-Day War, the majority of the Arab air forces were destroyed on the ground by the Israelis; it took a matter of a few hours and a few hundred sorties. In the Gulf War, the Iraqi Air Force proved far more difficult to kill. The offensive counter-air element of the Allied campaign involved several thousand sorties, extended throughout the 42 days of the war and used advanced munitions such as JP233 and laser-guided bombs. Early harassment attacks on operating surfaces gave way on Day 7 to a concerted effort to destroy hardened aircraft shelters. Yet at the end, much of Iraq's air power remained intact.

Partly this was because of the sheer size of Iraqi airfields. For example, Talill in southeastern Iraq covers an area of 9,000 acres, more than twice that of London Heathrow. Chopping up the vast acreage of operating surfaces into sufficiently small pieces to prevent take-offs and landings and destroying the widely dispersed infrastructure posed formidable targeting problems. In such circumstances, and even with the enormous resources at their disposal, it proved very difficult for the Allies to destroy Iraqi air power. Since June 1967, Air Forces have been haunted by the fear of being destroyed on the ground. The Gulf War shows that this is no longer an easy task.

Bearing in mind the scale, scope and complexity of the Gulf War, and the decisive part that air power played in its conduct, an article of this length can only scratch the surface of its subject. Many other tactical and strategic lessons may yet emerge, and as new facts are revealed current views may need to be refined or revised. Yet it is already clear that the events in the Gulf mark a watershed in warfare. Future historians may well see them as the start of an era in which air power was used not only to terminate conflicts rapidly and with the least possible loss of life, but also in many cases to avert them.

Group Captain A G B Vallance OBE MPhil RAF, is Director of Defence Studies for the Royal Air Force.



STORMIN' WITH NORMAN

Wing Commander Jerry Witts gives a Squadron Commander's view

"Got the offset. Correction's in. Take it!" says AJ. The aircraft lurches left as I reselect track hold on the autopilot. It all seems very unreal, creaming along at 500kt through the thick velvet darkness. The Head Up Display (HUD) tells me we are 180ft above the desert but it could just as well be 18,000 because I can't see a thing ahead, just the slowly unwinding time to weapon release circle in the HUD symbology. Thank goodness it's flat – at least we think it is! Perhaps I should have put the Night Vision Goggles on after all? Too late now.

"Five miles. I'm happy. Radar off."

"MASS. Late Arm. Stick Top alive."

We recite the litany of checks just as we have done a thousand times before. But never like this. This time it's for real and ahead in only 30 seconds lies an Iraqi airfield. It's shortly after midnight GMT on 17 January 1991 and we're on our way to war.

"Twenty seconds, fifteen, five."

"Committing."

There they go. The aircraft vibrates rapidly as our JP233s dispense their loads. There's a pulsing glow from beneath the aircraft. Then suddenly, two massive thumps as the

empty canisters are jettisoned. A quick thought: "So that's what it's like", but simultaneously, alarms sound, the autopilot drops out, we lurch sharply upwards and my heart rate increases to about 400 a second as I fight to get back down.

"What are those flashing lights, AJ?"

"AAA, you idiot!"

"Jesus!"

The flashing lights become white stair rods arcing over and around us. Away to the right the sky erupts in orange flames, quickly followed by a curtain of incandescent white lights as more and more AAA barrage fires into the darkness. A hundred fleeting experiences too rapid to recall in any detail. We rush onward. Homeward. I haven't touched the throttles or moved them from their max dry power setting but I see we're now doing close to 540kt as we jink left and right of track to avoid threats that illuminate our radar warning system. Let's try max wing sweep to see if we can get a few more knots out of her. I don't want to use reheat. It lights us up like a beacon and, anyway, we can't afford the fuel. Check the rest of my formation in. All there, thankfully.

Time seems to stand still and the brown line that marks the international border creeps so slowly down the moving map display. I suppress the irrational desire to laugh as we pass over a printed notice on the map:

'WARNING: Flight in Iraq outside controlled airspace is STRICTLY PROHIBITED.'

Then, just as suddenly, we're over the line. We're safe! We're alive! My God, we've done it! Now, where's that tanker?

Whenever I think of the Gulf these are amongst my most vivid memories. But that is not where it all started. It was in November 1990 that my Station Commander told me to start getting a new detachment ready to go to the Gulf. We might be going to Bahrain, or it could be Tabuk, or even some other location and there was no firm date for moving but mid-December looked about right. Such were the times and, in any case, at RAF Brüggen we pride ourselves on our ability to do any thing, any where, any when. We already had one detachment at Bahrain and we had plenty of experience to draw on. So we set to work.

Left: Training over the harsh desert environment continued until early on 16 January. Stuart Osborne

Below: Pilots eye view refuelling from a 216 Sqn TriStar K1; AAR was an essential feature of every mission. No 31 Sqn



The basics were easy. I was to command the detachment which would comprise twelve aircraft with 24 crews and a war establishment of groundcrew. The majority of crews were to come from my own Squadron, No 31, with the remainder from Nos 9, 14 and 17(F) Squadrons who were already working together as a composite team because their 'other halves' were already in the Gulf. I would take all my groundcrew and engineering management, again topped up from other Brüggen units and from elsewhere. Training was the priority and by now we had the benefit of *Operation Granby* work-up syllabus to guide us. The station was marvellous and nothing was too much trouble as we made increasing demands of all sections in our drive to get ready and packed. As mid-December approached with no sign of an order to move, or a destination to move to, we managed to stand most people down for a bit of leave. Four of my officers took the plunge and opted for early weddings and life seemed to become one long round of Ground Defence Training (GDT), night air-to-air refuelling, will forms and ceaseless speculation on where, when, and

even, if we were going. Undoubtedly, the families had the hardest time as plans changed, then changed again. Christmas served only to add poignancy to the prospect of six months unaccompanied service in the Middle East together with the possibility of going to war. Then, just a few days before Christmas, we were told at last. We were off to Dhahran in Eastern Saudi Arabia and our advance party was to move out on 27 December 1990. Not everyone was pleased about the location, especially those who enjoy a tippie, but at least it would give us the opportunity to do things 'our way' although, with only two weeks to go the UN deadline, things were going to be very tight.

So it proved to be. Through no fault of the RAF, the situation at Dhahran was even less prepared than we had hoped for. Coming so late into theatre we were very definitely at the back of the logistics queue and our operational accommodation, comprising a rather sorry set of portakabins in what was to become one of the world's busiest airfields, left quite a lot to be desired. But this was no time for carping and my team set to with a will to make the best of things. Not least

among our new experiences was learning to deal with our host nation. 'Inshallah' quickly became one of our stock expressions but it was surprising how often, just when my Senior Engineering Officer (S Eng O) was about to rip out the last of his rather sparse hair covering, that all that had been promised would arrive. Money was the thing that made things move so it was local purchase to the rescue and in no time at all we had computers, colour copiers, vehicles and all the paraphernalia necessary to get things going. We started in-theatre flying training on 3 January 1991 to familiarise crews with the desert by day and by night and to hone out newly learnt air-to-air refuelling skills. Day by day, the detachment grew as new personnel arrived via increasingly exotic routes: from Hannover on a British Airways jumbo, from Gatwick via Athens and Jubail on the flightdeck of a decrepit Boeing 707, or from Frankfurt in the hold of a USAF C-5. But arrive they did and we were pleased to see them as our intelligence and mission planning organisation blossomed from a bare room with a telephone to be the hub of a semi-hardened operations centre with attached chemical-proof air raid shelters, all mod cons and room for future expansion, all set in a rather fetching car park!

It was just as well that we had some spare capacity for, just after I arrived on 2 January 1991, I learnt that six Tornado GR1A reconnaissance aircraft with nine crews were to be integrated into my detachment. S Eng O (by now, totally bald!) took the news rather well I thought, and the Reconnaissance Interpretation Centre, housed in several mobile containers, certainly filled that annoying space at the back of the car park.

My major concern as the UN deadline approached was still aircrew training, the spares supply situation and, most importantly if war was to start, the whereabouts of the Atlantic Conveyor II which had most of my weapon stocks on it. However, by 14 January, Al Threadgould's (OC II(AC) Sqn) Recce team had arrived, the ship was off-loading at Al Jubayl and my 'Bombers' had completed their in-theatre work up. Best of all, things seemed to be coming together in all departments and people were working well together with was always a concern with aircrew from seven squadrons and four different home stations and groundcrew and support personnel from a host more. Even the tragic loss of one of my crews in a training accident did little to slow our momentum. Indeed, if anything it steeled our resolve to see this thing through if called upon.

By now a few of us had been briefed on the overall plan and on our specific targets if UN Resolution 678 was to be implemented by force. It didn't take the brains of a rocket scientist to figure out what we would be going against and, as the deadline ticked past at 0800hr local on the 16th and we were ordered to cease flying training, load the aircraft and stand at several hours readiness, there was a definite air of tension about the place. Were we ready? Had we done enough training? How would we cope? But things passed reasonably quietly and by 1730hrs it looked as though nothing was going to happen that day. I drove back to the quarters I shared with OC No 9 Squadron (Wg Cdr Ivor Evans) and settled down with one of his cold beers (alcohol free, of course!) to watch CNN for an update on the political situation. 'Our man in Baghdad' seemed happy enough and, indulging in what

now was clearly wishful thinking, I speculated that Saddam was obviously going to start pulling out of Kuwait now that he had faced it out past the deadline. Ivor, however, was less optimistic. Almost as he had finished speaking, the telephone rang and my Operations Officer told me to come straight to work. He didn't need to tell me why and I've never doubted Ivor's judgement since!

The drive to the airfield was interesting. I thought there was something wrong with the

petrol until I realised that my accelerator foot seemed to have a life of it's own! Gp Capt Cliff Spink, the RAF Detachment Commander (DETCO) met me with a top secret signal which, in very few words, told us to go to war. A quick check of the plan showed that we would have to take off at about 0130hr local, some time before the official 'off', so that we could reach our target in time. This gave us three or four hours to get everything buttoned up and ready to go. By now the rest of my

formation had arrived and, after breaking the news to them, we busied ourselves with our preparations. We were apprehensive but there was no time to brood about it and, in any case, we couldn't tell anyone who didn't need to know about it. We filled the time by briefing ourselves to death: R/T procedures, tanking procedures, route details, target details, enemy (for that's what they had now become) defences, friendly forces, escape and evasion, and so on. It was a strange atmosphere because many of those around us did not know what we were about to go and do. Thus, there were amusing incidents like "If the Boss is going night flying does he want the aircraft weapons taken off?" and so on. But, then, it was time to go although, predictably, we went to our aircraft far too early and sat there in strained silence waiting for the minutes to tick by to our take off time. As soon as we were airborne things were a lot better. We were busy and there was no time to worry. We just got on with the job.

The sky was full of aircraft, the AWAC's radio channels nearly jammed with mission after mission checking in. This was history in the making and there we were, right in the middle of it all! It was all very exciting and, on top of it all, I think we sensed that, whatever the outcome, things would never be the same again. All too soon it was down to low level, lights off, across the border and

We had all hoped, of course, that Saddam would get the message very quickly and that he would soon be scuttling out of Kuwait. After a few hours sleep, I was back at the Squadron to see how things were going and to brief the next formations on our experiences of the previous night. From here on in it became a bit of a juggling act to make sure we spread the load evenly amongst the aircrew, got the missions flown and still ensured that there was sufficient rest for all. The 'Reccies' were off to a very good start and found a Scud launcher on their first sortie which was magnificent, but we were all concerned as Tornado losses started to mount. These were all friends and

Left (top): 'Delta Kilo' prepares to leave Bruggen for Dhahran early in January. PRM Left: Huge JP233s positioned under the centre-section of the Tornado GR1. Andy Glover Below: Fighter support came from F-14s, F-15s, F-16s, F-18s and Tornado ADVs like this RSAF aircraft. BAe

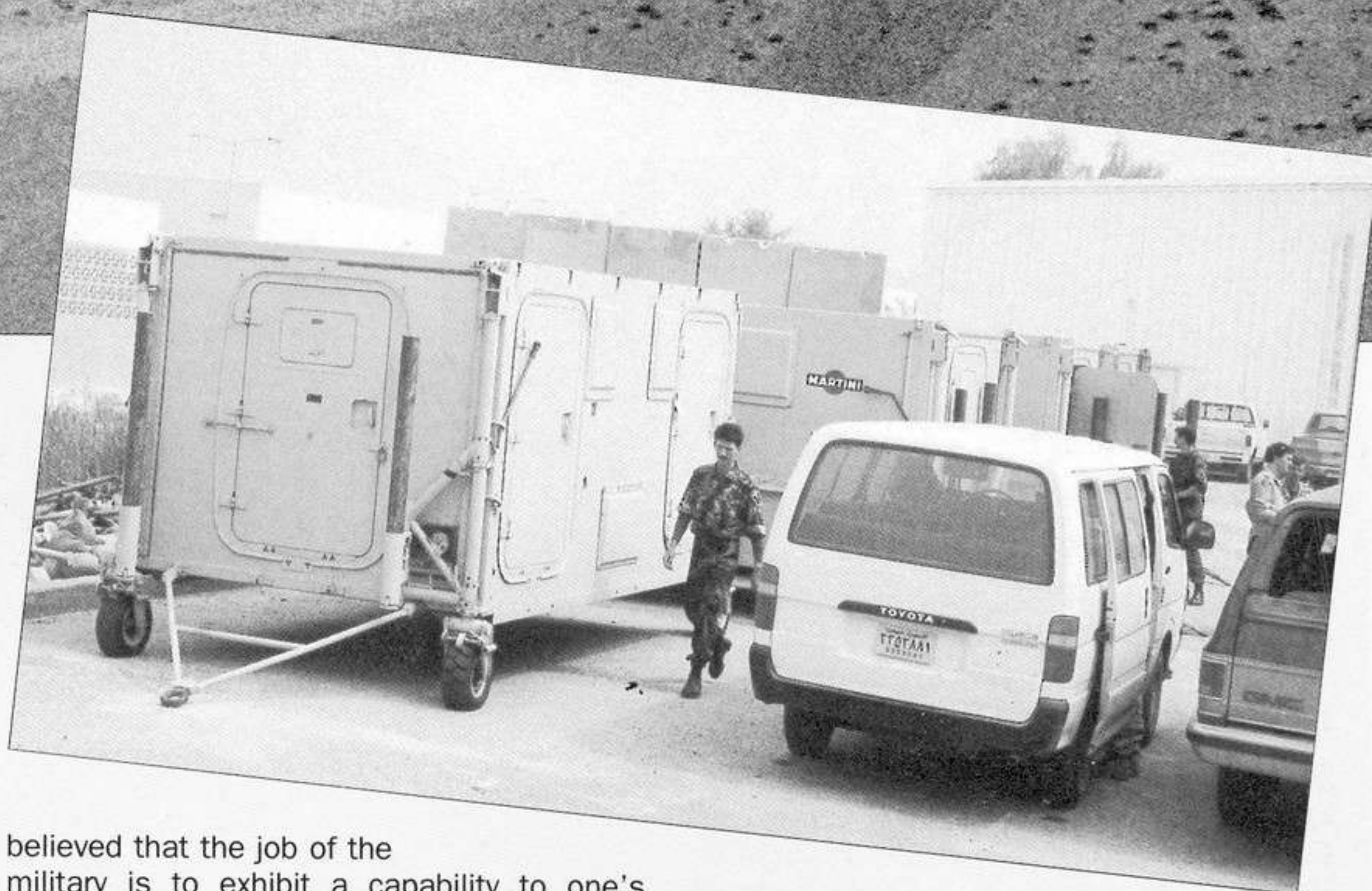




Above: With laser designation from the Buccaneers, less bombs were needed for precision bombing of targets like these HASS on Al Salman airfield, Iraq. Right: The RIC 'filled the annoying space at the back of the car park'. No 31 Sqn

colleagues and it mattered not which squadron or detachment they came from. Thankfully, we were obviously having a lot of luck and despite a few bullet holes the Team kept coming back. We were definitely not amused when S Eng O said he was glad that the battle damage repair teams now had something to do! Most of the nights were punctuated by Scud alarms and we all got very good at sleeping with our gas masks on. Our GDT instructors would have been proud of us! We were certainly very proud of our resident US Army Patriot batteries and we all became life members of the Patriot fan club. Perhaps Raytheon can now develop a quiet version that doesn't give you a heart attack every time it's fired!

After not a little discussion and heart searching it was decided that we should start operating at medium level around 20,000ft. The Iraqi Air Force was not taking part in the war so we could operate more freely than had been expected. It also allowed us to integrate ourselves more closely with the defence suppression forces and with the available fighter escorts. It was remarkable how easily we all worked together and on a typical mission we would be supported by two EF-111 Ravens, four F-4 Wild Weasels from the USAF and by F-14s, F-15s, F-16s or F-18s from the US Navy, US Marine Corps, USAF, Canadians or the Royal Saudi Air Force. On every sortie we were refuelled by RAF TriStar, Victor or VC10K tankers who quickly established a reputation for reliability and to whom we owe a great debt. Our targets were changing too. Gradually, we moved away from the airfields and started to attack industrial targets such as oil refineries, oil storage facilities and power stations as well as ammunition dumps. No one, least of all those who have flown in war, exults in destruction but it would be untrue to say that there isn't some cold satisfaction in seeing a target blow sky high having beaten the defences to get there. I've always



believed that the job of the military is to exhibit a capability to one's potential enemies such that they are deterred and war is avoided. Actually having to fight, although the ultimate expression of our determination, is in some sense a source of deep disappointment. It was with this in mind that we gained any satisfaction from the results we were achieving. We took great heart from General Schwarzkopf's attitude "that if we had to fight we were going to go in hard and decisively." That was the way it seemed to be going, although I don't think anyone at my level was expecting the air war to go on for quite so long. Now, of course, we know the reasons but, at the time, my concerns centred on sustainability. We were using up our bombs at a fair old rate and the aircrew were getting pretty tired. The aircraft were standing up magnificently, but not without a great deal of hard work from our groundcrew.

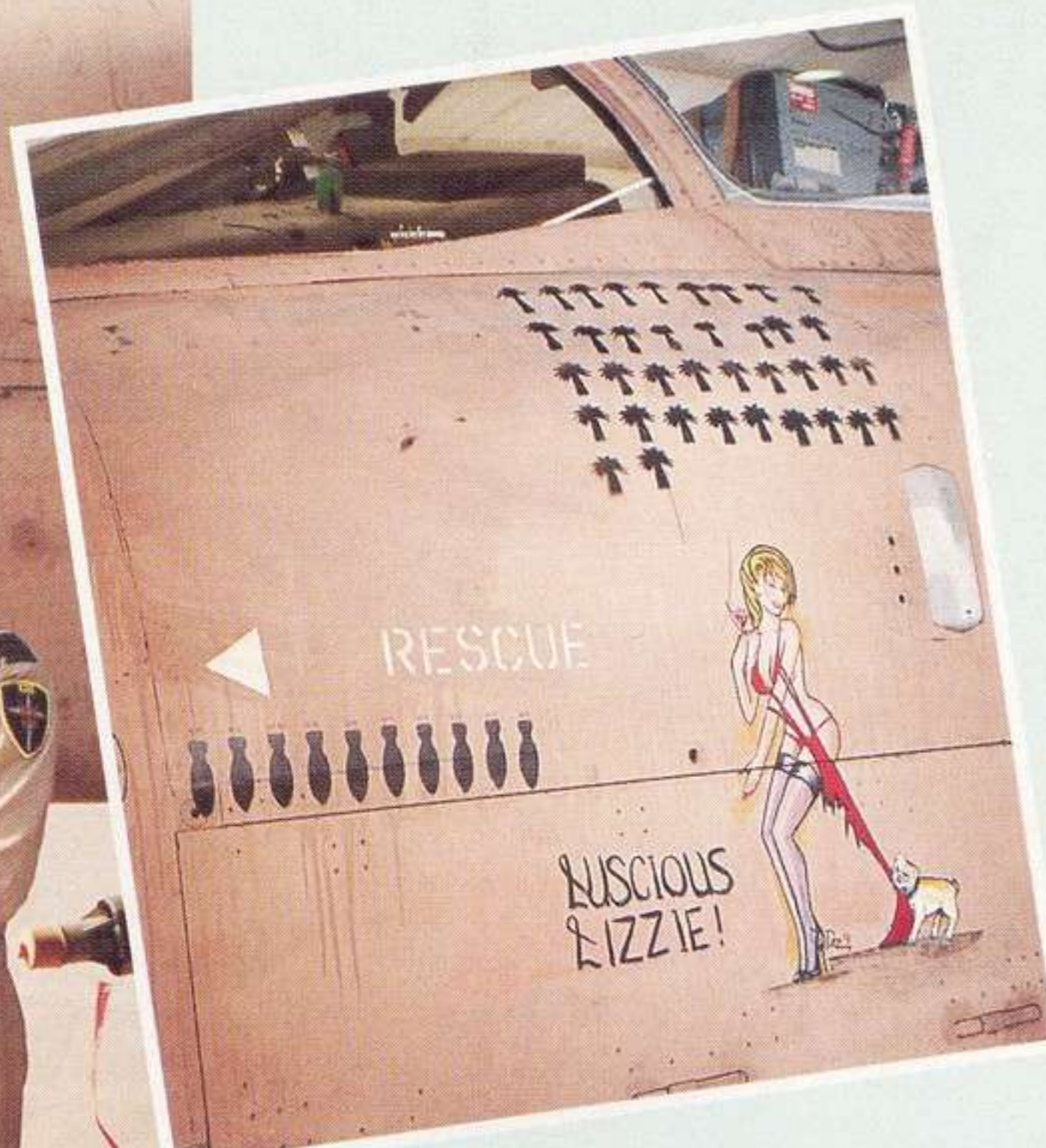
As the war progressed the 'Reccies' stayed on night operations but the 'Bombers' moved to daylight sorties and we began to carry out most attacks with laser-guided bombs with designation carried out by the worthy Buccaneers. This answered the problem about weapon usage; we just didn't need to drop so many to achieve the required accuracy. The rate of sortie tasking had also settled down so that I could introduce a fairly settled routine for the aircrew. I came to recognise that there were two distinct types of fatigue: the normal short term result of physical exhaustion and a longer term, more insidious tiredness which is perhaps the result of sustained pressure and stress. However, with regular routine this seemed manageable and, certainly, the aircrew could

probably have gone on for some time long after it all finished. But no-one was disappointed when the land campaign started and achieved such rapid and spectacular results. It was a very happy Wing Commander who woke up one morning to find Ivor Evans' note pinned to my door:

'Bush declares cessation of offensive action. Last one at Brüggen's a cissy!'

The six weeks of war now blur in the memory. Twenty-one Scud attacks and as many false alarms. The losses, the POWs. The hits and, not too often, the misses. The fatigue, frustration and fear, the exhilaration and excitement. Mission by mission, target by target we were part of a massive, unstoppable force. Old myths were dispelled and new tactics evolved. Long held beliefs dismissed in a moment as the situation changed, like so many sacred cows slaughtered without a thought. All to be replaced by new truths and the fundamental rule that 'if it works and it keeps you alive, it's good!' Through it all, the ups and the downs – and there were plenty of both – there was a constant feeling of massive support from home. Hundreds, thousands of letters from the whole spectrum of society. From the USA, Canada, France, Australia, Italy, South America, from all over the world, people sent their best wishes and their appreciation for what we were doing. It was very gratifying, not to say humbling, to know that people cared.

So, for us all, a whole host of memories. My own will always include the simple bravery and fortitude of our families back at home. The sheer guts of the 'plumbers' loading



'Bombers and Reccies' at Dhahran. From left to right: Wg Cdr Ivor Evans (OC IX Sqn), Wg Cdr Jerry Witts (OC 31 Sqn), Wg Cdr Alan Threadgould (OC II (AC) Sqn) and Wg Cdr Glenn Torpy (OC 13 Sqn). Inset: The OC 31's Tornado aircraft 'Delta Bravo' was adorned by Luscious Lizzie and appropriate mission markings. No 31 Sqn

bombs as bits of Scud rained down. Watching young, inexperienced aircrew grow so quickly into seasoned campaigners. The sheer professionalism of everyone and, most of all, the feeling of immense personal privilege to have shared such company and to have commanded such people.

All that and, of course, the fact that AJ, my navigator, once called me an idiot!

Wg Cdr J J Witts MBIM RAF is Officer Commanding No 31 Squadron, RAF Brüggen and was Officer Commanding Tornado GR1/1A Detachment, Dhahran, Saudi Arabia from 3 January 1991.

DHAHRAN TORNADO GR1/1A DETACHMENT

OPERATIONAL SORTIES AND MISSIONS FLOWN

Type	No sorties [%]	No missions [%]	Combat flying hours
OCA/Interdiction	439 [78]	88 [49]	1437hr 40min
LGB	205 [36]	55 [30]	
Recce	123 [22]	92 [51]	280hr 05min
Total	562 [100]	180 [100]	1717hr 45min

Ordnance expended: JP233 x 14, 1000lb bomb x 1,045, 1000lb LGB x 288, 27mm ammunition x 185, IR Flares x 310, Chaff x 21,330 bundles.
Fuel taken: 5,921,880kg (2,227,500kg during AAR)



Left and below: Homecoming. Tornados 'CN' (Miss Behavin) and 'CE' arrive back at Brüggen on 16 March after the long non-stop flight from Dhahran. Val March



SCUDBUSTERS

*Paul Jackson describes
the combat debut of the
Tornado GR1A*

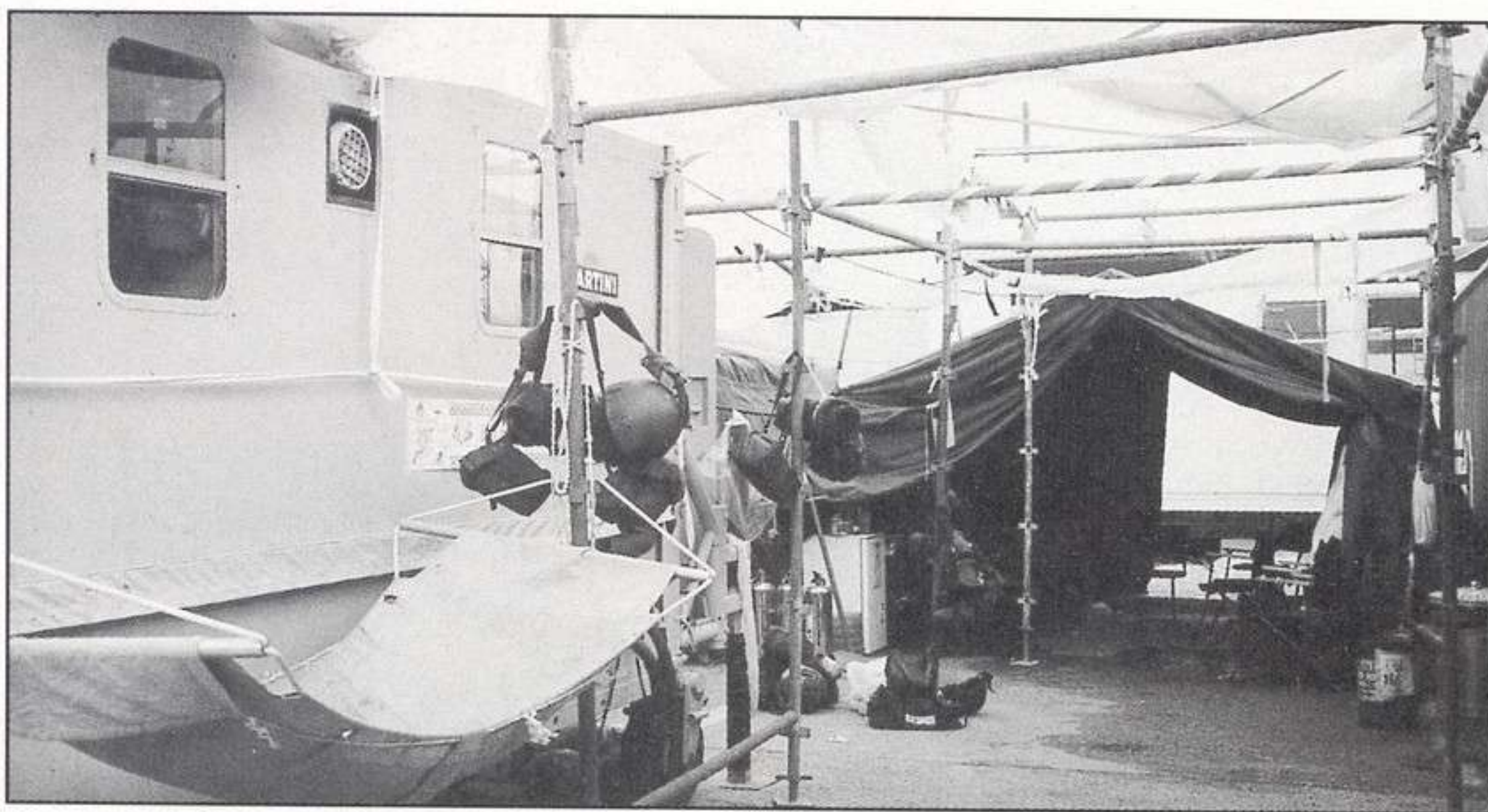
Since it entered RAF service, the attack version of Tornado has been designated 'GR' to indicate its **G**round attack and **R**econnaissance capabilities. The appellation is not quite correct, for the all-weather reconnaissance system was a later addition to the force, involving modification of 16 early aircraft to GR1A standard for No 2 Squadron at Laarbruch, Germany, and new manufacture of a further 14 for No 13 Squadron at Honington. The combined recce unit which operated in the Gulf theatre during January and February achieved notoriety as the *Scudbusters* yet its success was far from assured when it departed Europe a mere couple of days before the start of hostilities.

The Tornado GR1A represents a major departure from standard recce practice in dispensing with traditional film. All its images are recorded on video tape from sensors which can operate at night with no artificial form of illumination. Beneath the forward fuselage is the aperture for a Vinten 4000 horizon-to-horizon infra-red linescan, whilst on each side, ahead of the air intakes, are BAe side-facing infra-red sensors to provide a less distorted view of the middle-distance. Six video recorders complete the package, which fills the compartment normally occupied by two 27mm cannon. Because of development delays, No 2 Squadron only began receiving Tornados in September 1988 and No 13 formed from new in January 1990 – at which just eight Mk1As in the whole RAF had the recce kit installed.

Warning of impending Gulf transfer was issued to both squadrons within days of the Iraqi invasion of Kuwait, but the necessary upgrading of equipment took time, resulting in the target date being changed on several occasions. Six aircraft, all from No 2 Sqn, received a special programme of modifications devised by Computing Devices Co and known as *Granby 2*. This improved reliability is likely to be adopted as a retrofit for the whole fleet, but the imagery still was not wholly satisfactory, and it was only by the skill and patience of the dedicated photo-interpreters at the accompanying Reconnaissance Intelligence Centre (RIC) that the maximum information was wrung from each image. *Granby 2* was trialed between Christmas and the New Year, No 13's personnel not getting their hands on it until they flew to Laarbruch for two familiarisation sorties per crew on 8 and 9

Left top: *Desert imagery – taken directly from a VTR screen – of a night image from the Vinten 4000 infra-red linescan, showing an Iraqi trench position.*

Left: *Two Iraqi Scuds photographed on their launchers from the GR1A's side-facing infra-red cameras at low level 'somewhere in Iraq'.*



The makeshift reconnaissance intelligence centre at Dhahran. No 31 Sqn

January 1991.

Moves towards the Gulf began on 13 January when four crews led by Wg Cdr Glen Torpy left Honington by Hercules for Laarbruch, there to join five from No 2 Squadron under Wg Cdr Al Threadgould. The following day, the Hercules flew on to Dhahran, Saudi Arabia, with the RIC team and two crews, whilst Tornados ZA371, '372 and '373 made the eight-hour non-stop flight with the aid of Tristar refuelling. Two GR1A test flights from the Saudi base on 15 January produced acceptable imagery; further GR1As ZA370 arriving that day, followed by ZA397 and 400 on 16th.

First notification that the war had begun came in the form of an early-morning alarm call for crews at 0400 local on 17 January, when a false air raid warning sounded. No suitable tasking was received from the recce cell at Coalition HQ in Riyadh and the day passed without further incident for the detachment.

Procedure was for the recce cell to sift the requests from 'customers' at an early evening meeting and assign them to the most appropriate aircraft: TR-1, J-STARS (E-8A), RF-4C Phantom, F-14/TARPS and other systems. As a result, whilst the bombing Tornados received 24 hours notice of missions, their reconnaissance compatriots learned where they were going a mere two or three hours before

take-off. Without exception, Tornado GR1A missions were flown at night, even after the bombers ventured out in daylight, and only a couple of late sorties landed just after the sun had risen.

A priority for the Coalition was to eliminate the Iraqi mobile launchers for Scud surface-to-surface missiles. Moved from cover only at night, these elusive terror weapons were militarily insignificant. Their political effect could not be under-estimated, however, for those launched against Israel might have provoked a retaliatory attack on Iraq and caused Arab members of the Coalition to re-assess their position. The first three missions for the Tornado GR1A were all to be *Scudhunts*.

Wg Cdr Threadgould and navigator, Flt Lt Tim Robinson were first away from Dhahran in ZA397. Because no tanker aircraft was available, the Tornado carried a pair of 495-gallon (2,250-litre) drop-tanks under the wings and two 330-gallon (1,500-litre) tanks beneath the fuselage, more than doubling its internal fuel capacity of 1,400 gallons (6,364 litres). When lifting off the runway at a weight of some 26 tonnes, the GR1A was carrying 11 tonnes of fuel.

This first sortie was far from routine in more senses than one. Approaching the target area in western Iraq, Threadgould released the belly tanks, as normal, only to discover, with some alarm, that the wing

drop-tanks had come out in sympathy and were refusing to feed. With an anticipated fuel state of 924 gallons (4,200 litres) in the aircraft over target suddenly slashed to 374 gallons (1,700 litres), the detachment leader had no option except a rapid dash for the border, also jettisoning the reluctant, half-full big tanks to save weight and drag. Superb assistance from the ever-present patrolling E-3 Sentry AWACS allowed the Tornado to divert safely to King Khalid Military airfield, near Hafr al Batin, after 1hr 55min in the air.

More fortunate, in that they completed their missions successfully and almost without incident, were Sqn Ldrs Dick Garwood and Jon Hill flying ZA400, and the first No 13 Squadron crew, Flt Lts Brian Robinson and Gordon Walker in ZA371. The pair brought back images of a Scud launcher in firing position, but their elation at this early success was muted by the fact that weather prevented attack aircraft from destroying it. As a result of the publicity surrounding the GR1A's first operational missions, the popular press awarded the recce detachment the epithet of *Scudbusters* and a hard copy of the imagery was produced at an MoD press conference in London on 20 January.

Said Garwood, "It was a very, very black night; probably one of the darkest I have flown on. Once you get out over the desert, especially over Iraq, there are no lights on the ground. You are flying very low. We saw the odd Bedouin encampment flash by on the left-hand side of the wing". On arrival at Dhahran, the aircraft was found to have a single flak hole in the top of the rudder.

With the exception of a few urgent missions flown with four drop-tanks because tanker support could not be organised in time, Tornado GR1s externally carried only the normal under-wing complement of two tanks (495 gallon, instead of the 330 gallon units used at home), a Sky Shadow electronic jamming pod and a BOZ-107 chaff and flare dispenser. Usual operating altitude was 200ft (61m) with 'hard' ride selected on the terrain-following radar and at speeds between 540 and 580kt (1,000 – 1,075km/h). Most sorties were of two and a half to three hours duration, involving 20 to 60 minutes over Iraq. The longest, of four



Two of the six GR1As at Dhahran early in the air war at daytime rest. Stuart Black

hours 25 minutes, was a *Scudhunt* flown on 24 January by Flt Lts Rick Halley and Angus Hogg of No 2 Squadron in ZA371.

By dividing the nine crews (reduced to eight on 31 January by illness) into three shifts of three, the recce detachment was able to mount up to six sorties per night without over-taxing personnel. Early wave was on stand-by between 1500 hr one day and 0300 hr on the next, whilst late wave covered 2100 to 0900 and the third shift (the previous day's late wave) was resting. Maximum capability was not used early in the campaign, and on some nights (19 January and 4 February) there were no operational tasks flown. A normal sortie might involve three or four line-searches – a strip of road or a section of river – the routes between which had to be planned to avoid known defended areas. Pinpoint targets were visited for pre-or post-attack examination.

No missions were flown to Kuwait, although most of the remaining war theatre was covered. *Scudhunts* were concentrated in western Iraq (near H-2 and H-3, close to the Jordanian and Syrian borders). In preparation for Gen Schwarzkopf's bold left-hook into Iraq at the start of the land campaign on 24 February, the central southern region was constantly surveyed for evidence of military movements and laying of minefields. Heavily-defended Republican Guard positions were reconnoitred for command and control vehicles which would be singled-out for later attack, whilst bridges over the Euphrates were assessed for damage after they had been struck with laser-guided bombs. In the final days of war, retreating traffic on the Kuwait-Baghdad road also came under the GR1A's electronic eye.

As evidenced by events on the first mission, the defences were not idle. The Tornado's radar homing and warning receiver announced many lock-ons by radars attached to AAA and SAM batteries, whilst shoulder-held SAMs were launched without effect. Most AAA was optically guided, however, and fell ineffectually behind the Tornados as they sped through the desert darkness. Aircraft invariably undertook their tasks alone, but it was normal procedure to launch two or three at a time, and for them to proceed in different directions only after leaving the tanker.

Regular thunderstorms throughout the

campaign forced re-routing of missions to avoid cloud, and also obliged the tankers to re-position their refuelling tow-lines. The GR1 bombers, heavy with JP233 dispensers, would normally take fuel at the lower than usual altitude of 10,000ft (3,050m) when outbound, whilst GR1As refuelled down to 3,000ft (914m) when dodging the worst weather. Pilots were issued with night-vision goggles, but as few had used them before, their value was limited when over enemy territory – although they were useful for finding tankers under conditions of radio silence.

Despite low Coalition casualties, the dangers of a war-zone were brought home to aircrews on the evening of 25 February when victory was but three days away. A temporary US barracks 800 yards from the BAe compound in which recce personnel were staying was hit by a Scud, which killed 28 newly-arrived US National Guardsmen and injured many more. That night, the detachment undertook its final five missions, all of them successful. Last to land, 40 minutes into day-light on 26 February, was Flt Lt Mike Stanway and Sqn Ldr Roger Bennett of No 13 Squadron, flying ZA397.

Since arrival, the six GR1As had flown 128 night operational sorties totalling some 300hr. Reconnaissance achievements are far more difficult to quantify than simple bombing hits or misses, but the recce detachment had undoubtedly contributed in its own way to the complete success of *Desert Storm*. Assessment of road traffic and bridge damage helped commanders to

decide tactics and the right moment for the final attack, whilst the lightning advance by US and French ground forces towards Al Nasiriyah could only be made at speed with advance knowledge of possible obstacles. That the Scud eluded total subjugation should not be regarded as a failure of the Tornado GR1A, for many other sensor systems were also involved in the search. Unlike Scuds, needles in haystacks have the common courtesy not to move their position every hour or so.

Above: Infra-red image of an Iraqi logistics area, showing vehicles and buildings. Below: Six Tornado GR1As were specially modified (*Granby 2*) and given a coat of desert pink ARTF. RAFG



An Engineer's view – Sqn Ldr George Baber

I looked out of the window of the Kuwait Airways 747. As the aircraft banked the pink of the desert was replaced by the blue of the Gulf and Dhahran airfield slid into view. Had I really been standing in RAF Gibraltar's Officers' Mess 30 hours ago? It all seemed so distant – even that never-to-be-forgotten terse message from Lossiemouth telling me "To be back at base by midnight".

When the call came from Lossiemouth both Buccaneer squadrons were detached: No 12 Sqn in Gibraltar working up RN ships deploying to the Gulf and No 208 Sqn at RAF St Mawgan participating in a Maritime Exercise. The rapid recovery of both squadrons back to base was impressive for both its speed and efficiency. Whilst I was completing my own rushed journey, Lossiemouth had moved into frantic overdrive; the engineering team preparing aircraft and support equipment for service in the desert; the supply staffs gathering the vast range of spares and kit required and packaging them in Hercules aircraft sized loads; the administrative staff pushing personnel through medical, kitting and training centres, ensuring all were ready for life in a war zone. The most visible evidence of the intense activity was the sudden appearance of pink painted Buccaneers, with overload fuel tanks, AIM-9L Sidewinder air-to-air missiles and our 'raison d'être' – the Pavestrike laser-designator system, slung beneath their wings. Less obvious modifications included Have Quick II secure radios, Mk XII Mode 4 IFF, changes to the existing Marconi Guardian RWR and activation of the AN/ALE-40 chaff and flare system. Those aircraft that did not have TV tabs fitted in the rear cockpit had them re-fitted.

My arrival at Muharraq was almost as traumatic as my departure from Gibraltar. To arrive at an air base already at war, to see the ordered bustle and the complex jig saw of aircrew and aircraft preparation, was intimidating. I was the 'advanced party' for the Buccaneers and with a little over 24 hours before aircraft, personnel and equipment would tumble out of the sky upon me. The hurdles to cross were many - where to disperse aircraft on an already over

GRANDMA'S WAR

Engineer, pilot and navigator go to war with the Buccaneer in the Gulf.

crowded airfield? Where to sleep personnel? Where to store equipment? Where to site component workshops? Where to put the aircrew and their flying clothing? – the list occupied pages in my 'notebook'. With the impressive 'can do' attitude of all at Muharraq, each line of the list was scored out as completed with surprising rapidity. During the afternoon of Saturday 26 January 91, the first Hercules started disgorging its load of journey weary troops and hastily painted equipment. This was to be the first of 14 Hercules flights. During the next seven days 170 Lossiemouth personnel and almost 500,000lb of freight would arrive. That evening, with great relief and greater pride, I met the first two Buccaneers to deploy. 'Grandma' was to go to war for the first, and probably last, time since this aircraft rolled from the production line. The initial deployment was to be six aircraft but after the success of early operations this was increased to the full squadron size of twelve aircraft and the number of detached personnel eventually grew to 230.

That first week tumbled by as we gathered our engineering organization together, unpacked equipment and generally sorted ourselves out. Home for the engineers was to be a couple of rapidly installed

Portacabins, whilst a small hangar served as an all purpose stores and workshops. Aircraft parking was a major headache; the airfield was packed not only with RAF but also with US jets. Cover pink desert with black tarmac was to be the solution and this was completed in amazingly quick order. To provide some form of protection from air raids or Scud attacks, the Royal Engineers erected large, 20ft high concrete walls around each pair of dispersed Buccaneers.

By the middle of the first week in-theatre training, familiarisation and tactic development sorties were being flown. The momentum grew, with an increasing number of sorties being flown each day, until on Sat 2 February – seven days after our arrival in theatre and only ten days after the order to deploy – the first and successful joint sortie with four Tornados from Muharraq destroyed the Al Samawah road bridge in Iraq.

Just before dawn, the aircrew flying the first sorties of the day would arrive at the jets. The routine and familiar bustle of the groundcrew preparing the aircraft for flight must have been a comfort to them. Nevertheless, the anxiety, even fear, was evident in their words and manner. The way they coped with their daily foray into danger commanded my utmost respect and

Pink-painted Buccaneer S2B with AIM-9L Sidewinder and Pave Spike laser designator. Bob Archer



Below: 20ft high concrete blast walls were erected by the the Royal Engineers, but they didn't prevent the flooding when it rained ! Stuart Osborne



The Al Nasiriyah road bridge across the Euphrates River, 90 miles NW of Basra on the Iraqi supply route to Kuwait, was successfully attacked by laser designating Buccaneers and LGBs dropped from Tornado GR1s. Left: Pavé Spike laser designation – target as seen on the navigator's screen. Right: Pilot's eye view of the bridge as the Tornado's bombs hit their target. Dave Bolsover

admiration. They would clamber up the ladders to their cockpits, the jets would come alive as the engines provided hydraulic and electrical power to controls and instruments, and then slowly they would lumber out of sight on their way to the duty runway. As a night worker I never saw them return nor shared in their relief in still being alive or their exhilaration of completing a difficult mission well; I wish I could have. As it was, all I wanted was for all twelve aircraft to be sitting safely on the pans when I next arrived at work.

Pilot's View – Squadron Leader Mike Scarffe

The war missions flown by the mixed formations of four Tornados and two Buccaneers were fairly tense affairs. The targets were often more than 200 miles behind enemy lines and were often defended by anti aircraft artillery (AAA) and surface to air missiles (SAMs). The tension of planning, briefing and walking to the jet was only broken by the marvellous intelligence staff with their sardonic sense of humour and uncanny knack of raising a smile from a grim

looking bunch of aircrew with an uncertain future. The sorties were generally of between three and four hours duration, with air-to-air refuelling before crossing the Iraqi border, or 'sausage side' in the adopted and much loved jargon of Blackadder.

The straight and level release of LGBs worked well for the Tornados and the targets were picked out and marked by the Buccaneer crews with gratifying results, as seen on TV around the world. However, what the TV audiences did not see were the times when the weather was so poor that the target could not be seen from the air. An unfortunate number of sorties were source for little more than frustration for the aircrews who flew them. Generally, when the weather was good the results were good. Twenty four bridges were hit by 169 LGBs and destroyed completely or rendered unusable and 15 Iraqi airfields were hit hard, along with various other targets of military significance.

The freedom to operate at medium level anywhere in Iraqi airspace was provided by the omnipotent presence of US military air

power in the Gulf. The US air assets deserving particular mention for their support of Buccaneer operations were the F-4G *Wild Weasels*, the EF-111A Ravens, the F-15 Eagles and of course the ever present E-3 Sentry aircraft. Despite the puny efforts of the Iraqi Air Force during the first two weeks of the air war, the E-3 radar operators were able to make the comforting call of "Picture clear", with superb monotony. It was down to the almost complete air-supremacy over Iraq that, during the build-up to the ground war, the Buccaneers were able to linger over the target area after the Tornados had dropped their LGBs and carry out self-designated high angle dive deliveries of their own LGBs. Although only approximately 50,000lb of bombs were dropped by the Buccaneers this contribution to the total war effort represents a fitting climax to the career of a wonderful aircraft.

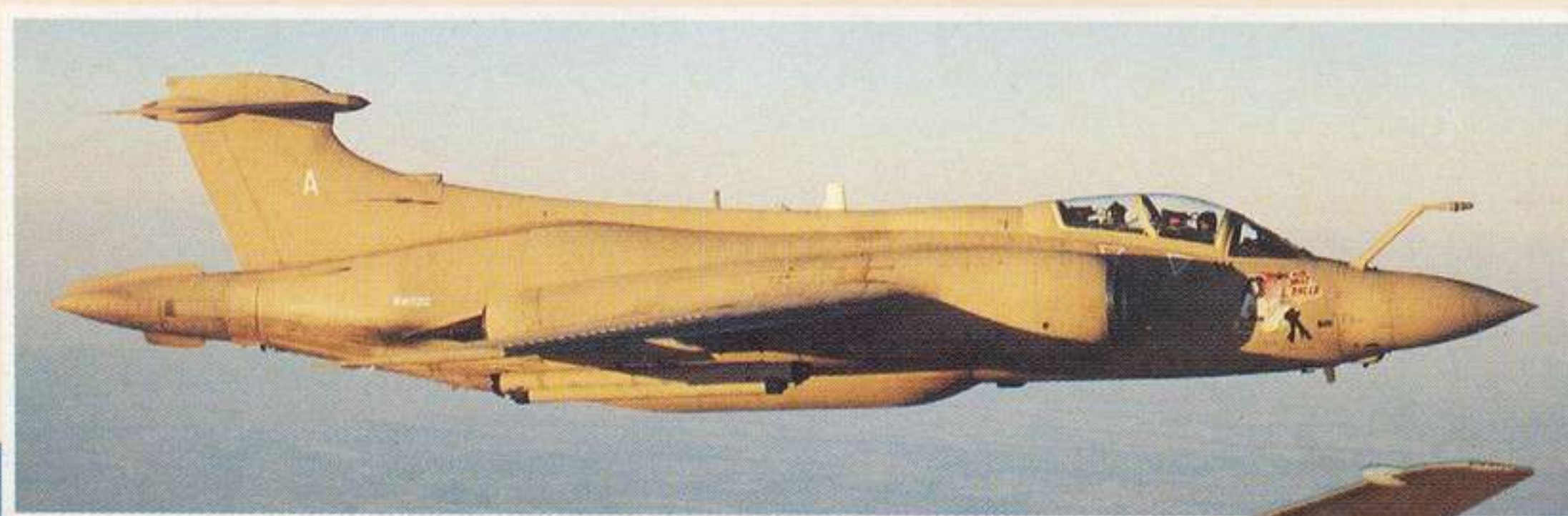
Navigator's View – Squadron Leader Russ Hall

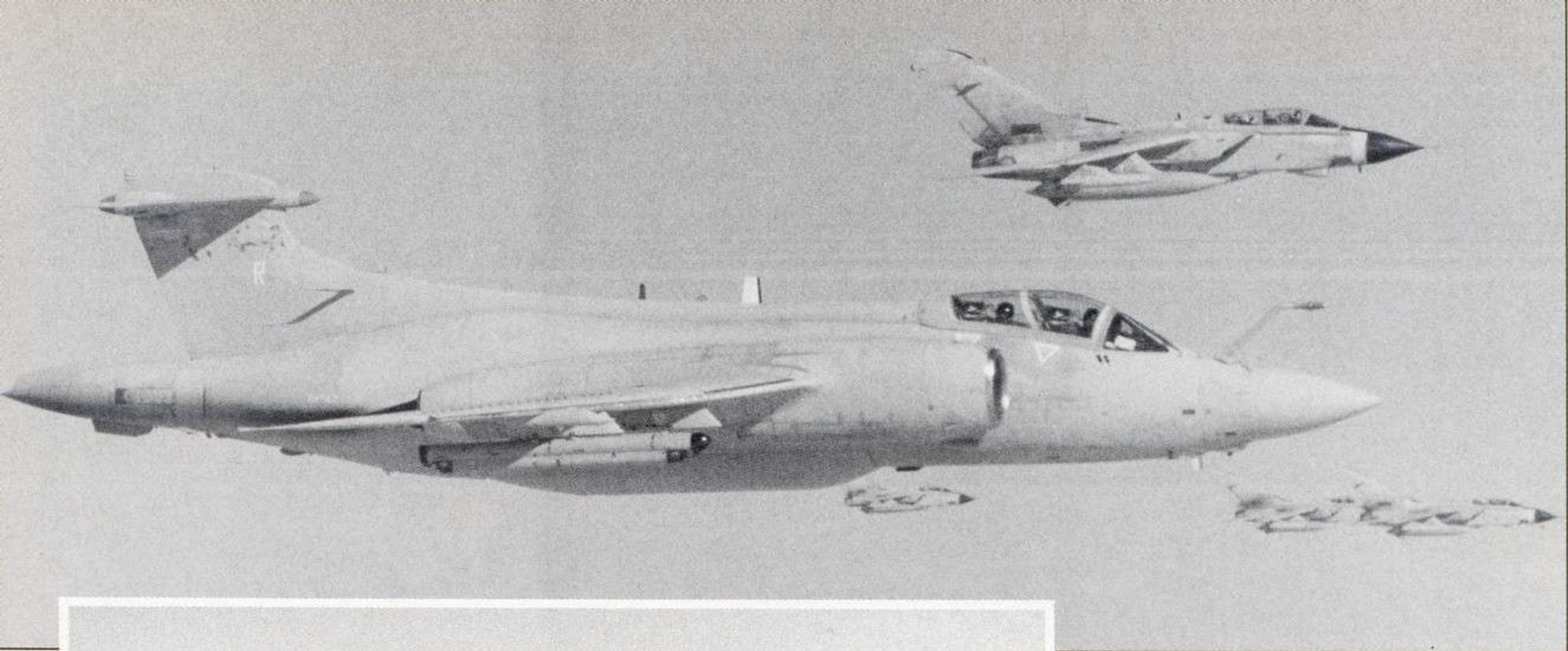
Although Bahrain is a civilian airport practically all civilian flying had stopped and the airfield was alive with Jaguars, Tornados,

Left: Mission complete, then it was a quick turn and a fast run home. Nick Wilcock

Below: After take-off the first priority was to find the tankers. Here a No 55 Sqn Victor K2 tops up a Sky Pirate. Stuart Osborne

Inset: It was hard work for the navigator when the Buccaneers started to carry an LGB as well. Dave Bolsover





Top and above: Buccaneers and Tornados heading back to Bahrain after the successful completion of another mission. N A Bishop

visitors and numerous British and American transport aircraft. Lesson one – always walk to your aircraft in plenty of time so as not to get caught in the ‘traffic jams’ and miss your take-off time. The airfield was guarded by missile batteries, both British and American, although you could not see them, they could be easily heard on the Radar Warning Receiver (RWR). Lesson two – ensure that the IFF was working and that you knew the back-up procedures, after all you did not want to get shot down by your own side on the way home. Once away from base we came under the ever watchful radar of the American AWACS, and we talked to them consistently. Lesson three – learn the correct terminology, to prevent creating too much misunderstanding between the Americans and us. So it went on, the lessons innumerable, the learning curve incredibly steep and yet at the end of the week we were ready for our first operational sortie.

Each crew had completed several training sorties. Some just as Buccaneer formations, others with Tornados to prepare us for the operations. There has always been a bit of good hearted rivalry between Tornado and Buccaneer crews, but we got on well together, learnt a bit from each other, and made a very effective team. So much so that the result of the first mission was a resounding success, the first of many bridges destroyed, all aircraft back safely and a huge increase in morale. This set us up for the rest of the war.

As the flying got more regular, usually five or six waves of two Buccaneers and four

Tornados per day, life began to set into some sort of pattern. We would arrive at work, change into flying kit, collect our personal weapons and head for the intelligence section for our brief. This would include the results of the previous day’s missions, from all bases, and any other significant developments in the theatre. It then carried on with AAA and SAM reports and finished off with a general assessment. The whole brief usually took half an hour then it was off to the planning room to finish the route work. The majority of the planning had been done the day before. The route having been worked out to take into account defences, target and time of day. This was checked with the new intelligence, on defences and SAM launches, before being finalised and passed to the rest of the crews. Once all the crews, both Tornado and Buccaneer, were satisfied the timings were added and the whole lot passed on to the Support Package. This consisted of tankers, fighters and defence suppression, in the form of F-4 *Wild Weasels* and other ECM aircraft, all of whom played a very significant part in the success of the mission.

When the planning was over, time for a quick cup of coffee and then into pre-flight briefing. All crews went to the brief which covered in depth all aspects of the mission, from walking to the aircraft until the landing back at base. This made certain that no one was in any doubt as to what was happening at each phase of the mission. Because of this the brief was quite a long affair but once everyone was happy it was off to int again.

This time it was for any last minute updates and to collect the escape and evasion details for the sortie (included in this was a piece of paper well loved during the last war, that promised to pay the bearer a lot of money if this particular airman was returned with all his *working parts* still in working order. Then it was out to the aircraft readily for the sortie.

After take-off the first priority was to find the tankers, Victors or VC10s and they would stay with the formation until the cast off point in Saudi Arabian airspace. Once they had seen us off they would go to a predetermined RV and wait for our return. Once off the tanker the formation would settle down on a northerly heading and make for the border. The formation was normally two three ships, two Tornados and a Buccaneer, at a predetermined interval to ensure that there would be no laser interference between elements.

The formation would then change over to the AWACS frequency and check in with the rest of our support package. Then wait for the ‘magic’ words from the AWACS, ‘Picture Clear’, meaning no hostile contacts – very reassuring. About this time the radar warning receiver would start reminding us that the Iraqi radars and SAM sites were still active. Once this happened it was a question of talking between front and back seat and between aircraft and constantly moving and dropping ‘chaff’, doing our general best to confuse any information that the radar operator was trying to get. This constant listening, talking and moving would continue all the way to the IP then ‘eyes out’ fell mainly on the pilot as the navigator diverted his attention to the Pavespike TV screen.

The TV screen is on the floor between the navigator’s legs and takes up most of his attention during this critical phase. Once the pilot has set the Nav onto the target, and the Nav had positively identified it on the TV screen, a ‘Happy’ call was given to the bombers, meaning clear to drop. Then all the concentration in the back seat went into keeping the ‘cross hairs’ on the target. Sometimes it was a single target for both bombers in an element, in other cases each aircraft had a different target, requiring the Buccaneer Nav to change targets and start tracking the new one before the second bomber released its bombs. In either case the result was usually the same, a direct hit. We can’t claim a 100% success rate, but the hit rate was very high indeed.

After a while the Buccaneers started carrying and releasing their own bombs. This,

on occasions, meant the Nav was 'spiking' three different targets on the same trip. A tricky task but one that gave great satisfaction when all the bombs impacted in the right place. All the time the Nav was working on the screen the pilot was keeping his eyes open for AAA and SAMs and once the last bomb impacted setting the heading back for the border.

Now came the seemingly longest part of the mission, the run out to the border. It was invariably quicker going out but it seemed twice as long. The relief at getting away from the target, yet still looking and listening and making sure that the other aircraft in the formation were clear. While we had been

locked in our own little world we could listen to the other missions talking to the AWACs. Although, apart from the odd occasion, you never knew how successful they had been, it was reassuring to know they were there.

Then it was over the border and home. The Buccaneers didn't need the tanker going home so it was as fast as we could heading for Bahrain and not forgetting the missile engagement zones around our own airfields. Once on the ground it still was not over, endless debriefs, intelligence reports, battle damage assessment, tactics, formation – the list was endless. Then when it was all over, food and back to your room, a second debrief on the way, and check on the target for

tomorrow's mission when the cycle started all over again.

We had all trained for something like this in a superb aircraft, the Buccaneer which was ideal for the job. With hindsight, I will not say it was enjoyable, but I would rather have been part of *Desert Storm* than anywhere else.

Buccaneer/Tornado Operations (from 2-27 February 1991)

24 bridges and 15 airfields attacked
218 Missions flown
169 LGBs dropped (48 by Buccaneers)
678.5 Flying hours



Some of the Gulf aircraft's most exotic nose art appeared on the Buccaneers at Bahrain. 'Miss Jolly Roger' is featured on the front cover. Other 'pin-ups' were: 'The Flying Mermaid'-'Kathryn' on XX901/N, 'Sea Witch'-'Debbie' on XV863/S (both Dave Bolsover), 'Guinness Girl'-'Pauline' on XW547/R and 'Jaws'-'Lynn' on XX895/G (both Alan Carlaw). The red bombs denote an attack by the Buccaneer itself. The red aircraft on XX901 represents one of two An-12s bombed at Shayka Mayhar and destroyed on 27 February, as seen on the 'Spikers' screen (above).



'Sea Witch' under the shelter at Muharraq, bombed up ready for another airfield attack during the final days of the air war. Stuart Osborne

ALARM

When No 32 Joint Trials Unit formed at the US Navy's China Lake weapons test base early in 1990, it planned to undertake RAF trials of the BAe ALARM (Air Launched Anti-Radar Missile), little suspecting that its task would be completed by others in the air above Iraq. Service-entry of ALARM had been delayed by several years because of development problems with its RoF Nuthatch rocket, but the modified weapon was now working well with the Bayard motor, produced in Germany. BAe completed its own programme of firings at China Lake late in October, intending to leave customer's acceptance trials to No 32 JTU – but the RAF had other ideas.

The need for an anti-radiation missile in any combat against Iraq had been realised early in the *Granby* build-up. Iraq's airspace – particularly around air bases – was known to be heavily defended by radar-guided SAMs and guns, making their suppression essential if attacking bombers were not to be shot out of the sky in large numbers. ALARM duty in the Gulf was first assigned to No 9 Sqn, which had sent one crew for a course on the missile at BAe. In fact, the peace-time plan was for No IX Sqn to be the *ALARMists*, in preparation for which, their Tornado GR1s had been modified with a MIL STD 1553B digital databus so that aircraft could 'talk' to the missile. There was yet a further change of plan in mid-October when Laarbruch's No 20 Sqn was assigned to the Gulf with ALARM. Its familiarisation took the form of a briefing from the genned-up No 9 Sqn crew and a week to become accustomed to the hard-disc computer system used to programme the missiles. The latter was then boxed for shipment to Tabuk, Saudi Arabia, where the ALARM force would be based.

After a week flying simulated attack profiles, No 20 Sqn despatched eight crews to Tabuk late in November 1990. (A further four of its crews joined the bombing effort, and all had to practice aerial tanking, which they had not done before). Under the leadership of Sqn Ldr Bob McAlpine, O/C 'A' Flight, the 16-man team had first to write 'the

book' – the Standard Operating Procedures – for ALARM. Experience was gained by participating in practice missions with other Tornado units and carrying dummy ALARMS which, nevertheless, had the aircraft/missile interface.

Initially, ALARM could only be carried on the inner wing pylons, thus displacing the 330-gall (1,500-litre) fuel tanks to the alternative position beneath the fuselage. By early January 1991, however, aircraft had been modified to take up to three ALARMS on launch rails attached to the belly, whilst 495-gall (2,250-litre) tanks went on the inner positions. External equipment was completed by the usual BOZ-107 chaff/flare pod, Sky Shadow jammer and two AIM-9L Sidewinders.

Tabuk eventually received nine ALARM capable aircraft, all but one of them borrowed from No IX Sqn, the last not arriving until 24 January. Four of these had cockpit lighting compatible with night vision goggles.

ALARM is not a point-and-shoot weapon like its US companion, the AGM-88 HARM. It is intended for carefully pre-planned defence-suppression missions in which it can provide protection for a force of attacking aircraft during the several minutes they may take to pass through a defended corridor or over their target and its associated missile engagement zones. Key to this ability is loitering. On launch, ALARM can be programmed to climb to about 70,000ft where it deploys a parachute and begins to descend slowly. Whereas the direct-attack HARM can be defeated by 'blinking' (the target radar switching off, then on again) during its short flight-time, ALARM is a longer-term threat which might more appropriately have been named 'Sword of Damocles'. If the enemy radar is switched on, the parachute is jettisoned and the missile swoops on its target; if left off, ALARM explodes harmlessly in the desert – but the attacking aircraft will have got through unmolested.

In operation, the system is far more sophisticated than indicated above. The accompanying hard-disc computer produces a tape which is fed into the missile before the Tornado takes off and lists the signal parameters of enemy radars and their priority for attack on that particular mission. During the work-up phase in Saudi Arabia, ELINT aircraft were busy mapping the Iraqi defensive network and providing a deluge of detail on the defences of individual air bases. Armed with this information, planners



No 20 Squadron crews first had to practice air-to-air refuelling. Mike Rondot



Mining



were able to work-out the best methods of using ALARM in support of bombers.

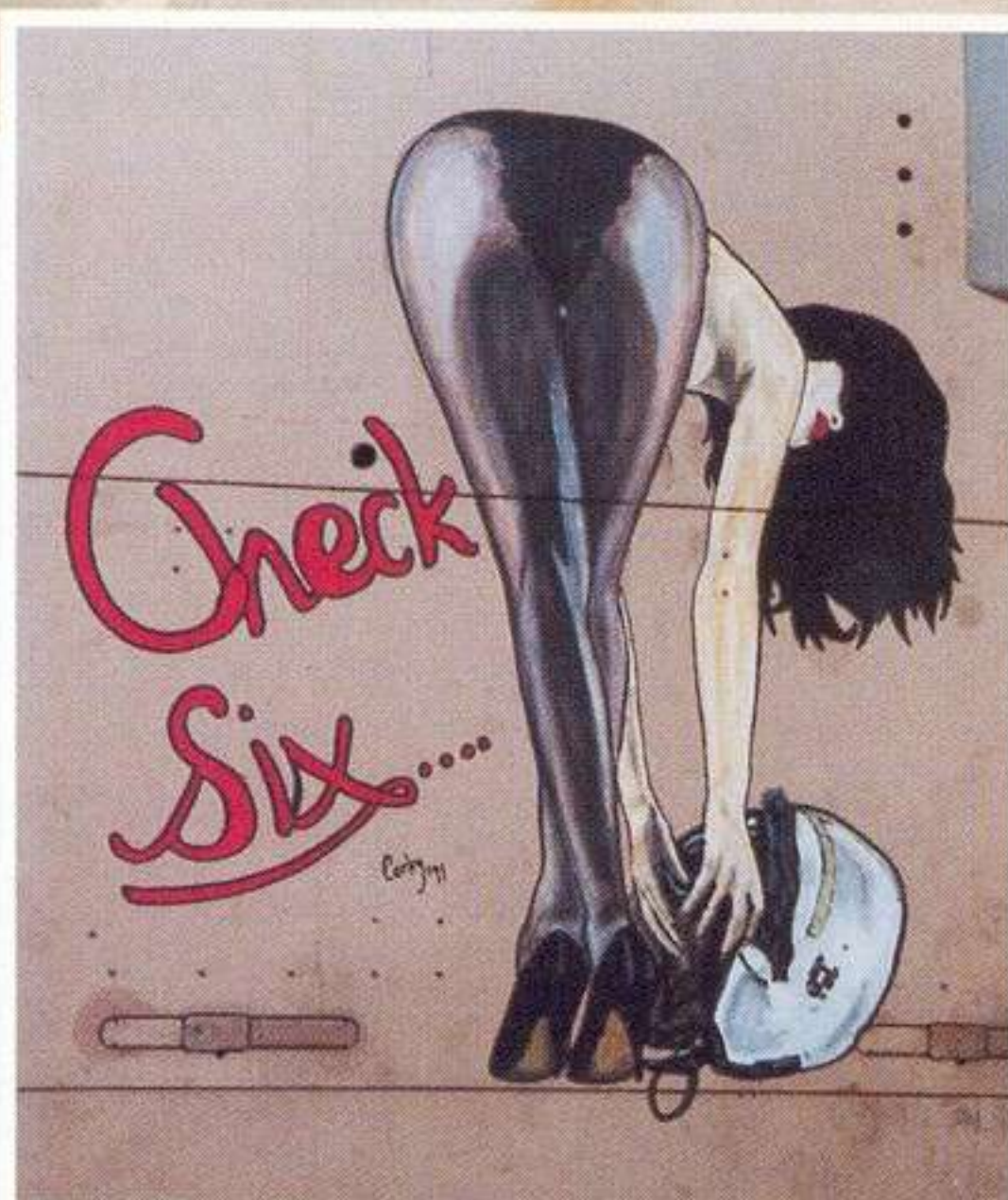
Missions are planned in close collaboration with the bomber force so ALARM aircraft approach the target from a different direction (for de-confliction), launching their missiles so that they are loitering overhead as the attack begins. The risk of a bomber flying over a radar just as an ALARM hits it are small enough to be discounted. The missile has been fed by tape with the aircraft's intended height, heading, speed and location at the moment of launch and has been instructed (say) to turn 10 degrees port, fly 20 miles and there look for signals from an SA-6 radar or, if none shows-up, go for an SA-2 or gun-laying radar in that order of importance. Because of the digital database, however, the missile can be instantly updated by the Tornado's navigation computer if it is decided to change the launch parameters, whilst the navigator can feed-in different priorities or change any other part of the instructions up to the moment of release.

To say that ALARM was untried would be an under-statement. When No 20 Sqn

was duly assigned to its operational role the missile had undertaken only one representative firing (the others had been merely to check that the motor worked) against a single radar. Now it would have to differentiate between several transmitters and target them according to instructions. The moment of truth arrived at 2310 GMT on 16 January (0210 Local) when two Tornados lifted off the Tabuk runway to support four of their companions that had left an hour earlier to bomb A1 Asad airfield with JP233. Flt Lts Roche and Bellamy in ZD810 and Flt Lts Williams and



Top: At first, ALARM was only carried on the inner wing pylons. Nick Wilcock Middle: Up to three ALARMs could be accommodated under the Tornado's fuselage. Stuart Black Above: The normal configuration after early January saw the ALARMs on belly launch rails, 495gal fuel tanks and AIM-9L Sidewinders on the inner pylons, BOZ-107 chaff/flare pod and Sky Shadow jammer outboard. Mike Rondot



Most of the nine ALARM Tornados based at Tabuk carried nose art, names and mission scores, including ALARM sorties. Top left: 'Anola Kay' (ZD748 - 8 Alarm missions) Top right: 'Alarm Belle' (ZD746 - 13 Alarm missions) Both via Dick Ward Above: 'Check Six' (ZD719 - 5 palms) Val March

Goddard in ZD850 had three ALARMS under each Tornado and, being comparatively lightly loaded, had no need of a tanker, so could depart later.

Approaching the target at 200ft (61m) with 'hard' ride selected on their terrain-following radar, the pair successfully launched four of their six ALARMs at 0350hr on 17 January, five minutes before the force of three Tornados was due. All returned safely to base, whilst eight bombers visited Al Asad during the evening of 17th and were similarly unscathed despite having no ALARM escorts. At almost the same time, four ALARM aircraft left for H-3 airfield and launched ten missiles successfully in a softening-up procedure. A few hours later, a second four-ship supported an attack by three bombers from Tabuk on H-3, but despite good ALARM launches the optically-directed flak was severe enough for the JP233 attack to be cancelled. This mission's take-off was somewhat protracted, as crews twice had to climb hastily out of their cockpits when Scud missile alerts were sounded.

In a new departure, four ALARMs were tasked on the evening of 21 January to support a USAF F-15E Strike Eagle raid on a Scud storage depot at Al Qaim. Each carried three missiles, of which ten were successful. Two more ALARM aircraft teamed-up with the F-15s to attack the same site on the evening

of 23 January. A further mission accompanying Saudi Tornado bombers was planned, but floundered on technicalities before launch. The Saudis were unable to be more precise than give a 30 minute window for their time-on-target and could not be specific regarding their direction of approach. When pressed on the latter point in the interests of avoiding a collision, they helpfully suggested that the RAF Tornados might care to fly around the target area with navigation lights switched on. This interesting proposal was robustly declined.

Iraqi radar operations soon gained a healthy respect for ALARM and its American cousins, Shrike and HARM. Radar output plummeted to the extent that four ALARM aircraft were only sent on three missions, almost all the others needing merely two. Even so, from 26 January onwards, they carried only a pair of missiles each. That was as well, for ALARM had only just entered production, and with no stockpile, the supply situation was precarious. BAe at Lostock, Lancashire, was working overtime to build missiles which were then flown out to the Gulf and soon fired. Aircraft not needed for ALARM could be switched to bombing with only the change of a software tape and, indeed, some did more of this than firing missiles.

From 22 January, Tabuk's Tornado bombers switched to medium-level missions to avoid the heavy AAA low-down, but the missile launchers stayed at 200ft (61m) for three more days. Their first day mission was flown against Qubaysah ammunition dump in the early afternoon of 22 January, but these did not become a regular feature until a week later. Beginning with a three-ship, of two missiles each, against a fuel store at H-3 on 25 January, the defence-suppression force began flying with the main formation at 20,000 to 24,000ft (6,100-7,320m). This change solved a few problems. The ALARMs were occasionally alarmed, when listening on the radio net, to hear themselves designated as possible low-level hostiles by the E-3 Sentry AWACS airspace controller. The speed at which Coalition fighters locked their radars onto the Tornados must have been comforting to others in the raid, but the ALARM aircraft had quickly to switch on their IFF to advertise their allegiance.

A further low-level problem obviated was the dip in the ALARM's flight path before it

climbed. Though 200ft should have provided enough room under the aircraft's belly, pilots made allowance for the slightly downward-sloping launch rails by momentarily pulling up the nose when firing an ALARM. There was no danger then of it striking the ground, but the splendid view of its rocket motor immediately ahead of the aircraft would temporarily rob a pilot of his night vision. In addition, those in the bombing formation above 20,000ft (6,100m) were somewhat agitated to see a missile streaking up – apparently from the ground – towards them. Accordingly, a code word was devised to warn companion aircraft of an ALARM launch, this being particularly comforting to the F-15E Eagles who did not have the benefit of a joint briefing with their support.

By early February – and in spite of BAe's efforts – the stock of ALARMS had been almost exhausted. The final mission in which missiles were launched was flown on the late afternoon of 13 February when ZD748 and ZD851 supported a TIALD/laser-guided bombing raid to Al Taqaddum air base, carrying a pair of ALARMs each. On 26 February, ZD746 and ZD851, similarly equipped, took off shortly after dawn to escort a mission against Habbaniyah air base, but this was aborted because of weather. In total 24 ALARM missions were flown, totalling 52 sorties (including four aborted after take-off), during which 121 rounds were fired. Lead aircraft was ZD746 with 12 successful and two aborted missions for a total of 31 missiles fired. Both ZD746 and ZD851 flew 11 successful missions and had two aborts each, but '719 launched 29 ALARMs compared with two less for '851.

Lack of ALARMs for the remainder of the conflict was made good by USAF *Wild Weasel* support, but the radar war had already been won. Fearful of attracting a missile, Iraqi radar operators became extremely circumspect and used, as examples, SA-2 search-radar to obtain targets for an SA-6 missile system, or attempted optical guidance of SAMs until radar was switched on at the last moment in the hope of a successful interception. The very few lucky hits achieved on allied aircraft only served to emphasise how complete was the destruction and demoralisation of a once powerful air defence system. In that element of the Coalition's victory, No 20 Sqn and its ALARMs played their part.

CATS IN ACTION

Jaguars in the Gulf: *Lindsay Peacock*

"Oh yes! I was scared. Every time I rolled in on the target I was scared. It got familiar . . . but it never got any better. I mean, it's not a nice feeling to know that there are people down there who are trying to kill you . . ." So said one Jaguar pilot soon after returning from Bahrain, expressing a sentiment that was probably shared by all of the RAF aircrew – be they pilots or navigators – who were called upon to employ their skills in combat during the Gulf War.

Ferocious in its intensity, *Desert Storm* literally witnessed the wholesale destruction of a large part of Saddam Hussein's much-vaunted armed forces and the part played by allied air power in the systematic dismembering of those forces cannot be over-estimated. *Desert Storm* did, however, go much farther than that, for key aspects of Iraq's infrastructure were also targeted as the nation's capability to wage effective war came under the hammer.

Munitions factories, biological and nuclear facilities, POL (petroleum, oil, lubricants)

dumps and countless other targets were bombed as the aerial onslaught unfolded. So too were bridges and key choke points on the road and rail networks attacked in a campaign which some feel has set Iraq back by 40 years as a developed nation. In the overall picture, the part played by the dozen RAF Jaguars – the *Desert Cats* under the leadership of Wg Cdr Bill Pixton – that operated from Muharraq, Bahrain might appear relatively insignificant, but for those who were there and who lived through it, it was indeed a salutary experience.

One of the first RAF elements to depart for the Gulf region, twelve Jaguars left from RAF Coltishall on 11 August 1990, just over a week after the Iraqi invasion and barely 48 hours after Defence Secretary Tom King's announcement of *Operation Granby*. Their destination was Thumrait, Oman; but visits to Muharraq began soon after arrival and the unit actually moved to Bahrain in October.

Soon afterwards, in mid-November, the Jaguar Detachment (JagDet) pilots were

rotated, with the new arrivals being told that they would be present for a period of six months. At about the same time, a fresh batch of aircraft was flown out to the Gulf as replacements for the original complement. All of these incorporated a number of modifications which operating experience had revealed as operationally essential. Such 'mods' included adjustments to the twin Adour engines so as to provide greater thrust and, in turn, enhanced performance. Fitment of the Sky Guardian radar warning receiver and a colour HUD video recording facility was also undertaken but perhaps the most obvious change concerned the provision of overwing weapons rails to carry the AIM-9 Sidewinder infra-red homing air-to-air missile.

This feature was first incorporated on former RAF aircraft supplied to India but was not previously applied to the GR1A version as used by the RAF. However, in the Gulf, weapons stations which would normally have been used to carry the AIM-9 were occupied by a Westinghouse ECM pod (outer port) and





Top: Initially Coltishall's Jaguars were based at Thumrait in Oman. Sandy Wilson. Above: Standard arrangement quickly became four 1,000lb bombs under the wings and a centreline fuel tank. Outboard was a Westinghouse ECM pod (port) and Phimat chaff dispenser (starboard). Mike Rondot

a Phimat chaff dispenser (outer starboard). In this configuration, there was no self-defence capability, a shortcoming that must have given rise for concern in view of the potential of the Iraqi Air Force and one which was successfully addressed by the overwing rails.

That's not to say that Jaguar pilots would have chosen to 'mix it' in the event of meeting Iraqi fighters but the trusty AIM-9L is clearly an item of kit the presence of which is always welcome. As it transpired, the Jaguars were never directly threatened but one pilot probably spoke for all when he referred to "running away bravely", albeit in a somewhat different context. In the Jaguar –

which is first and foremost a 'bomber' and far from being a 'dogfighter' – that is an eminently sensible tactic.

At the start of hostilities, the Jaguars were quickly in action, with the first strike being staged on 17 January 1991, day one of the air battle. Four aircraft took part, piloted by Sqn Ldr Mike Gordon (who led the formation) and Flt Lt Steve Thomas, Fg Off Mal Rainier and Flt Lt Roger Crowder. For this mission, which entailed an attack on an Iraqi Army barracks in Kuwait, the Jaguar 'rig' comprised the defensive aids mentioned earlier and the pair of overwing AIM-9Ls with auxiliary fuel tanks being carried on the inner

wing stations. This left only the centreline hardpoint available for the carriage of offensive ordnance and each of the four aircraft took just two 1,000lb free-fall bombs.

Within days, however, the configuration was changed, due in no small part to the pilots' desire to go with as much ordnance as possible. Consequently, the underwing fuel tanks were replaced by tandem beams, while the centreline station was devoted to the carriage of fuel – in this guise, a maximum of four 1,000lb bombs could be carried, in tandem pairs under each wing. Fusing options varied depending on the target, with airburst, impact and delayed action being amongst those that were employed to good effect.

Other weapons used included cluster bomb units (CBUs), but the familiar Hunting BL755 played little part and only eight were dropped. The reason for that was simple, for BL755 can only be delivered from low-level and the tactics employed by JagDet therefore necessitated finding a CBU that could be deposited from medium altitude. The solution was the American CBU-87 Rockeye II – a weapon not previously associated with the Jaguar – which was hurriedly purchased 'off the shelf' and this was added to the Jaguar's arsenal with effect from 29 January. In discussing Rockeye, Flt Lt Alex Emtage commented, "It's really quite vicious. Excellent against troops; excellent against soft-skinned vehicles, ammo storages if they are not that hardened, petrol stores and that sort of thing. I wouldn't like to be anywhere near it when it went off."

Another debutante was the Canadian CRV-7 2.75in rocket, Jaguars in the Gulf carrying two 19-round LAU-5003B/A pods. Proving trials were undertaken in the UK in late 1990 and cleared the way for operational use, this device thereafter being hastily deployed to the Gulf and pressed into action at the outset of the war. Unfortunately, accuracy was initially less than perfect and the CRV-7 was withdrawn from use until computed weapon aiming became available. This was the responsibility of Ferranti and Wg Cdr Pixton was full of praise for the company's efforts in coming up with the new flight program in just two weeks, which allowed CRV-7 to be brought back into action, often with devastating consequences. Single or 'ripple' firing options were available, with the latter seemingly being preferred so as to ensure target saturation and achieve a higher 'kill' probability. Warhead weight is relatively light but terminal velocity is of the order of

Returning from a sortie on 12 February, a Jaguar GR1A on finals to land at Muharraq. Mike Rondot



Mach 4, and there aren't too many objects that can stand up to that sort of impact.

Of course, the two internal 30mm Aden cannon were brought into play. These were mainly employed during strafe attacks against shipping targets but it was also common practice to squeeze off a burst of 30mm during the pull-out after dropping bombs, this being a literal interpretation of the term 'parting shot'.

At peak strength, JagDet had 22 pilots available. Most were from Coltishall, where the three resident squadrons (Nos 6, 41(F) and 54(F)) provided four, nine and seven pilots respectively, with the remaining two coming from No 226 Operational Conversion Unit at Lossiemouth. The majority were concerned with attack tasks, with 20 pilots being organised into 'constituted fours' which operated together throughout the entire conflict.

Organisation in this manner basically meant that aircrew worked a four days on/one day off pattern with the flight schedule being arranged in such a way as to allow a 48hr interval between each duty period. Thus, following a day off, a 'constituted four' would return to action on the afternoon wave, flying as the second element of an eight-aircraft group. On the next day, they would have responsibility for planning and leading the afternoon wave, again of eight aircraft. After that, they would go as the second element on the following morning's 'early push' before winding up as

lead element on the morning of the fourth duty day. With that mission completed, they would then have a 48hr break before resuming the cycle.

So, a typical flying day required JagDet to mount two eight-aircraft attack waves, for a total of 16 sorties. This level of activity was sustained for most of the campaign, apart from weather disruptions or the very occasional technical problem.

In addition, JagDet also undertook reconnaissance tasks, most of which were generated to meet 'in-house' requirements although some work was performed on behalf of other agencies in the latter part of the war. Two pilots functioned as 'recce specialists' and they almost invariably operated as a pair, raising the daily sortie rate to 18. Before that, Sqn Ldr David Bagshaw logged a handful of solo reconnaissance sorties, usually latching on to a 'four-ship' for a measure of mutual support. A 54-year-old fast jet veteran who passed a personal milestone and set a record that is unlikely to be equalled on 8 January 1991 when he logged his 4,000th hour in the Jaguar, Sqn Ldr Bagshaw also completed five bombing missions in the early part of the war, when he augmented the 'constituted four' which was led by JagDet's boss to form a 'five-ship'.

Once reconnaissance operations got underway in earnest (on about 11 February), two of the dozen Jaguars were normally configured for this task and their primary

objective was to obtain pre-strike pictures of target areas to augment satellite imagery in the planning process. They usually operated as a pair, one aircraft carrying a Vinten LOROP (long-range oblique photography) pod and the other a standard BAe pod with an F126 survey camera. The reason for that stemmed from the fact that while the LOROP imagery offered remarkable resolution, its narrow field of view (and lack of a data matrix) meant that it wasn't always easy to determine just what the results portrayed, for, when all is said and done, one bit of desert does tend to look very much like another. However, comparison with F126 imagery usually enabled RIC (Reconnaissance Interpretation Centre) personnel to sort things out satisfactorily.

Battlefield air interdiction (BAI) was the primary role for the Jaguars. Although one or two missions were staged against targets in Iraq, during the period leading up to the start of the ground war, they concentrated their attentions on that part of Kuwait which lay to the south of Kuwait City, an area which was particularly well protected by anti-aircraft artillery (AAA). Targets were many and varied, including SAM and AAA sites, Silkworm SSM sites, fixed and mobile artillery pieces both inland and on the coast, Astros multiple rocket launchers, armoured concentrations, barracks, storage facilities and at least one airfield.

However, once *Desert Sabre* commenced, the rapid Allied advance resulted in JagDet's main area of concern very quickly being

Main picture below: JagDet formation, each aircraft configured for a different mission, with CBU-87 Rockeye II, 1,000lb bombs, for reconnaissance and with laser guided bombs. Below left and inset: VC10s and Victors provided AAR for many Jaguar attack missions. Below right: The Canadian CRV-7 2.75in rocket was rushed into service. Two 19-round LAU-5003B/A pods were carried. Photographs Mike Rondot



declared 'off limits'. In consequence, the focal point shifted to that portion of Kuwait which lies to the north of Kuwait City and from this point on it was Republican Guard forces that presented JagDet with most of its targets.

With regard to mission orders and targeting, Kuwait and Iraq were divided into what might best be called 'target boxes' although they were usually referred to as 'kill zones'. Instructions were received from the coalition headquarters in Riyadh on the day before the mission was to be flown and these invariably provided details of a primary target in a specific 'kill zone' as well as a time block. Having received that data and studied the associated 'int' (intelligence), the 'constituted four' with responsibility for leading the mission would select a secondary target before getting down to some serious planning and preparation of the mission data used to programme the Jaguar's Ferranti FIN1064 digital nav/attack system.

When it came to actually flying the mission, there was not too much that remained to be done in the way of preparatory actions. A final intelligence update from the Ground Liaison Officer (GLO), a five to ten minute brief on the target area (with emphasis on the defences) and it was time to walk. Within a couple of hours, they would be back and into the debrief cycle, which often lasted longer than the mission itself, since it invariably included electronic warfare analysis, study of HUD videos, discussion of RWR indications and notification of visual identifications of SAM and AAA sites to the GLO who was responsible for updating the 'big' picture.

In those terms, it all sounds fairly simple, but one should not forget that the Jaguars seldom worked alone and were often dependent upon other allied forces for support. One area in which this support was furnished concerned SEAD (Suppression of enemy Air Defences) – thus, USAF EF-111A Ravens would be jamming Iraqi radars while the F-4G *Wild Weasel* would be prowling around, ready to engage any SAM site that showed launch indications. Friendly fighters would also be nearby, to pre-empt intervention by Iraqi warplanes and there



Jaguar on Support Combat Air Patrol circles, waiting for 'trade'. Mike Rondot

would also be a constant stream of advice on SAM/AAA threats and enemy fighter activity coming in from the E-3 Sentry AWACS and the EC-130E ABCCC (Airborne Battlefield Command and Control Centre).

Without that support, life would have been much more difficult. This is perhaps best illustrated by the tactics that the Jaguars used. During the work-up period that preceded the war, operational training anticipated the Jaguars going in at ultra low level, in accordance with RAF tactical doctrine, which is aimed at meeting 'worst case' criteria. As it transpired, good – some would say brilliant – allied support permitted the Jaguars to operate at medium altitude, above the 10,000ft level and out of range of all but the heaviest calibre AAA. Going higher does, of course, have the drawback of putting one into the lethal SAM envelope and it was here that SEAD played its part almost to perfection by virtually eliminating the threat from SAMs. Perhaps the greatest fear was that of enemy fighters but the Iraqi Air Force seems to have taken the philosophy that 'discretion is the better part of valour' to its extremes and never posed a serious threat to the Jaguars.

The decision to operate at medium altitude seems to have been greeted with reservations, even though the Americans confidently asserted that it would be safe. In the end, it was left to Wg Cdr Pixton to make up his mind and he opted to give it a try. Had

it not worked out satisfactorily, there is little doubt that tactics would have changed but all went well and the Jaguars were able to remain at medium altitude for the entire campaign, although they did modify procedures in the light of combat.

Despite the undoubted complexity of the command and control net, the system was inherently flexible and JagDet had the freedom to choose the tactics it wished to employ. In determining those tactics, it was by no means simply a case of Wg Cdr Pixton selecting a course of action that would be pursued and then telling everyone to get on with it regardless. Indeed, in discussing leadership, one member of the team remarked that he found it 'exemplary', adding that "the boss (Wg Cdr Pixton) encouraged debate about tactics and would consult all pilots, listen to their arguments and then reach his decision, based on those arguments. . . ." So, everybody was given the opportunity to have some input into the overall 'game plan'.

An instance of this was provided by attack arrangements. When operating as eight-ship formations, experience soon showed that the first and second pilots to roll in and bomb seldom encountered much in the way of opposition fire, but subsequent pilots almost always received a hotter reception and 'enjoyed' some moments of anxiety while in the dive. Needless to say, those



Jaguar nose art: Left: 'Debbie' (XZ367) later became 'White Rose'. Below left: 'Fat Slags' (XX962). Below: 'Diplomatic Service' (XZ358). Right: 'Katrina Jane' (XZ119). Photographs Mike Rondot and John Dunnell





Above: The Guardian Reader (XZ375) with pilot Sqn Ldr Mike Rondot in the cockpit.

at the back end of the formation (normally the less experienced pilots) drew the heaviest and most accurate fire and voiced reservations about the 'fairness' of this. As the war went on, the ToT (time on target) brackets were expanded to a maximum of about 30 mins and the Jaguars took advantage of this to spread their attacks, initially operating as fours and, eventually, as pairs, with varying amounts of time separation between each pair. This made life much more difficult for Iraqi artillery and offered other advantages, not least of which was that the first pair to go against a target could effectively reconnoitre that target for later elements. Up-to-date intelligence of this kind often proved quite invaluable in allowing JagDet to make the optimum use of the resources at its disposal.

Nevertheless, there were many stressful moments, one pilot commenting that even though his primary aim was to deliver his ordnance accurately, he was always anxious in the dive. There were also some close calls, with one or two Jaguars coming home with minor battle damage while several pilots recalled incidents in which a late pull-out exposed them to AAA, although one who commented that "things came close" was perhaps guilty of understatement. In summing up, good tactics helped to minimise the hazards but the Jaguar crews also enjoyed good fortune and had that all-important little bit of luck that was denied to

their colleagues in the Tornado.

Other missions including 'SuCAP' (Support Combat Air Patrol) and the associated 'CSAR' (Combat Search and Rescue). These taskings mostly involved pairs of Jaguars which maintained a CAP orbit while they waited for 'trade' and they were reasonably productive during the first half of the war, when Iraqi naval forces were active. Mission duration was typically three to four hours and entailed multiple aerial refuelling while ordnance loads varied, with bombs, rockets and cannon all being employed.

On 5 February, with Iraq's Navy virtually destroyed, SuCAP and CSAR operations terminated but they had produced a fair number of exciting moments, of which perhaps the best documented was the attack made by Wg Cdr Pixton and his wingman, Flt Lt Tholen, on a 1,120-ton Polnochny landing craft. During this attack, the two pilots paid scant heed to the tactics manual and proceeded to make multiple gun and rocket passes on the landing craft which was soon left hors de combat. In the normal course of events, re-attacks were most definitely not to be recommended but on this occasion – and, for that matter, numerous others – airborne controllers confirmed that no threat existed from enemy fighters and other defensive systems, hence the decision to stick around and finish the job.

Away from flight operations, aircrew were billeted in The Diplomat hotel in Bahrain, the name of their quarters evidently inspiring the choice of the name *Diplomatic Service* for Jaguar XZ358. Life in Bahrain was described as being "peacetime normal", although air raid warning alerts were sounded every time that a Scud missile was launched against Saudi Arabia or Israel and protective kit was never far from reach.

As to the lessons that were learned, it's still early days but there can be little doubt that analysis of the campaign will result in some new chapters being added to the tactical doctrine manuals and some other chapters being drastically re-written. What is clear is that the Gulf War seems to have reinforced the adage that "you never fight the war that you train for" and this is certainly true in so far as the *Desert Cats* were concerned, medium altitude operations being



Above: An emotional welcome for the pilot of XX962 on his return to Coltishall on 13 March. Paul Jackson

very much an alien philosophy when the time came to do battle.

Having said that, those who were there were firmly of the opinion that normal peacetime RAF training policy, with its heavy emphasis on getting right down 'among the daisies', was largely responsible for allowing them to switch tactics with such impressive ease. Perhaps the most important lesson – and perhaps the most difficult to implement in the face of growing pressure to limit low-flying training – is that, when it comes to war, one must always train to meet the 'worst case' scenario. In the Gulf, the value of that training was emphatically confirmed by the fact that the dozen JagDet aircraft accumulated more than 600 sorties while at the same time using a variety of weapons, some of which were hurriedly introduced to meet the exigencies of war.

JAGUAR OPERATIONS

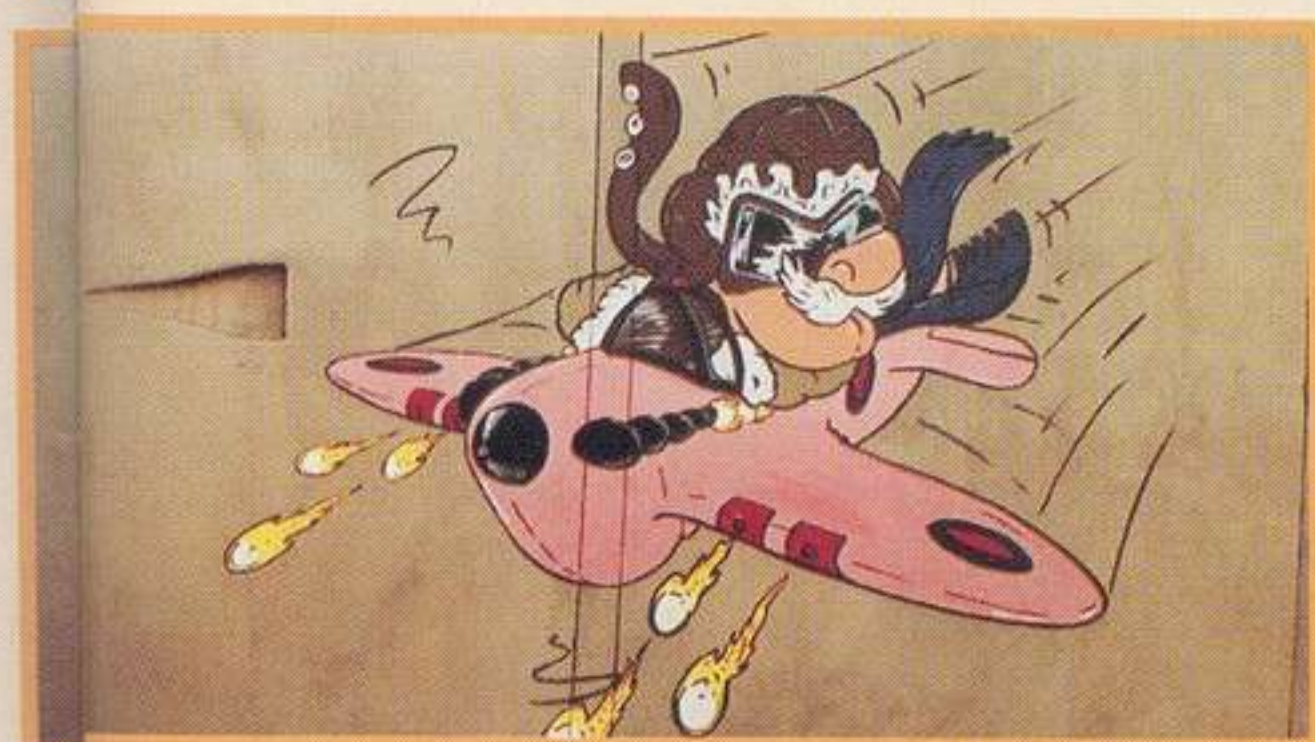
Table 1 – Sorties and Missions Flown

Type	Sorties (%)	Missions (%)
SuCAP/CSAR	48 (7.8)	23 (14.6)
Reconnaissance	31 (5.0)	21 (13.3)
BAI	538 (87.2)	114 (72.1)
Total	617	158

Table 2 – Ordnance Expended

Weapon Type	Quantity
1,000lb bomb	750
CBU-87 Rockeye II	385
BL755 CBU	8
CRV-7 2.75in rocket	608
	(32 19-round pods)
30mm ammunition	9,600

Table 3 – Combat Flying Hours
921hr 50min

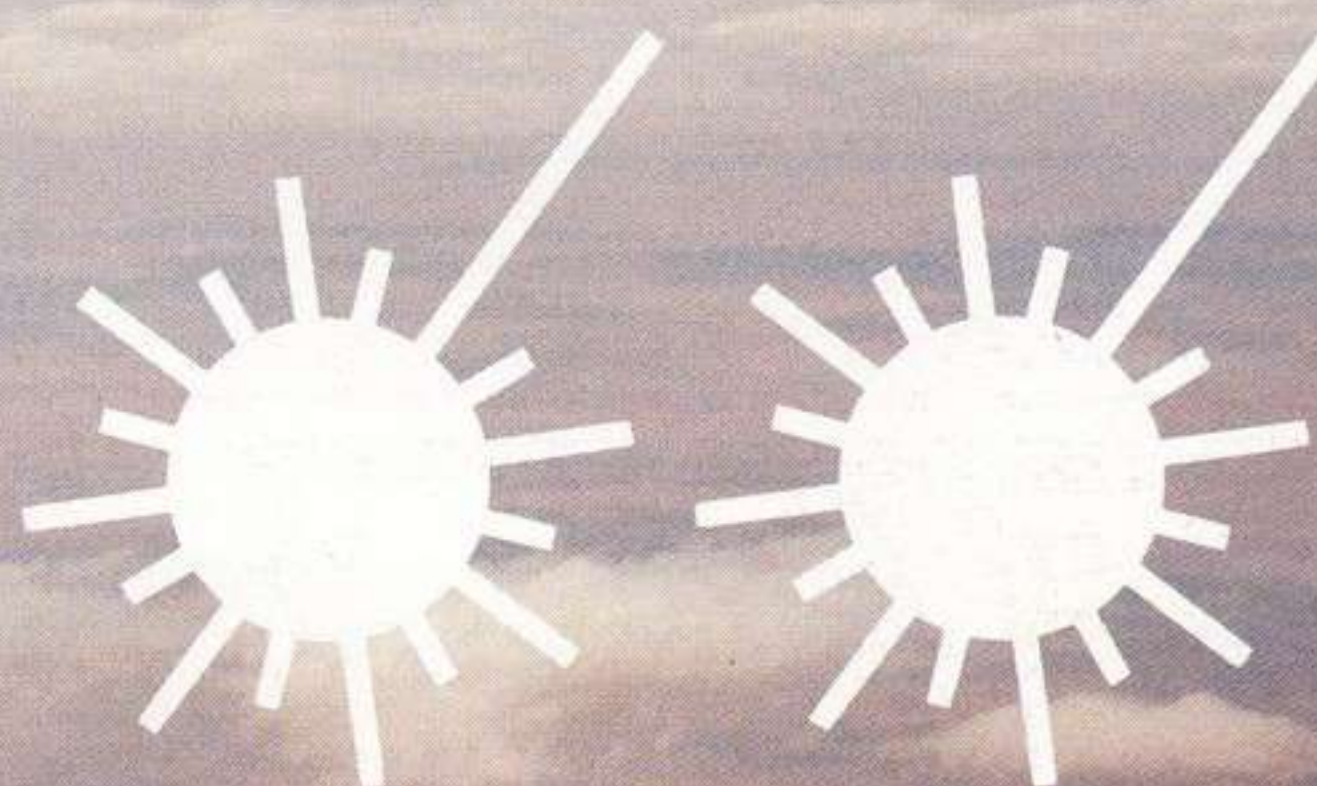


Left: The Iraqi president received a British boot on XZ364. The high quality of the artwork is exemplified by a 'Spitfire' on XX733. Mike Rondot



TIALD

DESIGNATED A SUCCESS



Paul Jackson

As Britain's armed forces discovered during the 1982 Falklands War, development of weaponry can be considerably accelerated when there is an urgent requirement. In as far as the Tornado GR1 was concerned, the ALARM anti-radar missile cut short the last few months of its qualification trials in order that it could be issued to squadrons in the Gulf. More notable, however, is the story of GEC-Marconi's TIALD pod. Whisked out of the laboratory for highly effective use in *Desert Storm*, it has now returned there for a further two years of trials.

TIALD – Thermal Imaging and Laser Designation – was ordered in June 1988 to meet Air Staff Requirement 1015, which called for a day and night laser designation pod to equip a 'pathfinder' squadron of Tornados. This was No 9 at Bruggen, Germany (also the first with ALARM) but when the decision was made in December to accelerate development, with the aim of Gulf deployment, No 9 was heavily involved with preparations for the bombing campaign. Instead, Honington's No 13 Squadron was selected to spearhead deployment of TIALD, even though many of its personnel were occupied with the reconnaissance Tornado

flight which would also be sent to the Gulf.

Soon after the invasion of Kuwait, BAe had been asked to examine the possibility of writing new computer software for the Tornado GR1 so that TIALD could be rushed into service. The quote of six months of development time made this seem impractical and so the proposal was abandoned by all except GEC-Ferranti, which privately contacted the programmers at EASAMS Ltd of Camberley for a re-assessment. They replied with a time-scale of six weeks and were immediately put under contract. In fact, computer specialist Roger Downs completed the programme in the incredibly short time of two weeks, allowing (fortuitously, as it transpired) four further weeks to be spent in evaluation of the system.

The trials TIALD was meanwhile removed from its Buccaneer host and sent to Ferranti in Edinburgh for refurbishment, whilst the same company used spares to make-up a second pod. Manufacture of a third was stepped-up, but it was not ready before the conflict ended. At Honington, the Tornado Engineering Development & Investigation Team modified five Tornados to take TIALD.

Changes involved additional wiring to the port under-fuselage weapons pylon, including a power supply, as well as Phase 1 Gulf-theatre modifications. The pod, which weighs 463lb (210kg) and is 9ft 6in (2.90m) long, has a rotating ball-shaped head mounted in a forward portion which swivels on the longitudinal axis, allowing total lower-hemisphere coverage.

Squadron Leader Greg Monaghan of No 13 Squadron led four crews to Boscombe Down on 14 January to begin the work-up phase, the five modified aircraft regularly rotating between here and Honington for further modifications. After check-lists had been composed and A&AEE test pilots had flown the Tornado/TIALD combination on 18 January to ensure there were no undesirable handling characteristics, flights with the system could begin. The software worked perfectly, suggesting that the target deployment date of 11 February could be brought forward to 20 January, but the pod was not so obliging. It required 30 sorties, both day and night, plus long hours by the software team and engineers before TIALD was declared combat-ready on 6 February.

The trial, code-named "Albert", unhappily

Top: A TIALD laser designation pod is fitted under the fuselage of unnamed Tornado GR1 ZD848. Two 2,250 litre tanks borrowed from the Tornado F3 force are prominently carried. Paul Jackson



Qubaysah oil refinery under attack from TIALD-equipped aircraft, a pall of black smoke marking a direct hit.

chose the worst fortnight of European weather in living memory. Tornados flew to weapons ranges as far afield as Scotland, the Netherlands and Germany in the hope of finding gaps in the cloud. No 13's only previous association with TIALD had been to drop one laser-guided bomb for the trials Buccaneer some months before. It now succeeded in releasing one further weapon on the Garvey Island range in Scotland before coming to the conclusion that (a) the system worked and (b) better weather for further trials would be found in Saudi Arabia.

Four Tornados (ZA393, ZD739, ZD844 and ZD848) flew non-stop from Honington to Tabuk on 6 February, whilst the two pods and Ferranti personnel followed later in the day by Hercules. On arrival, the TIALDs – one black, one white – were given a coat of sand-pink camouflage paint and named "Sandra" and "Tracy", with appropriate illustrations, after the Fat Slags cartoon characters in *Viz* magazine. Also at Tabuk, having delivered attrition-replacement Tornados and now keenly looking for a new job, were two crews

from No 617 Squadron, including the CO, Wing Commander Bob Iveson. They were accordingly attached to the TIALD flight, Iveson assuming command from Monaghan and thus becoming the only combat pilot to have fought in both the Falklands (where he was shot-down in a Harrier GR3) and the Gulf. Each crew flew one training sortie in Saudi Arabia, but only Monaghan and his navigator, Flt Lt Jerry Cass, dropped a bomb on the Badr range. On the strength of this not over-intensive training, the TIALD flight went to war.

The sprawling H3 Southwest airfield in the far west of Iraq was to be the target for the first TIALD operation. Normal force composition for this and subsequent raids was two laser-equipped Tornados and four bombers, each carrying British 1,000lb (454kg) bombs fitted with the Texas Instruments CPU-123B Paveway guidance head and fin, for a total weight of 1,210lb (549kg). Because of the increased size of the Paveway, only three bombs can be fitted beneath a Tornado, compared with eight in

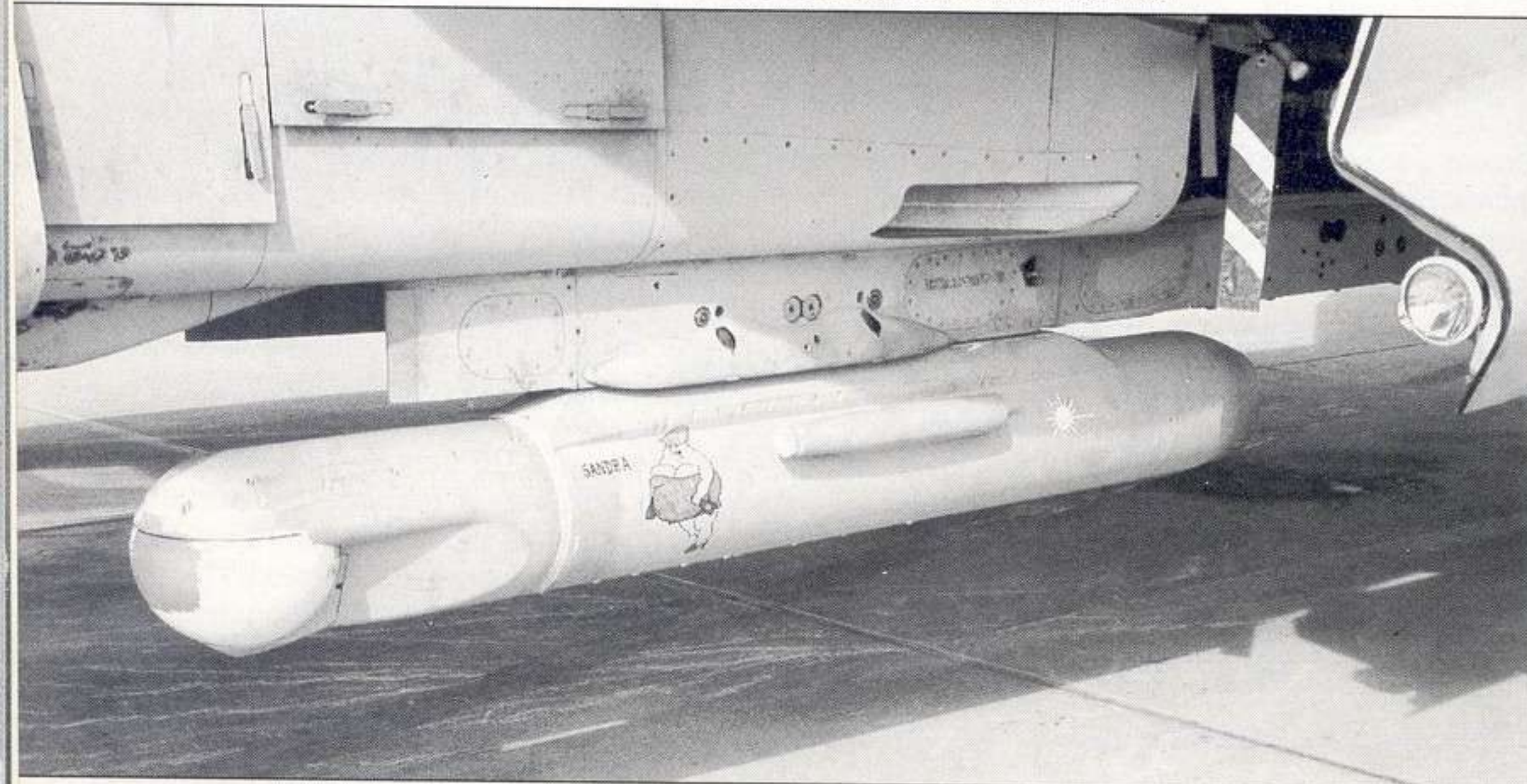
free-fall (or 'dumb') mode. It was soon established that two per aircraft was sufficient for the average hardened aircraft shelter, although three continued to be used against bridges.

Usual tactics were to approach at 20,000ft or above in two cells of three, each led by a TIALD aircraft. The second trio, though some miles behind, could not bomb until the first had finished its attack, although the designator aircraft would have its own TIALD pointing at the first cell's target in case of a malfunction. Within each trio, the pattern for airfield attacks was for the second bomber to release its load before the first's had struck – fall time being about 40 seconds. Thus, the navigator had less than this interval to re-position his designator on a shelter or storage installation which might be some considerable distance away from the first. Detailed maps of airfields from satellite reconnaissance were a great help in finding the specific shelters which intelligence officials considered might contain aircraft. After one had been hit, the navigator would use his miniature control stick to re-position the laser by following the 'street map' on his knee: down the taxiway, second fork on the right, third shelter on the left.

On the morning of 10 February Wg Cdr Iveson and Flt Lt Chris Purkiss in ZD848 were accompanied to H3SW by Flt Lts Gareth Walker and Adrian Frost, plus the four bombing aircraft. Iveson's cell was first to attack, but a last-minute malfunction resulted in the bombs being released without the benefit of a laser beam. Instead, Walker and Frost became the first to use the system successfully, the majority of credit for two destroyed shelters rightfully belonging to the navigator. His role was to acquire the target area on x2 magnification, then zoom-in on x4 for precise marking.

Once fixed, the cross-hairs are kept automatically on the target by a computerised system which compares each scan of the screen and looks for the shape and colour contrast of the selected target.

Even TIALD itself received the attention of the Gulf artists. Norman Roberson



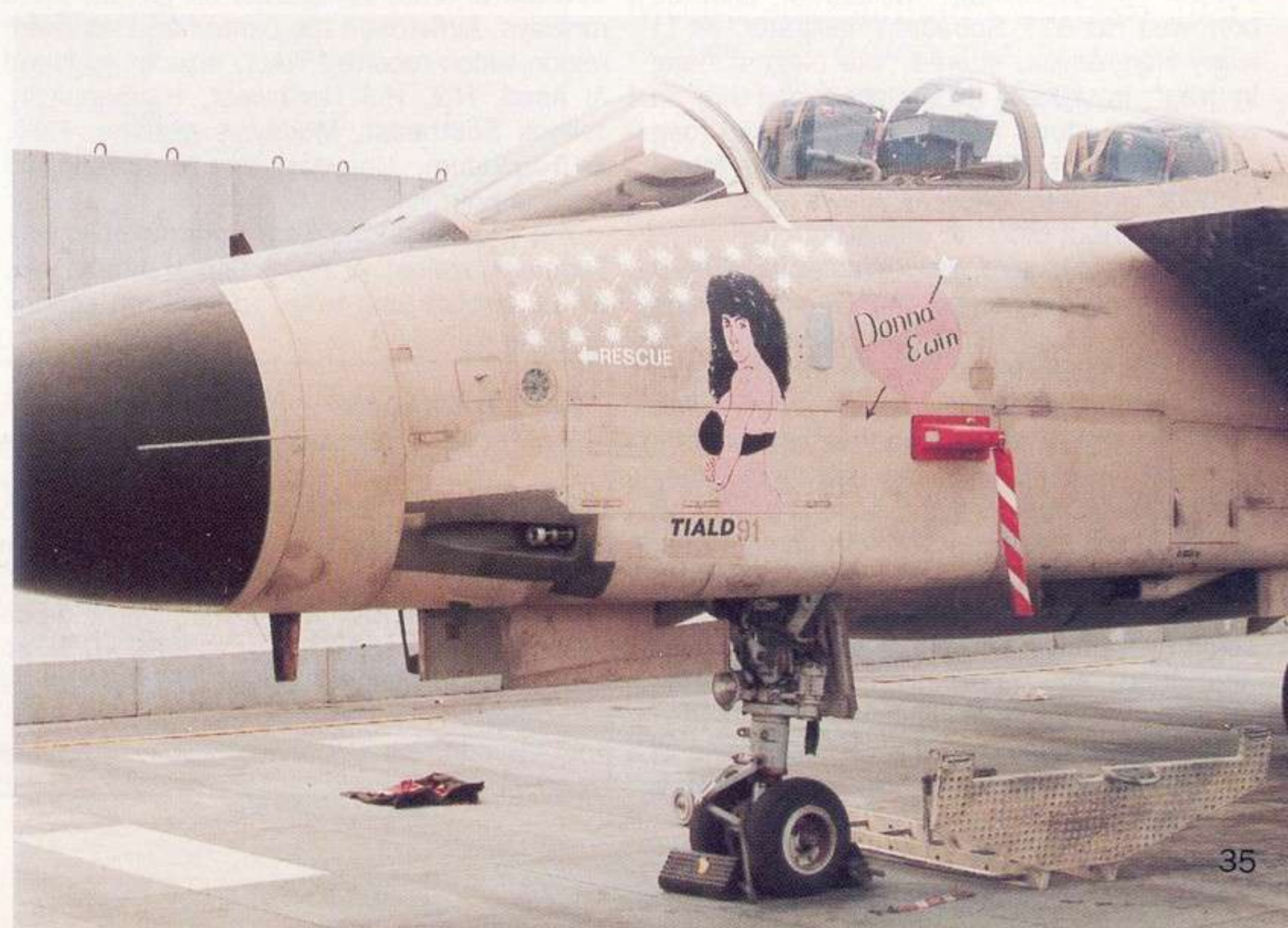


Above: Tornado GR1 ZD739 'Armoured Charmer' pictured before the successful completion of 36 missions. The same aircraft is shown below with laser 'splashes' applied, many containing a number indicating the hits obtained on that sortie. Norman Roberson/ Nick Wilcock Bottom: 'Donna Ewin' was ZD844/DE. Note that names match the aircraft's code letters. PRM

Bombers release their weapons so that they will fall in the cone of laser energy reflected from the target. whereupon the guidance system takes over. If this is not done, or the laser is moved violently, the bombs adopt a ballistic trajectory like any other free-fall device. Not all of the latter were wasted, for one bomb which declined to hit an aircraft shelter scored a direct hit on a runway.

Full potential of TIALD took a little time to realise. Apart from its ability to see as well at night (with thermal imaging) as during the day – to which the Buccaneer designators were restricted – it could also be used for instant damage assessment. To crews trained for single-pass attacks at 200ft (61m), use of the pod at medium altitude opened a new seam of information. The aircraft's video system could also record the imagery for later assessment but, equally important, turned the Tornado into a reconnaissance system. Sorties were regularly flown with the recorders switched on to gather data on anything of interest which the aircraft happened to overfly during the outbound and inbound legs of the mission. Assessments in the cockpit were hampered by the 200-line green screen in the Tornado, but back on the ground the tape could be played on a 625-line set with greatly improved clarity.

For a supposedly un-developed system, TIALD performed extraordinarily well and turned-in excellent serviceability. There were the occasional failures, however, one of the more common being the 'nodding donkey syndrome'. This was experienced by Monaghan and Purkiss over Ruwayshid Air Base on 12 February when the ball-shaped head of the pod began oscillating uncontrollably a mere five seconds before bomb-release. Fortunately, Flt Lts Bill Bohill and Jim Ross in the second aircraft were able to take-over and so designated for all four Tornados in the two cells. The asinine behaviour resulted from a programming glitch which will be corrected in the production version of the pod.





Once TIALD was available, Tabuk's Tornados dropped nothing other than laser-guided bombs, launching three waves per day whenever possible. To relieve the pressure on crews and aircraft, RAF Germany donated four crews, increasing the detachment to ten, whilst ZA406 arrived on 20 February to boost the TIALD Tornado strength to five. After the RAFG infusion had been trained, the personnel were divided into five shifts of four men each, who flew one night mission, one by day and then took one day off.

The Tabuk wing roamed through large tracts of Iraq, reaching as far as Habbaniyah Air Base, near Baghdad, and the airfield at Shaibah, far to the southwest. The latter was a 1,600-mile (2,575-km), three-hour round trip, its unpopularity enhanced on 21 February when bad weather resulted in three of the five waves launched having to bring their bombs back when clouds obscured the target. This was more than offset by a visit to Ubaydah bin al Jarrah on 19 February when Monaghan and his borrowed No 617 Squadron navigator, Flt Lt Harry Hargreaves, scored "the biggest bang in Iraq" in ZD844 when their cell hit an ammunition store. A fireball and smoke rose to 15,000ft (4,570m), a fact which found mention in the following day's UK news reports without credit to aircraft or crew.

For the long-range missions, TIALD Tornados supplemented the two under-wing 495-gallon (2,250-litre) drop-tanks with a 330-gallon (1,500-litre) tank on the starboard belly position, jettisoning the latter before the target so that it did not obstruct the laser's all-round view. Unlike the bombers, they rarely took-on fuel in flight, so could take off some 30 minutes later and join up with their companions after they had left the tanker. In the above configuration, a TIALD aircraft could fly for three hours to Shaibah and back and land at Tabuk with over 2,645lb (1,200kg) of fuel remaining.

TIALD participated in the closing phase of the anti-bridge campaign, for example with a



Top: Although ZA406/DN carried no name, it had nose art applied – shown above with the source of inspiration! Stuart Black

successful attack on the As Samawah rail bridge over the Euphrates on 17 February. Thereafter, airfields took the brunt of the offensive, particular aiming points being shelters and storage installations. Fears that the Iraqi air force might launch a chemical attack when the ground war began on 24 February resulted in the preceding days being devoted to cratering attacks on taxiways and runways. Airfields in the central and southern region which received TIALD attacks included Al Asad, H-2, H-3 Northwest, Habbaniyah, Jalibah Southeast, Mudaysis, Shaiba, Tallil, Al Taqaddum, Ubaydah bin al Jarrah and Wadi al Khirr.

The final missions were undertaken on 27 February against Al Asad and Habbaniyah, all 11 aircraft (one failed to take off) scoring

direct hits. In the second raid of the day, helicopters were destroyed at Habbaniyah when one of the old hangers built by the RAF before Iraq's independence was designated by bombs directed by Monaghan and Hargreaves in ZD739. Had the war continued for a further week, Tornados would have greatly increased their striking power with the adoption of American Mk 84 bombs weighing 2,000lb (907kg) each, for which dropping clearance had been received from the technical viewpoint.

TIALD mounted 72 successful and 23 aborted operational sorties (48 missions, including nine cancelled in the air due to weather) between 10 and 27 February, of which 45 were flown by No 13 Sqn pilots, 20 by No 617 Sqn, 16 by No 16 Sqn, seven by No 2 Sqn and seven by No 14 Sqn. However, the five Tornados bore only 88 mission symbols by the war's end, apparently as the result of simple omission. The system suffered a high number of weather-related problems because its infra-red sensor does not work well in damp conditions. Production TIALDs will also have a TV system to obviate this problem. That said, in terms of percentage hits, TIALD proved superior to all precision bombing systems in the Gulf theatre except the USAF's immensely costly F-117 Stealth Fighter and almost certainly assured itself of a more prominent place than originally planned in the RAF of the mid-1990s.

TIALD TORNADOS					
Serial/Code	Name	Arrived	Returned	Mission	Actual
		Tabuk	UK	symbols	Missions
ZA393/CQ	Sir Galahad	6 Feb	11 March	7	5 + 3*
ZA406/DN	nil	20 Feb	11 March	10	6 + 4*
ZD739/AC	Armoured Charmer	6 Feb	11 March	36	31 + 5*
ZD844/DE	Donna Ewin	6 Feb		20	15 + 6*
ZD848/BC	**	6 Feb	11 March	19	15 + 5*

* Aborted missions
 ** Intended as 'Bacardi and Coke' but nose-art only partially completed

MAMMS'

EXPERIENCE

Flight Lieutenant Roly Barth

Everybody talked about it, the thriller writers dreamed about it and wrote books about it, and the pacifists and environmentalists demonstrated about it, but nobody really believed that it would actually happen – but it did and 2 August 1990 saw the invasion of Kuwait by Iraqi forces, which would eventually turn the rape of Kuwait into the Gulf Conflict and ultimately the 100 Hour War. A chance for the *Dambusters* to fight alongside the *Desert Rats*, and for many other less well-known units to come to the fore in the most technologically-advanced and widely-publicised war the world has ever seen.

One such lesser-known unit was the United Kingdom Mobile Air Movements Squadron, (UKMAMS) a unit normally thought of by those not in the know, as one that travels the world on easy little trips in search of the ultimate hotel or swimming pool bar. *Operation Granby* was the opportunity to remind many people that the key to military success is having the right equipment in the right place at the right time. Why then am I talking about the much-maligned band of merry men so often criticised for ensuring that you arrive late at the wrong destination with your bags and freight in a completely different place altogether!! Well let me explain.

During *Operation Granby*, the squadron was responsible for moving 134 million lb of freight and mail, 1,242 vehicles and 81,219 passengers within the theatre, mostly to the right place and mainly without loss or breakages. The squadron supported up to 15 detachments within the Gulf zone itself (as well as detachments in Cyprus and throughout the UK) handling not only aircraft but also military aircraft from the USA, USSR, Belgium, Spain, New Zealand, Sweden, France, Canada and Norway, as well as numerous chartered civil aircraft.

Accommodation varied from hotels to tents in the desert, from compounds to disused garages while working temperatures ranged from 57deg C (135deg F) in Oman to -5deg C (23deg F) in the Northern Saudi Desert at night. The detachments varied from reinforcing existing movements setups (ie at Akrotiri, Cyprus), or setting up whole movements organisations (as at King Khaled International Airport, Riyadh) to manning Forward Operating Bases run from a dirt strip in the middle of the desert.

The following extracts from 'blueys' (letters from the front line) were written by UKMAMS personnel manning one of the Forward Operating Bases in the Northern Saudi desert to colleagues back in the UK at RAF Lyneham. They highlight the conditions under which the UKMAMS cheerfully carried out their varied duties.

Dear Mams Ops,
Hi, whoever is in Mams Ops these days. We're getting reports back that you don't really know what's going on out here, so here we go.

First a bit of background to this place. When we arrived on the morning of 16 January along with the Henley the only unit here was the 101st US Rangers, everyone else was south of us – only the Egyptians were in front of us. The Rangers asked why we were on their front line, we made an unrepeatable comment! Anyway we set up and dug in and posted our chemical sentry. At about 03.15 were told the war was on and

Below: 'A passing Army Gazelle was flagged down'.
Jeremy Flack/API



the US had launched 100 Tomahawks. So for the next few nights we were in and out of our air raid shelters and NBC suits. On the NE horizon you could see a glow and hear the rumble of B-52 bombing. Now that we're well into it (the war) we're having a quiet time, with Scuds going overhead one way and artillery shells the other. Now the Yanks have got their act together only those areas affected by the Scuds get warned, whereas before everyone got an alarm. There is a Wadi that runs N to S just to the west of the airfield which is a natural tank trap but it is a good route for sneaky Iraqi Spec Forces attacks, the only crossing is by the airfield. Six days ago some Iraqis came down the Wadi and took out a Saudi OP but then got wasted themselves by some Egyptians. Now we've got the US 6th Cavalry with their helicopters with us. The Yanks think we're all snipers with our SLRs.

Dear Mams Ops,
On the 23 February myself, Deano Dawson, Taff Evans and Dave Hind from MSS set off across the desert to landing site LZ04 about 45km away to the NW. Following directions we headed up the MSR Dodge (Main Supply Route) for 15km to Hafar Al Batin, turned North following the Kuwait sign then out NW across the desert. We were told to follow the MSR Black for about 40km. The MSR Black is a dirt track. What we should have done was to go 20km then veered off west. We ended up well north with all the tanks of the Brit 1 Div instead. So when you are lost you ask a policeman, in this case an RMP. He didn't know where LZ04 was, even when we explained it was near the Chinooks. The next thing was to flag down a passing Gazelle

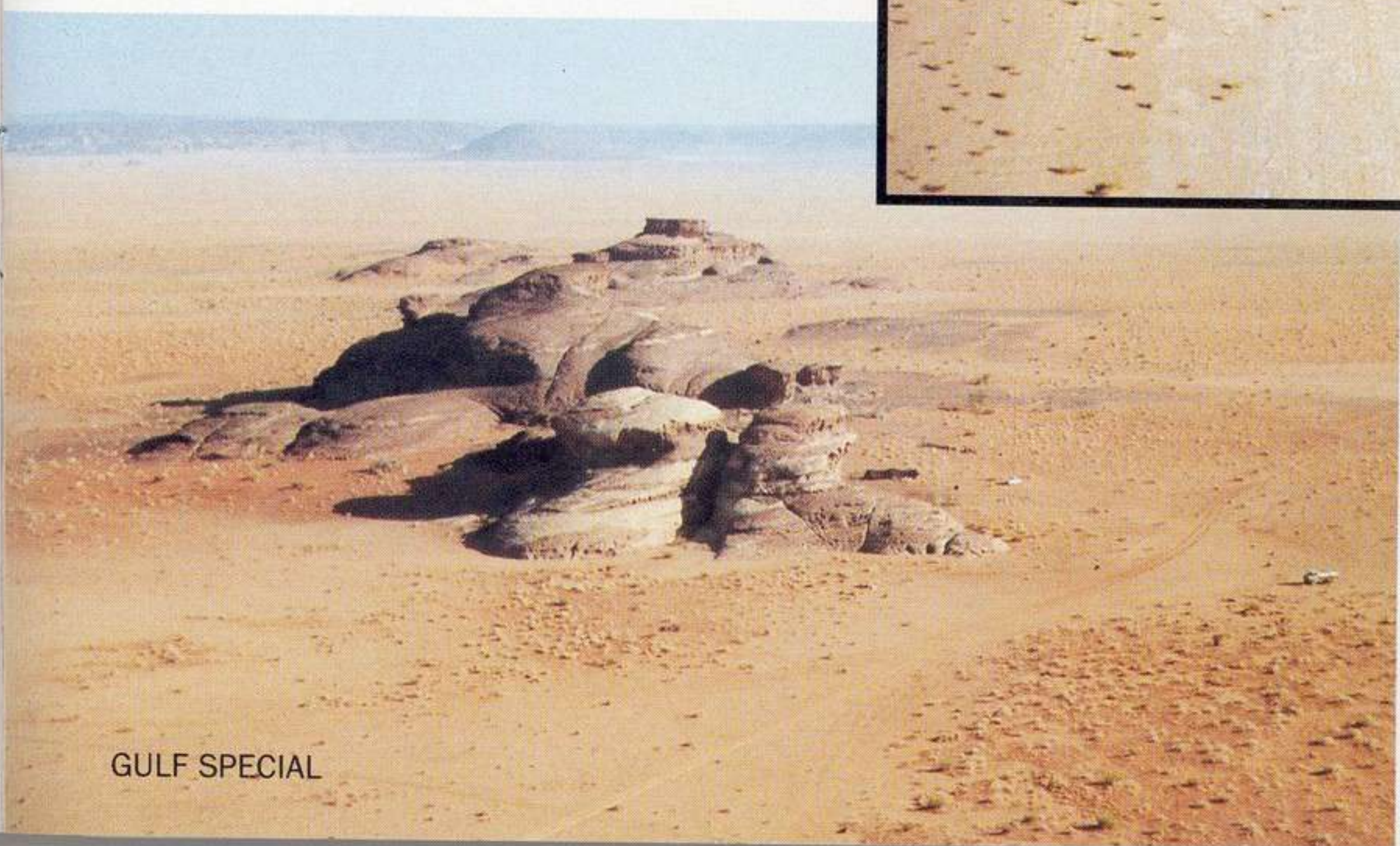
helicopter who kindly gave us a compass heading. So armed with this, we headed off across country, the desert here being flat and fairly firm. After some 15km we arrived with 30 min to spare to meet the first Hercules.

As usual you get no time to set up camp, dig shelters, etc. etc, as the flow of aircraft starts straight away. Using a 7.5K Volvo with extension lines we off-loaded the pallets and



back-loaded tank engines, averaging 35min to off-load five pallets and backload two pallets, the aircraft were doing EROs so the sand got everywhere, and I mean everywhere. The strip was rolled sand in the middle of nowhere. Once again we came across the question, where's your rough terrain loading equipment? As a mobile unit able to operate anywhere supposedly, we have absolutely no rough terrain capabilities. Why not? Who is to say we will always operate from nice hard standings?

The aircraft finished for the day, so we quickly pitched tents, camouflaged up and had a meal. The next day we did a strip inspection as during the night an entire tank transporter convoy had crossed it. Flying ceased at midday due to a sandstorm which lasted four hours. With the tent closed up we still had to empty everything out, dust it off



Above, left and below: Operating from the desert landing strip, the Hercules creates its own sand storm. Dave Fry/API

Bottom of page: It was easy to get lost in the inhospitable desert.

and replace it after the storm had passed. Meanwhile the boys at FOB 'Q' were extremely busy doing all the diverted traffic, from us. The plan is to use the LZ until it is too far south, but with the weather being bad with heavy rain it has made the LZ unusable with deep ruts made by the aircraft.

The war is going extremely well at the moment with very few casualties, let's hope that is a trend. We've had a few Scud alerts with two being shot down within sight of here. The first one we had no warning of at all. After all the holes we've dug for urinals, bomb shelters, burning pits, the list is endless. Yesterday the new FOB team from UK arrived at LZ04. We were amused to see they had brought an electric photocopier with them!



Before all the *Dambusters* arrived with their Tornados and before all the *Desert Rats* arrived with their Challengers, UKMAMS had been there with the RAF's Air Transport fleet, setting up all the airheads and ferrying all the men and equipment necessary to fight and support such a war. More importantly, long after the troops had returned home to the cheering crowds waving flags and bands playing stirring music, there was still a small band of merry men working away around the clock to return the enormous amount of equipment to the UK – that's UKMAMS.

ALBERT *of Arabia*

The RAF Air Transport Detachment (ATD) at King Khaled International Airport, Riyadh, was formed on 30 October 1990 with three Hercules and six crews, plus engineering, movements and support personnel from RAF Lyneham. Under the command of Wg Cdr Peter Bedford its task was to provide 'in-theatre' transport wherever and whenever it was needed by British and other coalition forces in the Gulf.

Two Hercules and three crews from No 40 Squadron Royal New Zealand Air Force joined the ATD on 23 December 1990 and was expanded to four crews in mid January, making a total of about 60 RNZAF personnel during the war period.

The initial basis of operations was a 'hub and spoke' system, with RAF TriStars and VC-10 C1s feeding the 'hub' at King Khaled

International Airport with freight and passengers and the Hercules flying out on the 'spokes', carrying the freight and passengers to locations within the theatre of operations. These included Seeb and Thumrait, both in Oman, Minhad in the United Arab Emirates, Bahrain, and Saudi Arabian airfields such as Dhahran, Tabuk, Jubail and Qaisumah as well as many lesser-used airfields and strips.

The unit was expanded on 14 January 1991 to seven Hercules and 14 crews with proportionally more engineering and movements personnel, which brought the total number of people to about 200. The increase in size occurred just before the start of the air war on 17 January.

The beginning of *Desert Storm* saw the Hercules using short strips – natural surface

airfields – for moving troops of the 1st British Armoured Division. These flights employed 'combat loading', a procedure in which the aircraft fuselage is left empty of seats and the troops sit on the floor. During this time crews became expert in the skills of desert low flying. Their principal function, once the land war commenced was to have been aeromedical evacuation from the field hospitals back to KKIA for onward flights to the UK. Luckily there was little call for this service.

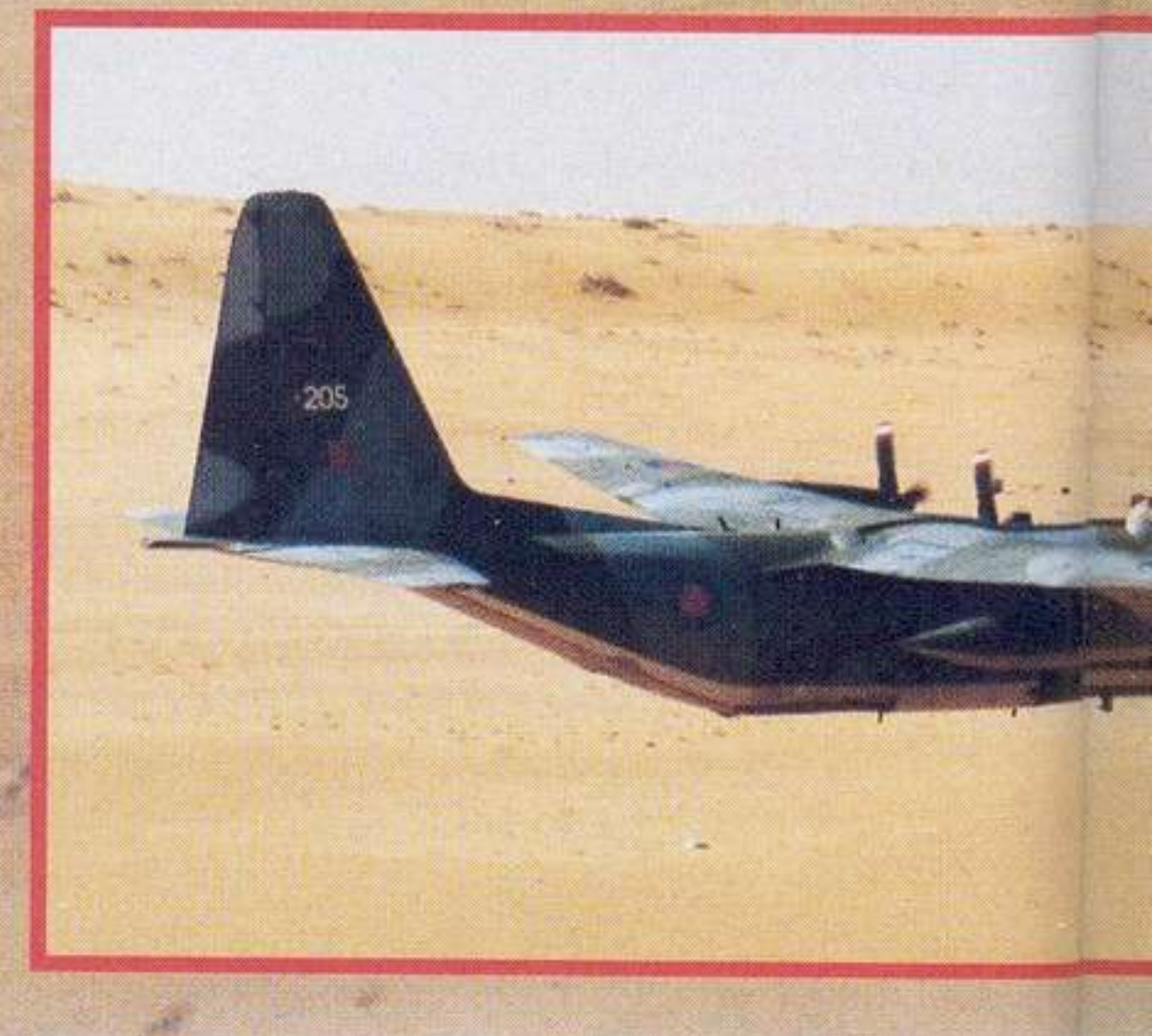
The unit began to operate into Kuwait International Airport on 28 February 1991 and an ATD Hercules was the third fixed-wing aircraft to land there after the airport was re-opened. Subsequently the crews faced the nightmare of flying into the thick black choking smoke that emanated from the



Above & left: From 28 February the Hercules operated into Kuwait International Airport, through the dense black smoke from burning oil wells. PRM

Below left: RNZAF Hercules from No 40 Squadron landing at desert airstrip LZ05. Jeremy Flack/API

Main picture & below: Crews became expert in the skills of desert low-flying once Desert Storm got under way. Dave Fry/API



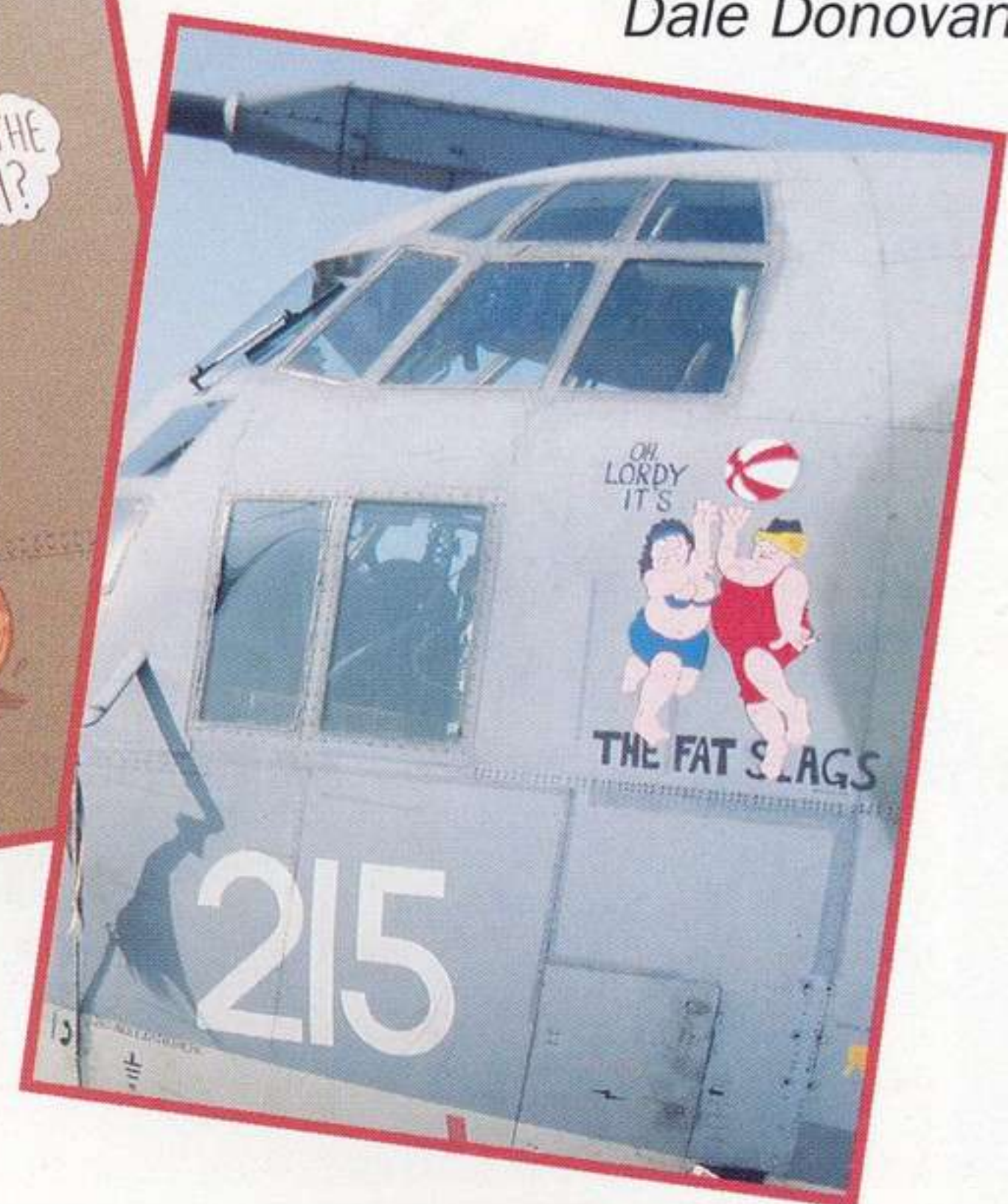
burning Kuwait oil wells.

From the beginning of March, the Hercules operated regular schedules from Riyadh to the big seaport at Al Jubayl (Saudi Arabia), the Tornado bases at Tabuk (northwest Saudi Arabia) and Muharraq (Bahrain), as well as Dubai and Kuwait City and as required between various desert airstrips, like LZ05 in Kuwait and the desert airfield at Qaisumah (northern Saudi Arabia). Many tons of equipment and large numbers of homeward-bound personnel were carried on these flights, contributing to the records already broken by the RAF's Hercules fleet since August last year.

The impressive achievements of the combined RAF/RNZAF Air Transport Detachment at Riyadh both before and during the war were as follows:

	30 OCT- 15 JAN	16 JAN- 27 FEB	TOTALS
Hours flown	1,347	1,643	2,990
Sorties	956	1,275	7.4
Freight (Millions lb)	12.5	7.4	19.9
Passengers	8,915	13,912	22,827

Colourful nose art adorned some of the ATD Hercules in keeping with other front-line aircraft, including XV297- 'Where's The Beach?' (above), XV215- 'The Fat Slags' (right) and XV306- 'The Baron' (below). PRM/Stuart Black



TANKER TRAIL

The RAF's air-to-air refuelling tanker aircraft played a key role in the Gulf air war. Their important task is described in the following three features.

Flight Lieutenant Nick Wilcock



AAR VCs

Left: Equipped with JP233s, a trio of Tornado GR1s queue up for fuel from a VC10. Mike Lumb

Below: All nine of 101 Sqn's VC10s lined up on the apron at KKIA on 21 January. John Gulliver



One of the major lessons learned from the Falklands campaign was the vital role played by the RAF's tanker force in supporting long range operations. Thus it came as no surprise to Group Captain Geoff Simpson, Officer Commanding No 101 Squadron to learn that the squadron was to be involved in *Operation Granby* right from the outset. On 9 August, within hours of the decision to deploy British forces to the Gulf, most of the squadron's VC10Ks were on their way to Akrotiri to prepare for the deployment of fast jets from the UK. The initial deployment was completed on 13 August 1990 with No 5 Squadron equipped with Tornado F3s based at Dhahran and No 6 Squadron equipped with Jaguar GR1As based at Thumrait.

To enable the Jaguars to mount a viable offensive plan, a pair of VC10Ks was co-located in Thumrait. However, Thumrait was not an ideal base from which to operate such large aircraft and by 29 August the decision had been made to redeploy the VC10Ks to Seeb. On 27 August a pair of tankers was deployed to Muharraq, Bahrain, to provide air-to-air refuelling (AAR) training for Tornado GR1s and CAP support for RAF Tornado F3

and Saudi Tornado ADV fighters. No 101 Squadron was now split across three bases (Brize Norton, Seeb and Muharraq) and was fully occupied supporting CAPs and operational work-up training in the Gulf whilst still providing AAR support for UK tasks. However, in October the decision was made to increase the Gulf detachment to seven aircraft, with VC10 K3s at Seeb and VC10 K2s operating from Bahrain. The remaining two aircraft were kept in the UK as new VC10K crews and the 'retread' crew completed their training.

A pattern of tasks began to evolve during October and November with the primary operational requirement being the support of RAF and RSAF air defence fighters. Other tasks included routing AAR training for Tornado and Jaguar crews and AAR support for attack aircraft training in the Saudi and Omani Low Flying Areas. All missions were fully integrated into the Kuwait Theatre of Operations (KTO) daily mission plan and all AAR sorties were tasked using the US system of Air Tasking Orders (ATOs); here No 101's legacy of *Red Flag* participation paid dividends in that many crews were already familiar with US methods and could rapidly

pass on their experience to others.

With the deployment of further Tornados to Tabuk in Saudi Arabia it was soon appreciated that to mount attacks on suitable targets in Iraq extensive use of AAR was essential. Consequently, more demanding training sorties were planned which would involve VC10Ks achieving precise rendezvous with formations of Tornados at night whilst observing radio silence. The formation would then continue along a pre-planned route giving 'pre-strike' AAR to the Tornados before releasing them at their cast-off point within seconds of the briefed time on task. The Tornados would depart to attack a practice target in Saudi Arabia before returning for 'post-strike' refuelling and recovery to base.

This mission profile was totally representative of planned war missions and the crucial part to be played by the VC10K was made fully aware to No 101's crews. Indeed, such was the mission awareness of the crews that on one occasion after their VC10K2 suffered an engine failure on take-off from Muharraq, at close to maximum all-up weight, the crew's chief concerns after carrying out the appropriate emergency drills

Main picture: 101 Sqn VC10 K3 with Dhahran based Tornado F3s. Ian Black



Below: VC10s provided AAR to Jaguars based first at Thumrait and later Bahrain. Mike Rondot Other 'customers' for fuel included US Navy EA-6B Prowlers (below right) and this EA-3K Skywarrior (above right). John Gulliver



were that a message could be sent to Tabuk with a revised rendezvous time and that the hard-working groundcrews could generate a replacement aircraft in time. After a safe three-engined landing the crew was able to change aircraft and complete the mission, taking advantage of the long westerly transit to complete the Incident Report for their original engine failure! This type of mission orientated task need was readily understood by the squadron groundcrew who were operating as dedicated teams rather than as a pool of manpower. The team concept worked well and was ideally suited to short notice deployments of VC10Ks to other bases such as Tabuk.

Modifications to the VC10K for Gulf operations were limited to the provision of *Have Quick* anti-jam radio and secure Mode 4 IFF equipment. The aircraft also received minor compatibility and stowage modifications to permit the use of aircrew AR5 NBC equipment. However, although the need for EW equipment had been recognised none had yet been fitted. Consequently a second phase of modifications was approved which incorporated a Marconi Sky Guardian

radar warning receiver, a second TACAN unit incorporating an airborne beacon facility and 'Autocat' automatic radio relay equipment. Although it had been intended that all aircraft would be modified, only two aircraft had been fitted with RWR by the outbreak of hostilities and no complementary self-protection countermeasure equipment was fitted.

On 17 December the whole squadron moved yet again, relinquishing its base at Muharraq to No 55 Squadron's Victors and operating from King Khalid International Airport at Riyadh in Saudi Arabia. The squadron operated from the incomplete terminal building and shared the facilities (and the Scud attacks) with RAF and RNZAF air transport detachments, a French AF detachment and a very large field hospital. However, despite the austerity of its surroundings the squadron was soon providing AAR for allied air defence CAPs, supporting fighter-bomber trials to weapons ranges and practising more exacting missions involving multiple tanker formations flying representative mission profiles by day and night. As the threat of war became more of a certainty the squadron had finalised

mission plans in support of what had been envisaged as the 'D-Day Option'. However, at the eleventh hour the plan had changed and on the night that hostilities began crews found themselves due to take-off in less than five hours with totally new tasks to plan. Fortunately the training had paid off and all missions took off on time and successfully completed their allocated tasks.

The early missions supporting JP233 attacks on Iraq soon gave way to support for conventional bombing and subsequently to support for Buccaneer-designated Tornado laser-guided bomb attacks and Tornado GR1A reconnaissance missions. Some support for air defence CAPs was carried out by VC10Ks but this task was more usually allocated to No 216 Squadron's desert camouflaged TriStar, known affectionately as the 'Pink Pig'.

However, the RAF and RSAF were not the only customers for No 101 Squadron. Late in 1990 training had been carried out with USN and USMC aircraft and with the outbreak of hostilities crews were frequently tasked to refuel F-14 Tomcats and EA-6B Prowlers involved in strike support. Other USN aircraft

were also supported including S-3 Vikings, A-7 Corsairs and F-18 Hornets and on one occasion a US Navy EA-3K Skywarrior which surprised the crew involved as they had thought the type to be extinct! Later the variety of receiver types increased still further with operational support for Canadian CF-18s and French Mirage 2000s. The serviceability of the VC10Ks allowed a flying rate far above anything which had been anticipated, approaching nearly four times the normal peacetime rate at times.

The dramatic success of AAR supported Buccaneer/Tornado and TIALD Tornado LGB attacks on Iraqi targets paved the way for the ground offensive to begin and a rapid end to hostilities to be within the allies' grasp. One hundred hours after the ground offensive began hostilities ceased and the intensive flying rate for No 101's crews stopped. A few CAP support missions were flown while the squadron eagerly awaited plans for the return to the UK. Finally the plan was ready and in mid-March the squadron began a three-day operation to return the vast majority of the Gulf-based Tornados and Jaguars to the UK and Germany.

After a night stop in Sicily the first four VC10Ks overflew Brize Norton in a tight box formation at low level to a reunion with families and friends in front of the local media. Within 24 hours all nine aircraft were back at Brize Norton and the squadron could take a well-earned rest. Peacetime training had been totally vindicated in war; as well as routine UK training the invaluable worldwide experience gained in *Red Flag* and Far East deployments had enabled crews to adapt rapidly to the changing requirements of the war. The VC10K had proved to be highly reliable and over the seven month period the squadron achieved a sortie success rate of over 99%. A total of 600 sorties (2300 hr) were flown prior to 16 January, off-loading 14000 tonnes fuel; after 16 January 381 sorties (1350 hr) were flown with a further 6800 tonnes given away. The reliability of Flight Refuelling Ltd's AAR equipment proved to be outstanding in a very demanding environment, no VC10K mission having failed due to refuelling equipment malfunction.

Hitherto the traditional war scenario had anticipated Eastern Europe as the most likely threat; however, the last two conflicts in which the RAF has been involved have shown that force mobility to achieve rapid deployment and to sustain long range offensive missions is crucial. This mobility can only be achieved with air-to-air refuelling and will continue to be a major part of the RAF's future strategy irrespective of the legacy of any peace dividend. AAR has often been described as a 'force multiplier'; however, with over 90% of all RAF attack and air defence missions in the Gulf needing AAR, perhaps this description should be changed to 'force enabler' for without the tanker force it would have been totally impossible for the RAF to enjoy the success in the Gulf which it did.

Notwithstanding any future options for change, tanker crews and their aircraft will have a vital part to play in enabling the RAF to discharge its duties successfully whenever and wherever it should be called upon to do so in the years to come.

Flt Lt Nick Wilcock: After five years flying the VC10K he was posted to CFS in May 1989 and subsequently to the University of London Air Squadron at RAF Abingdon. Flt Lt Wilcock was recalled as a VC10K captain for Operation Granby and flew 38 operational sorties.

TANKER TRAIL

MULTI-ROLE

Like the VC10s and Victors, the RAF's fleet of TriStars played a key role in Operations *Granby* and *Desert Storm* and of course the homecoming of aircraft and personnel after hostilities had ceased. No 216 Squadron, based at RAF Brize Norton since 15 August 1983, operates a mixed fleet of former British Airways and Pan Am aircraft. The six ex-BA TriStar 500s have all been converted for single-point air-to-refuelling and four of them have strengthened cabin floors and large side cabin loading doors to take palletised cargo. The two former Pan Am aircraft remain in their previous airline configuration carrying up to 250 passengers. Current 216 Squadron fleet list therefore reads: K1 ZD949, ZD951; KC1 ZD948, 950, 952, 953 and C2s ZE704, ZE705.

From August 1990 to April 1991 there was hardly a day when one or more of the TriStars was not carrying freight and/or passengers between the UK, Germany and bases in Saudi Arabia, Bahrain and Oman. When there were deployments of RAF Jaguar and Tornado squadrons or small flights of replacement aircraft, the TriStars were in action in their air-to-air refuelling role.

All of the K1 and KC1 TriStars were employed on the UK/Germany - Gulf (and Cyprus) AAR Trail and during the period of the air war the two K1s were based at King Khaled International Airport just outside Riyadh, Saudi Arabia. They operated in the air-to-air refuelling 'pool' alongside No 101 Squadron's nine VC10 K2/K3s, providing support for the RAF and Royal Saudi Air Force Tornado F3/ADVs on combat air patrol from Dhahran and replenishment for

Tornado GR1s on their bombing missions over Iraq, and occasionally other coalition aircraft.

Compared with the 'hemp' coloured VC10 tankers the TriStar K1s shiny white and silver paintwork made them very conspicuous over the desert of northern Saudi Arabia. So they returned to the UK where Marshall of Cambridge gave them a coat of 'desert pink' alkali removable temporary finish (ARTF) all over the fuselage, leaving the blue cheat line along the sides. This earned them the nickname the 'pink pigs' with ZD949 dubbed *Pinky* and ZD951, the first to emerge from Marshalls on 17 January, named *Perky*, after the children's tv characters.

King Khaled International Airport has been recently constructed to serve the capital of Saudi Arabia, Riyadh and provides a focus for the national airline Saudia. A fourth terminal was in the process of construction but as yet unfinished when Iraq invaded Kuwait. It thus provided a distinct area on the western edge of the airport for military operations by the RAF and French Armée de l'Air. Both air arms based their AAR tankers here (RAF VC10s and TriStars; French KC-135FRs) and used it as a focus for their transport support operations. (RAF TriStars, VC10s and Hercules - including an RNZAF C-130 detachment; French DC-8s, Transalls and Hercules) from November 1990. The overall military operation was under the command of Group Captain Geoff Simpson, Officer Commanding No 101 Sqn.

RAF flights from Europe routed into KKIA Riyadh where personnel and cargo were handled by a UKMAMS detachment and

TriStar KC1 ZD953 on the apron at KKIA with K1 ZD949 alongside. John Gulliver





Left: Tristar KC1 ZD951, here refuelling a Buccaneer, became known as the 'Pink Pig' after repainting at Marshalls. R. Phillips/MAP



TRISTARS

Peter R March

Above: Pallets of newspapers and mail loaded onto TriStar KC1 ZD953 at Brize Norton. PRM

passed on to the Air Transport Detachment for onward transit by Hercules to their Gulf destination. To this end a complex programme of flights was arranged on a regular basis to the principal locations of British forces. There was a similar 'structure' for casualty evacuation during the land war, in the reverse direction. Casualties were brought back from the front-line through the field hospitals to forward airstrips and airfields. Here they were picked up by Hercules and flown back to KKIA for onward transport by VC10, TriStar to the UK and Hercules to Akrotiri. Thankfully this casevac system was little used. Had it been necessary No 216 Squadron's TriStars would have played an important role.

In addition to carrying essential spares and equipment, the TriStars played a key part in maintaining the morale of British troops in the Gulf. Each daily flight from Europe carried on board pallets piled high with mail from Britain and Germany, parcels and newspapers – the vital link with those back home.

We joined Flt Lt Dave Hulse and his crew from No 216 Squadron on KC1 Ascot 3612 (ZD953) for a typical six-hour, 3120 miles non-stop flight from RAF Brize Norton to Riyadh (KKIA), Saudi Arabia. On the busy home-base ramp the big transport was prepared for the early afternoon departure. Two-thirds of the capacious fuselage was cleared of seats and two pallets of mail and one of military items were rolled in through the side cargo door. Most of the mail had originated from Germany coming to Brize Norton from Wildenrath on the morning's incoming flight from Riyadh, which routes via Germany. The 46 passengers were accommodated in comfortable airline seats at the rear of the aircraft, looked after by a trio of stewards. 953's tanks were topped up to nearly 70,000kg of fuel, of which some 48,000kg was expected to be used.

Although ready for departure on schedule a delayed airways clearance for the busy initial section, caused take-off to be held up until 14.25. Despite a take-off weight of 197,549kg the TriStar was soon airborne from Brize Norton in the fresh westerly wind, and climbing rapidly towards Midhurst and Worthing on the south coast.

The standard route, flying at 33,000ft

initially and up to 37,000ft for the latter stages, took the TriStar down through France to Nice, northern Corsica, off the west coast of Italy, across to southern Greece where it arrived 2hr 20min after take-off. Then it was south across the Mediterranean to reach the Egyptian coast at El Daba 1hr 30min later. With several alternative routes now available, subject to the whim of air traffic control, Ascot 3612 was lucky in being given the shorter option of being able to head almost directly from Nabed across the Red Sea to Saudi Arabia and its final destination.

Landing with just over six hours flight time, it was approaching midnight local time at King Khaled International Airport, when the TriStar taxied to a halt amongst the assorted tankers and transports and was quickly surrounded by refuellers, and handling equipment. A two-hour turn-round and ZD953 would be heading back to Wildenrath and Brize Norton just one small part of the day's

work for No 216 Squadron. Alongside KC1 Pinky was being prepared for an early morning take-off to refuel Tornado F3s on combat air patrol.

With 120 tonnes of fuel on board ZD949 lifted off KKIA's runway at 0645 local time and climbed northwards towards the Kuwait-Saudi border and the *China Berry* CAP. On station 45 minutes later the first Tornado F3 silently slipped in behind the TriStar and took its 3.5 tonnes. During the next five hours high over the desert a further eight Tornados arrive for a top up; the last 2 tonnes of fuel are given to French AF Mirage 2000s before the *Pink Pig* turned for home. This typical AAR sortie had lasted 7hr 35min and 37 tonnes of fuel had been dispensed. During the four weeks of the air war one of the TriStar K1s gave away 1,325,465lb/165,683gal of fuel to aircraft on CAP. This would have been enough to keep a family car going for over 400 years!

Below: Before repainting, the shiny white top of TriStar ZD951 was very conspicuous over the Arabian desert. Mike Rondot Bottom: One of a pair of ex-PanAm TriStars, C2 ZE705 remains in a conventional passenger role. PRM



TANKER TRAIL

VETERAN VICTORS

Wing Commander David Williams

Main picture: *Jaguars en route from the UK to the Gulf at the end of October receiving fuel from a Victor K2 of No 55 Sqn.* Mike Rondot Top: *Many of the 138 Olive Trails were in support of Tornado GR1s.* Stuart Osborne

In August 1990 No 55 Squadron was supporting Jaguars at the Reconnaissance Air Meeting in Texas when the recall of all Victors to the UK was ordered. Within 24 hours the tankers were back at RAF Marham and within 48 hours they were operating over France and Sicily to help deploy the fast jets to the Gulf.

Numerous tasks involving all the Victor assets were needed to position the Tornado GR1s, F3s and Jaguars from Britain and Germany to Tabuk, Dhahran and Muharraq. On completion of these deployments one Victor aircraft arrived at Muharraq on 14 December 1990 for a formal handover from No 101 Squadron VC10 detachment, who had been operating at the base for three months. The next day three more Victors arrived, shortly followed by two more crews.

The initial requirement from Strike Command was that the Victor detachment would support the Tornado F3 and the Jaguar missions only, and the VC10 detachment would support all Tornado GR1 sorties. After all ground training was completed, flying began on 16 December 1990 to air-refuelling 'towlines' scattered throughout the Saudi

Arabian airspace. It became apparent that the rigid apportioning of receivers to tankers was impractical, and the Victors supported all types of aircraft from the UK, Canada, France and the United States Navy and Air Force that were probe and drogue compatible. After two weeks of intensive flying, four crews returned to the UK so that the remaining four crews could be brought into the environment and be fully trained up to a war footing by 12 January 1991.

On 12 January 1991, additional Victor aircraft together with the two initial crews, were positioned at Muharraq, and by 16 January 1991, No 55 Sqn was a total of six aircraft, eight crews and 99 groundcrew. Further training sorties were flown until 16 January 1991 when at 2250 Zulu, two Victors led the first Muharraq Tornado GR1 bombing mission into Iraq. The sortie was flown along *Olive Low Trail* which was a track south of the Iraq border but concluded with a northerly heading to cast off the receivers into the heart of Iraq. *Olive Trail* then became the bread and butter route for the rest of the war. To meet all contingencies and to ensure that fuel was available for the Tornados on their

return from the mission, all Victor aircraft were refuelled to the maximum 123,000lb for take off. The early sorties were affected by the very poor weather along the refuelling tracks and consequently, the aircraft consumed treble the normal fatigue. As experience grew, the take off fuel was adjusted and the fatigue penalty was reduced.

On 19 January 1991, an additional Victor was sent to supplement the other six, as up to a maximum of 14 sorties were being flown per day. Many sorties were flown over the Persian Gulf in support of attack missions and air defence patrols and together with 138 *Olive Trails* and numerous other combat air patrols, 299 sorties were flown over the 42 day war, an average of 33 missions per crew. The Victor detachment achieved every objective and did not fall down on any operational sortie. It was tight at times, and the need for flexibility, excellent engineering support and good airmanship saved the day and produced a 100% success rate.

Wing Commander David Williams is Officer Commanding No 55 Squadron, RAF Marham.

Colourful nose art adorned the Victors: 'Slinky Sue' (later 'Sweet Sue' - XH671, 'Saucy Sal' - XL164, 'Lusty Lindy' - XL231, 'Teasing Tina' - XM715, 'Lucky Lou' - XM717 and 'Maid Marian' - XH672. Photographs: Paul Jackson, Mike Rondot, Dick Ward, PRM



Below: The squadron was based at Muharraq, Bahrain from 14 December. Stuart Osborne



GULF CAP

Tornado F3 crews from Nos 29(F) and 43(F) Sqns describe the deployment of their respective units to the Gulf.



Flt Lt Ade Brass of No 29(F) Squadron.

No 29(F) Squadron's Armament Practice Camp (APC) during July and August 1990 in Cyprus was greatly affected by Iraq's invasion of Kuwait on 2 August 1990. The squadron had completed a successful and enjoyable APC (all pilots qualified to ACE standards) and was preparing to return to the UK on 8 August. However, things rapidly changed when a signal was received by OC No 29(F) Sqn "to remain in theatre". The squadron had already been joined at RAF Akrotiri, Cyprus by No 5 Sqn which was about to start its APC on 7 August. The two squadrons waited with baited breath to see what their next move would be.

Rumours as usual were rife, but on 10 August the squadrons received a Warning Order: 'move to Dhahran, Saudi Arabia'. Twelve Tornado F3s, under the command of the OC No 5 Sqn, flew to Dhahran on 11 August, – six jets and crews from each squadron. The remaining aircrew and groundcrew also flew to Dhahran on that day by Hercules. By 12 August 12 F3s were available at Dhahran with 22 crews, supported by over 200 groundcrew. Their task at this stage was to bolster Saudi's air defence network, as the Iraqis were now amassing a sizeable force on the Kuwait/Saudi border and the intentions of the Iraqi President, were 'unclear'. The squadron had completed an exhilarating five days and was preparing itself for the worst: both mentally and logistically. *Operation Granby* was under way.

The Coningsby detachment flew its first combat air patrol (CAP) on 12 August, just south of the Kuwait/Saudi border. The US was rapidly moving resources into Saudi to deter Iraq from further aggression and the situation was becoming relatively 'stable'. The MoD produced its first 'roulement' and the Coningsby aircrew, groundcrew and aircraft were replaced by Tornados from RAF Leeming, which were by now equipped with the superior Stage 1 Plus *Operation Granby* F3s.

No 29(F) Squadron personnel knew, as soon as they had returned to RAF Coningsby, that they would have to return to Dhahran. The only question was when. Eventually it

Main picture: Training with F-15s, Mirage 2000s, F-14s and this USMC F/A-18 Hornet of the coalition air arms continued until 10 January. Tony Paxton

Above top: Combat air patrols (CAPs) were flown just south of the Iraq/Kuwait/Saudi Arabia border by the F3s. John Reeve

Above: A dispersed flight-line with concrete walls was essential for the Tornados with war approaching. No 43 Sqn

Right: Air-to-air refuelling formed an essential part of each sortie. Dave Edwards



became clear enough – in December 1991 for a six-month period! 'A' Flt, along with OC No 29(F) Sqn, left Coningsby on 14 December with 'B' Flt following a week later. In total the squadron deployed 13 crews, including one crew from No 25 Sqn at Leeming. This time the Dhahran F3s were commanded by Wg Cdr Andy Moir, OC No 43 Sqn, Leuchars. Again No 29(F) Sqn personnel was playing a major supporting role. This time, the squadron felt more prepared. An extensive work-up programme had been completed by the crews in the UK. This included AR5 flying, combat to reduced base heights, and a thorough night

vision goggles (NVG) flying phase. The crews also felt at home with the improved Stage 1 Plus F3s, and had studied the capabilities of the enemy.

The squadron continued to fly a mix of CAPs (again, to the south of the Saudi/Kuwait border) and training sorties until 10 January 1991. The 15 January UN deadline was fast approaching and the chances of a diplomatic solution were disappearing. At Dhahran we had now been joined by a detachment of Tornado GR1s, and the overall RAF Detachment Commander was Gp Capt Spink who had just taken over as

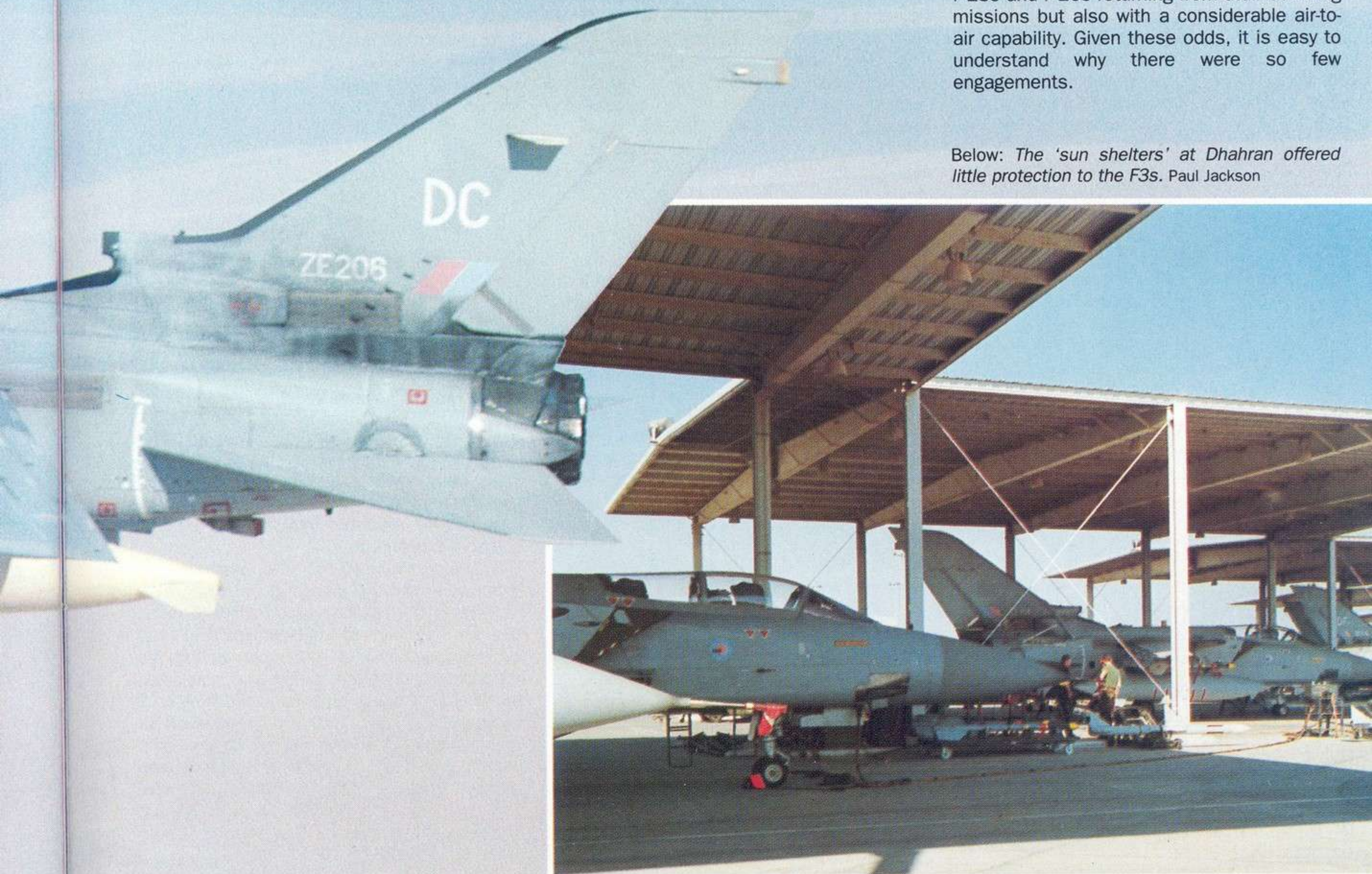
Station Commander at RAF Coningsby. It was Gp Capt Spink who broke the news to the RAF aircrew at Dhahran: "... our mission is the elimination of the Iraqi Air Force ...". H-hour was defined as 0300am (local) 17 January 1991. The GR1s had their targets, the F3s had their CAP locations. All rumours were dispelled – The facts were clear enough!

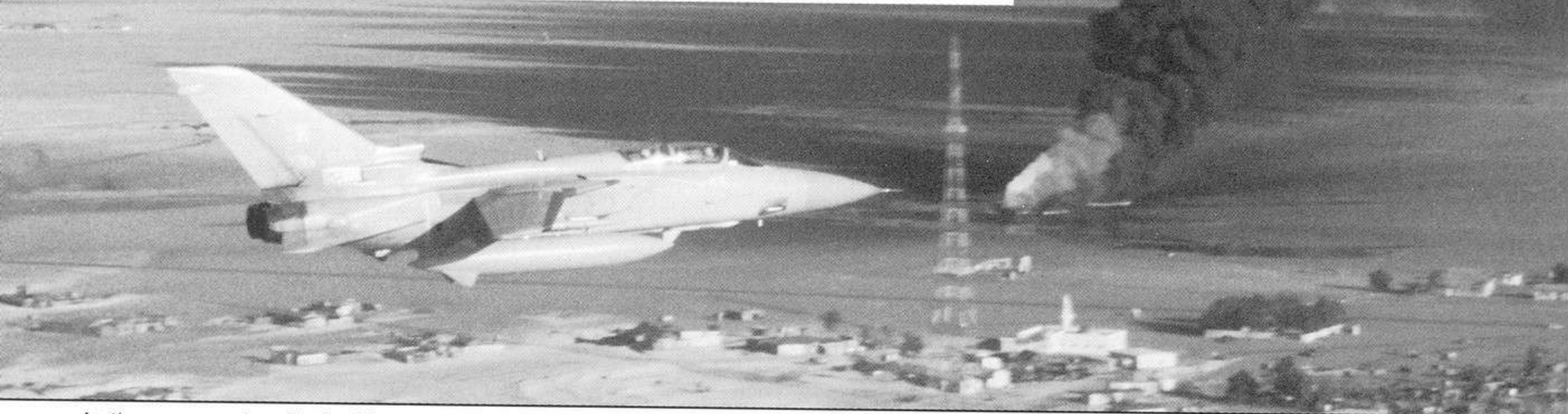
The squadron flew over 360 missions over the next 50 days and to the surprise of all concerned engaged no enemy aircraft. The major worry for the crews was actually the threat from Iraqi surface to air missiles (SAMs) and anti-aircraft artillery (AAA) in the



operating areas. The Iraqi Air Force was extensively bombed on the ground and those aircraft that survived chose not to face the overwhelming allied air superiority which existed as far north as Baghdad. Had the Iraqis got airborne they would have faced a mixed fighter force of F-15s, Tornado F3s, Mirage 2000s, F-18s and F-14s. Also included in the line-up were dual role F-15Es, F-18s and F-16s returning from their bombing missions but also with a considerable air-to-air capability. Given these odds, it is easy to understand why there were so few engagements.

Below: The 'sun shelters' at Dhahran offered little protection to the F3s. Paul Jackson





As the war moved north, the F3s were flying over burning Kuwaiti oil wells. Andy Moir Inset: Improved Stage 1 Plus Operation Granby modified F3s soon replaced the initial deployment. The Desert Eagles of No 11 Sqn remained until December. Ian Black

Flt Lt A F Clitherow No 43(F) Squadron

After intensive training and a considerable period of '48 hours notice to go', No 43(F) Squadron arrived at the Saudi Arabian air base at Dhahran in the early hours of Saturday, 1 December 1990 to join Saudi, US and French fighters in the Air Defence of Saudi Arabia. The first crews were flying Tornado F3s on Combat Air Patrols (CAP) by the morning of the next day, providing both air defence of Saudi Arabia from the Iraqi bomber threat and protection of the many reconnaissance and AWACs aircraft from possible fighter attack. Covering these high value assets remained a task throughout the hostilities but as the land war approached the F3s were also given the job of covering our own attack aircraft should they be bounced by Iraqi fighters over the area of the land battle.

The Tornado F3s were an integral part of an air defence system which included surface-to-air missiles, airborne and ground radars, guns of various calibres and the fighter aircraft of the Coalition. The F3 CAPs were placed as barriers just south of the border of Saudi Arabia with Iraq and Kuwait. These CAPs were usually manned for 24 hours a day by the crews of No 43 and also No 29 Squadron who arrived in mid-December to make up the second half of the 'composite' squadron. The aircrew rotated between day and night shifts but this 24-hour

commitment was hard work, particularly for the ground crews who maintained an exceptional level of aircraft serviceability.

On arrival, much still remained to be done in preparation for war. The aircraft were parked out in the open under 'sun shelters', which were fine for that purpose but provided no protection from airborne attack, being little more than 'car-ports' for aircraft. As soon as practicable the Tornados were moved to a dispersed flight-line which, while open to the sky, was revetted and for extra protection huge concrete walls began to appear. These walls broke up the possible lines of attack from the air. By the time the shooting started the Squadron was as protected as it could reasonably be and this was a great tribute to the ground crews and the RAF and Saudi Logistic and Support personnel at the base.

Active service was declared for all British personnel in the Gulf theatre of operation at one minute after midnight on 17 January 1991 and the pace of flying became intense. However, the biggest surprise of the war was the almost non-existent aerial opposition. It was not long before rumours of Iraqi defections to Iran began to filter through the intelligence network and it is now clear that after a few fighter air defence sorties by Fulcrum and Mirage F1 aircraft the Iraqi Air Force played no more part in the war. There

were no enemy offensive bombing operations but the F3s continued to wait on the border and were used in the early days when the Iraqis still flew.

On 18 January two Dhahran F3s, one with Wing Commander Andy Moir, OC No 43 Squadron on board, committed north into occupied Kuwait. A formation of American A-10 attack aircraft was escaping south and being chased by Iraqi fighters. The F3s moved at high speed, blowing off their fuel drop tanks and locking their targets from long range with the Foxhunter radars. The targets, no doubt fully aware of the approaching Tornados from their own radar warning alarms and their ground control radar operators, turned tail and ran north. On various other occasions the Tornados of both Nos 43 and 29 committed north into Iraq and Kuwait and came under fire from Iraqi operated defence systems, most notably 57mm and 23mm AAA guns.

As the ground war started and the coalition tanks rolled north the Tornado CAP positions moved north with them. By Day 4 of the ground war the F3s were 'capping' over Kuwait City itself and the crews were able to see clearly the results of the 'scorched earth' policy carried out by the retreating Iraqis. The country below was littered with burning oil well heads, polluting the skies over the whole region. Just north of the city the F3s overflew the scene of a large tank battle where the main escape road into Iraq was littered with burnt-out equipment.

Following the end of the war and in accordance with the pledge given to the Arab partners in the coalition which allowed for no long term presence in the Gulf, Nos 43(F) and 29(F) Squadrons withdrew as soon as both the capabilities and intentions of Iraq became clear. The Dhahran F3 detachment finished flying on 8 March 1991. On 12 March six Tornados left for home, followed the next day by another pair. The last of the Squadron groundcrew and equipment left on Friday, 15 March 1991. After a short period of leave both squadrons were again carrying out their normal peacetime duties over the UK.



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NIMROD'S WAR

Wing Commander Andrew Neal

Wg Cdr Andrew Neal in common with the rest of the RAF personnel at RAF Kinloss had been following events in the Middle East closely, after the Iraqi invasion of Kuwait on 2 August 1990 and the subsequent ordering of United Nations sanctions against Iraq. The Nimrod with its long endurance and excellent surface search capability with Searchwater radar, would be an ideal platform to police the waters of the Gulf in the search for ships attempting to get supplies into or out of Iraq. It came as no surprise therefore when on 8 August Gp Capt Brian Burrage, the Station Commander at Kinloss was told to prepare to send up to three aircraft and four crews to the Gulf. A specific destination was not known at that stage, but with crews regularly deploying to Seeb in Oman on *Exercise Magic Roundabout*, that appeared to be the favourite option.

On 11 August the decision was made to deploy: the first aircraft leaving Kinloss on 12

August – destination Seeb. The remaining two aircraft were to follow later. This first aircraft, flown by Flt Lt Nigel Priest and his 13 man crew from No 120 Sqn, their Squadron Commander Wg Cdr Andrew Neal, who was to be the deployment commander, four operations support crew and eight groundcrew, left Kinloss with little media coverage. The issuing of personal weapons and ammunition and the salutations of many (including London Control as they left UK airspace) left them in no doubt, however, as to the importance of the task ahead. The aircraft first flew to Cyprus, and taxiing past the lines of Jaguars (who had left the UK the day before), Tornados, Hercules and VC10s, it was immediately apparent just how big an operation was being mounted by the RAF. An hour and a half was spent on the ground at Cyprus while the aircraft was refuelled, and then the journey continued to Seeb, arriving 14 hours after leaving Kinloss.

Working accommodation at Seeb was sparse: a room with two telephones for an operations centre, and a space in a hangar for the groundcrew. No such accusation could be levelled at the local hotel where the deployment was accommodated! No specific instructions had been issued as to the form that the Nimrods' operational flying was to take, so the deployment commander contacted the UK and US Military Attaches to ascertain what naval units were already in the area. The next morning the aircraft flew to Bahrain so that tactics could be co-ordinated with the Captain of *HMS York*, a member of the Armilla Patrol. From these discussions it was decided that the Nimrods would patrol the Gulf of Oman (GOO), and the first proving flight was mounted the following day, 15 August.

That first operational sortie was planned as a three hour flight in the GOO and the crew were briefed to check the density of

Below: Nimrods were fitted with a number of self defence measures. Here the crew are testing the release of flares to decoy infra red air-to-air missiles. No 120 Sqn Two Nimrods received the attention of the 'artists' – XV235 'Muscat Belle' and XV258 (bottom) 'Guernsey's Girl'. John Meston



shipping in the area and locate the expected US Navy warships. These were of particular concern as at that time the area was very tense, and trigger fingers were very itchy. Haze reduced visibility down to only three miles and the sortie was only just under way when the crew were challenged by an American voice on the international distress frequency with the words "Aircraft squawking mode 3 4014, heading 150, height 500ft, speed 200kt, you are approaching a US Navy warship operating in international waters. Your intentions are unclear. Turn onto 360 degrees and identify yourself or face possible US Naval defensive measures". With memories of the USS *Vincennes* incident in their minds, the Nimrod crew were not slow to carry out the instruction and were eventually able to talk to the warship – which turned out to be the aircraft carrier US *Independence*. Much of the remainder of the sortie was spent with the deployment commander and the Nimrod captain talking to the carrier battle staff on the secure radio; it was from this exchange that the Nimrods' future operating procedures were established, and the foundations of excellent UK/US maritime co-operation in the Gulf were laid.

The next day the area was extended to cover the whole of the GOO and to investigate the waters around the Straits of Hormuz. This was the first time a Nimrod had operated at low level through the narrow airspace round the Straits and the crew were challenged by Brander Abbas Radar in Iran which was not used to seeing foreign military aircraft operating in their patch. It was explained that Nimrods would remain clear of Iranian territorial waters and the precedent was set for regular Nimrod flights through the Straits unhindered.

By the time the crew arrived back at Seeb, the second aircraft had arrived, to be joined the following day by the third aircraft, bringing the deployment up to full strength. The routine was quickly established with two sorties of six and a half hours a day. Crews were tasked to identify all shipping in their area in the search for Iraqi vessels or other sanction busters. In order to achieve this the Nimrods flew past the stern of the vessel at 200ft to get the name and port of registration. The vessel was then called on the maritime radio band, asked to identify its port of departure, destination and type of cargo. These details were then passed to the RN and USN warships in the area. The response from merchant ships ranged from the polite to the unprintable, but by the end of the first month it was not unknown for a ship's master to call up the Nimrod as it flew past and offer the information before being asked.

Operations continued on this scale throughout August and September with Nimrods being present at the boarding of numerous Iraqi vessels, and earning the praise of the USN for their professionalism. The aircraft had been fitted with the Mark 12 IFF with Mode 4 facility so were no longer challenged by the Americans.

It was not until 10 September that the first dedicated Persian Gulf sortie was flown. It was found that by operating in the North West corner of the new area, it was possible to radar map the coast of Kuwait and so keep a check on various Iraqi contacts of interest that were known to be there. The Nimrod operating pattern was now changed to one sortie in the Persian Gulf and one sortie in the GOO each day.

In October a search and rescue (SAR) standby requirement was added to the

Nimrod's role. This was to be not only maritime SAR which Nimrod crews were well versed in, but overland Combat SAR (CSAR) in the event of aircraft crashing in the desert. At that time it was not envisaged that Nimrods would be called on to operate at no notice on the front line. Numerous practice overland SAR sorties were flown. On one such sortie in Saudi Arabia, two US airmen were pre-positioned in the desert to represent survivors. They were soon located by the Nimrod, flown by Flt Lt Nick Hardy from No 206 Sqn, and fighters were called in to deal with the simulated advancing Iraqi army, however, when it came to picking up the survivors, their helicopter became unserviceable. With night time rapidly approaching it became obvious that there was now a genuine survival situation, so the Nimrod crew dropped an overland survival canister to the airmen, the first time that this equipment had been used by a Nimrod 'in anger'.

Monitoring the Iraqi merchant fleet was still the Nimrods' primary task, but by the end of November, the Allies were so successful with interception measures, that no more Iraqi vessels tried to run the gauntlet through the congested waters of the Gulf. In December, plans were formulated on how best the Nimrod could contribute to the

surveillance around the Allied naval task force in the northern Persian Gulf, in conjunction with USN P-3C Orion maritime patrol aircraft. It was agreed that the Nimrods would come under US control when airborne, flying two sorties each night in direct support of the Allied naval task force. *Desert Storm* began with Nimrods in the front line ready to play a significant part in the destruction of the Iraqi Navy.

Warships had proved vulnerable to attack in the confined waters of the Gulf during the Iran/Iraq war. The primary threat to the Navy was from fast patrol boats, helicopters and aircraft fitted with anti-ship missiles such as the Exocet. A threat was also thought to exist from suicide attacks by fanatics in motor boats packed with explosives and there was also the ever present danger from mines.

The primary task of the Nimrod crew was to establish a radar surface plot from 29 degrees North to the enemy coast, and report all contacts of interest. This was not as simple as it sounds in an area packed with oil rigs, well heads, channel marker buoys and wrecks. The professional skill of the SNCO radar operators, soon allowed them to memorise the radar picture and quickly report any new contacts for identification.

As a 'high value' unit, the Nimrod was not



Above: Having first detected them on Searchwater, Nimrod crews identified all ships in the Gulf by flying past their sterns to read the name and port of origin, then calling them on marine band radios to ascertain their cargoes and ports of call. No 120 Sqn Inset right: Crew from No 42(TB) Sqn, who were 'joint top scorers' in the war, in front of Nimrod MR2P Battle Star at Seeb. No 42 Sqn.

protection of Allied ships from any possible attack by Iraqi military vessels.

As military convoys seemed to fill every road leading North, at sea the massive battle fleet was quietly sliding into position. The economic blockade of Iraq was complete, now the Allies were preparing for war. With combat search and rescue becoming more and more likely, all the Nimrod crews flew low level sorties over the desert, to become familiar with locating and helping downed aircrew as the 'On Scene Commander', without getting shot down themselves. A Nimrod was always on search and rescue standby in the Gulf, just as it is in the UK.

Only days before the fighting began, the plans for the protection of the carrier battle groups were finalised. The Nimrods' task was to contribute to the 24 hour surface

allowed to break its radar coverage to identify contacts. The crew provided regular updates of the position, course and speed of any target to allow Surface Unit Combat Air Patrol (SUCAP) to identify it using infra red equipment. On occasions the Nimrod vectored the SUCAP to the target directly. When the contact was positively identified as hostile it was attacked with laser guided bombs, rockets or missiles until it was sunk. Nimrods were directly involved in the destruction of 15 Iraqi vessels.

The following reports are typical of Nimrod operations during the war period – the first comes from Flt Lt A N McLaughlin

15 February 1991

"My crew of 13 began to assemble in the briefing room about two hours before the



Top: A Nimrod MR2P flies along the coast of Kuwait, with smoke from burning oil wells clearly visible in the distance. Above: US Navy carrier borne S3A Viking aircraft also assisted in air surveillance operations. No 120 Sqn



The deployment commander, Wg Cdr Andrew Neal, with members of the aircrew and ground support personnel at Seeb. No 120 Sqn

planned take-off time. This would be our 15th combat mission on *Operation Desert Storm*. A few precious letters from home were tucked into flying suit pockets as the crew started to collect the information they required from dozens of signal clipboards in Nimrod Operations. The brief followed a standard format and always included an update on the progress of the War, for which a BBC reporter would have given his eye teeth!"

"Engines were started ten minutes before take-off and the 90min transit with Air Traffic Control was routine. As we entered the Northern Persian Gulf the pace quickened. The Air Electronics Officer called the nearest of five US aircraft carriers for clearance to overfly, as the Radio Operator spoke to the Air Warfare Controller for identification and clearance to enter the Missile Engagement Zone. Meanwhile, the Co-pilot was talking to a controller on the US E-3A Sentry to confirm that our fighter escort of two USN F-18 Hornets was ready for us and the Routine Navigator was getting a handover from the USN P-3C Orion we were to relieve.

The positions of the hostile vessels in our area were plotted out and tactical and combat checks carried out to prepare the aircraft for handover to our Air Control Unit (ACU) for the night. So, as the Nimrod passed 29 deg N, the Tactical Navigator briefed the crew on all the information that had been received in the last 30 minutes of intensive communications, and we called 'On Patrol!'"

"Our tasking was to take over the surface radar plot from 29 deg N to the enemy coast and report all contacts of interest to the Allied Naval Task Force. The ACU would then allocate a Surface Unit Combat Air Patrol (SUCAP) to visually identify the contact and if necessary destroy it. The crew were all alert as we entered a holding pattern about 20 miles off the coast of Iraq. Ahead lay four hours of intense concentration before our responsibility for the safety of the Naval Task Force from surface attack could be handed over to another Nimrod crew".

"The visibility was good for a change and while the daylight lasted we could see about 30m into Kuwait, Iraq and Iran from 12,000ft. The Link 11 Operator called that there was a B-52 raid approaching from the West and we could soon see the contrails from the first wave of bombers. The contrails changed direction as each aircraft began its

bombing run and the sticks of bombs could be seen clearly exploding on Kuwait City Airport. The first of the oil well fires were visible in Southern Kuwait, but the huge cloud of smoke that would soon obscure the view had not yet formed. In the oil stained waters of the Gulf we could see the half submerged hulks of Iraqi warships from previous actions".

"An urgent call from the ESM Operator told the crew that he had detected a radar fitted to an Iraqi ship, among the dozens of Allied radars saturating his screens. The Radio Operator passed this information to the ACU along with the positions of three radar contacts that could not be identified as known ships or obstructions. Suddenly one of the radar contacts began to move East at 15kt. The ACU was warned with a Flash message and a request for SUCAP assistance. Within minutes a pair of USN A-6 Intruder fighter bombers were allocated and the Radar Operator began to vector them towards the contact. The vessel was identified as a 'large tug with boxes on the deck' and no attack made before the A-6s had to return to their carrier for fuel. We were also running short of fuel according to the Flight Engineer, but the FLIR Operator was convinced our target was not a tug so we requested another SUCAP. Our handover to the next Nimrod complete, we had the satisfaction of hearing the second SUCAP re-assess our contact as an Iraqi landing craft and sink it as we began our transit South and thoughts turned to letters from home".

The second war report is on a Nimrod CSAR Sortie, by Flt Lt Nigel Priest

3 February 1991

"At 0420L the 'phone rang in the SAR captain's room. The crew were required immediately for a SAR sortie. It took five minutes to raise the rest of the crew and a further 15 minutes to drive in to the airfield. While most of the crew prepared the aircraft, the crew execs looked at the information that was available on the incident".

"A flight of four US Army AH-1 Cobra helicopters had been returning from night operations when it was discovered that one aircraft was missing. A brief search was conducted by the other three but to no avail. It was therefore decided to send a Nimrod to act as airborne mission commander to co-

ordinate the search for the missing helo. The area of possibility was just south of the Iraq/Kuwait border".

"After waiting for a final message from JRCC at Riyadh, the crew got airborne just over an hour after the initial call. It was decided to transit to the search area via the normal Nimrod mission route. All agencies were used to the aircraft by now so although slightly longer in distance, this route would be quicker to get the aircraft identified by the air defence environment".

"The over sea transit went smoothly and after a short delay the aircraft was identified by the AWACS and able to transit over land and descend to its operating zone just south of the border. The crew made contact with the Airborne Command Control and Communications aircraft and asked for two helos to assist in the search. These duly arrived in fairly short order along with the missing helo's wingman. Although a brief search of the missing aircraft's route had been conducted during the night, the crew decided to re-search the route by daylight. Each helo was given a ten miles radius to search and were vectored to their start positioned by the Nimrod. When they had searched their initial area they were to be moved down track by ten miles so there would be good overlap between areas. While the search was getting under way, the AWACS was asked to find a tanker for the Nimrod in order to extend its on task time if required".

"Fifteen minutes after the start of the search a crashed helo was found. Further investigation revealed, however, that this was an aircraft that had crashed before the war started. Half an hour later further wreckage was seen, and this time it was confirmed that they had found the Cobra. Regrettably both crew members had been killed in the crash".

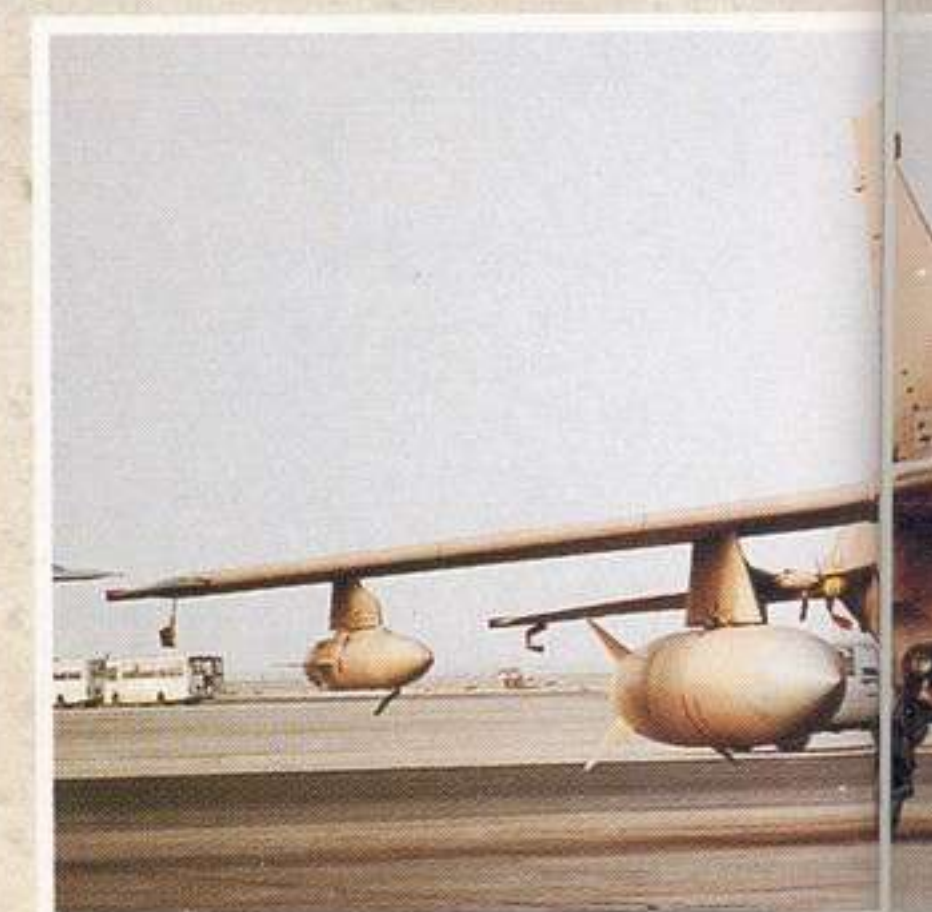
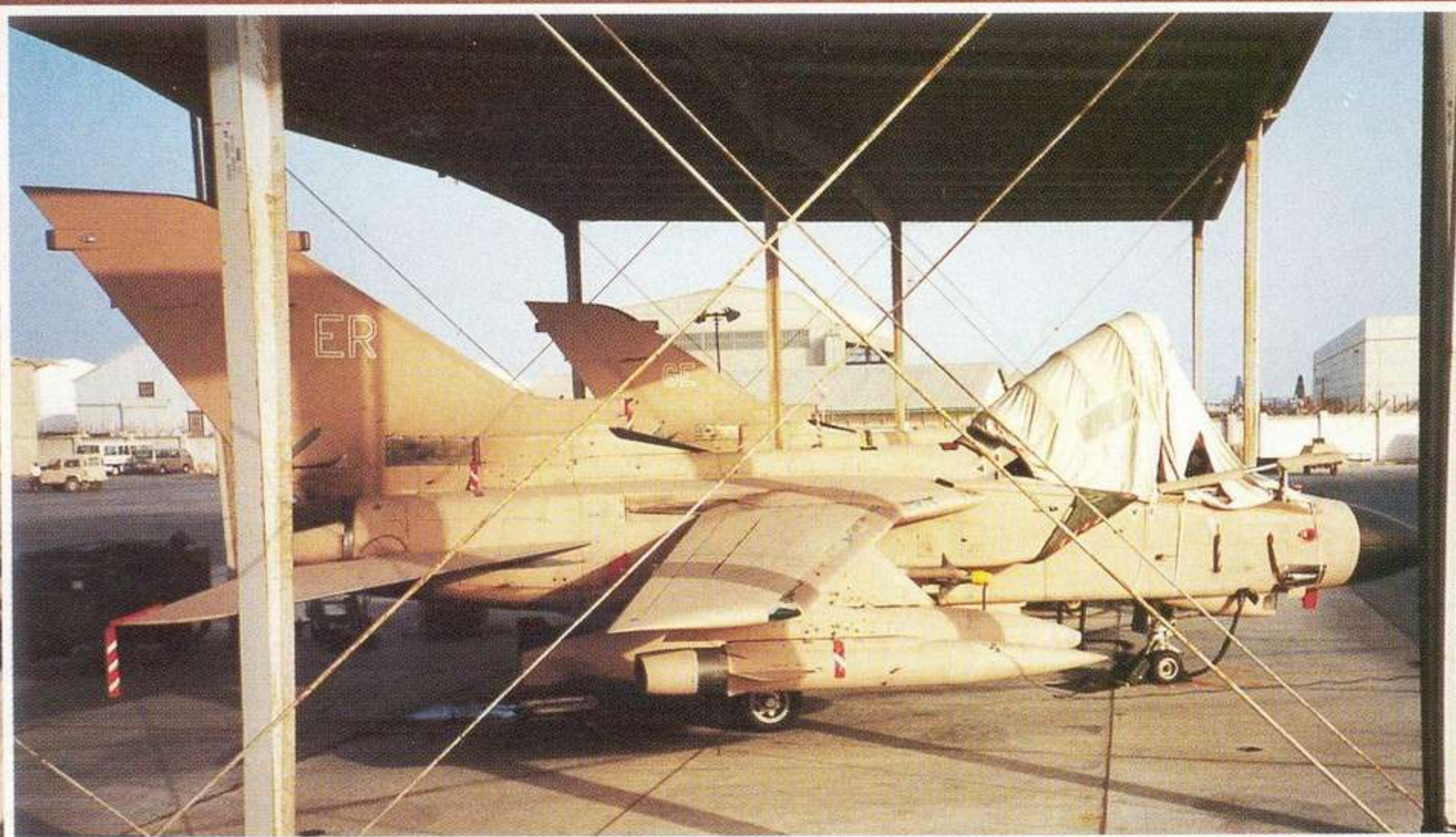
"The Nimrod remained on task for the next hour providing a communications relay for the remaining helos as they went to collect a 'mishap' team. Then with the help of the AWACS the Nimrod climbed out from the border area, coasted out, and rejoined its normal routing back to Seeb".

Flying just off the enemy coast by Kuwait City, the Nimrod had to be totally integrated into the Allied air battle. IFF mode 4 identified it as a friendly aircraft and a simple radio procedure confirmed that crews were 'clear to proceed'. Link 11 gave them a full air picture and with an average of 200 allied aircraft airborne in the North Persian Gulf at any time, this, combined with a good lookout, helped Nimrods avoid the danger of mid-air collisions.

Almost totally without publicity the Nimrod has, once again, proved to be a versatile and highly effective asset in wartime. First flying 310 sorties totalling 1751hr in support of the Allied warships and enforcing the UN trade embargo, and then flying 86 combat sorties, totalling almost 616hr, during *Operation Desert Storm*, the Nimrods worked closely with the RN and US Navy to prevent the loss of a single Allied ship due to enemy action.

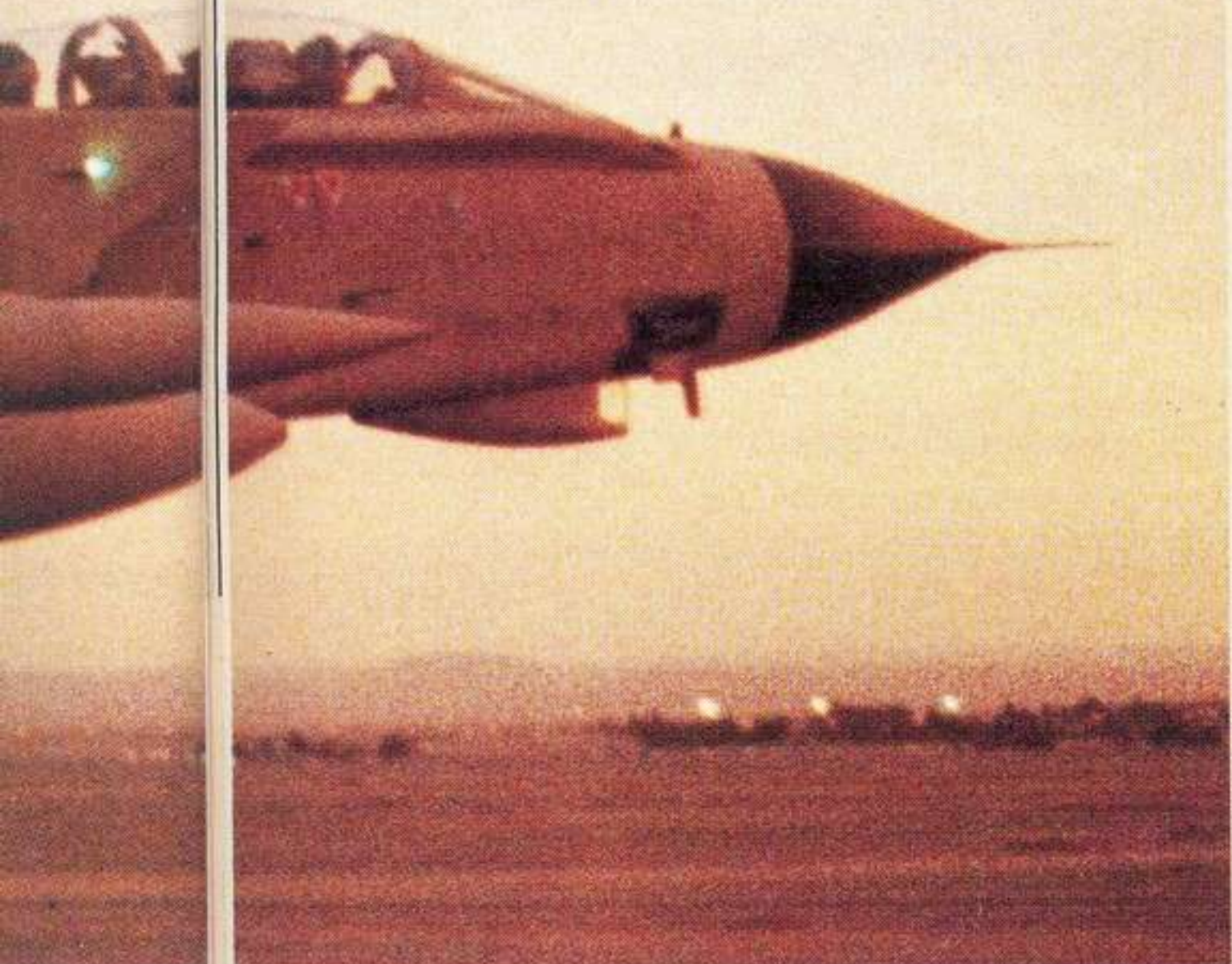
After the air war had ceased Nimrods continued to provide surface surveillance sorties. A total of 25 missions (169hr) were flown in direct support of the US Navy between 28 February and 15 April when the final sortie was flown over the Persian Gulf. Two days later the last Nimrod returned to Kinloss.

Wing Commander Andrew Neal is Officer Commanding No 120 Squadron, RAF Kinloss and was Nimrod deployment commander at Seeb in Oman.



TORNADO STORM

Paul Jackson examines the impressive record of the Tornado GR1 and its crews during the conflict



For the RAF, *Desert Storm* was the Tornado's war. Representing three-quarters of the British air attack force at the opening of hostilities, the GR1 interdictor daily harassed Iraq's airfields, weapon storage sites and communications, gaining for its crews a reputation for bravery and accuracy. Despite early misfortune – when disproportionate losses resulted in the aircraft receiving more flak from the UK media than the enemy – Tornado GR1 emerged from the conflict with its reputation immeasurably strengthened. In addition to bombing, the aircraft hastily, yet successfully, introduced to service both the ALARM anti-radar missile and TIALD laser-designator and also flew

617 later). Here were a further 15 Tornados, of which seven were equipped to carry ALARM missiles as an alternative to the usual bomb load. Dhahran had 15 GR1s and six recce GR1As, its RAF component under Gp Capt Cliff Spink who, unlike his two fellow base commanders, was an air-defender rather than a mud-mover. At this base, No 31 Squadron (Wg Cdr Jerry Witts) was reinforced by personnel from Nos 9, 14 and 17, plus Nos 2 and 13 from the recce world.

Bases each had eight aircraft – two flights of four – available for operations, the remaining seven being in reserve or undergoing servicing. There was no danger of crew fatigue, for each Tornado had three crews working a shift system to provide ample time for rest. Shifts were introduced a few days before expiry of the UN ultimatum to Iraq on 15 January, so that crew sleep patterns were adjusted to the regime before hostilities began. Engineers used a two-day lull in activity to bring each aircraft up to its peak of serviceability. Crews reported approximately five hours before take-off, worked for eight hours and remained awake for a further four hours or so thereafter, so that they would have risen just before the start of their next duty period. Tabuk's personnel had little in the way of recreational activities off base, but those at Muharraq and nearby Dhahran were more fortunate. As a pilot was heard to remark, "There's only one pub in the Middle East; it's called Bahrain."

Plans for aircrew and aircraft to replace those lost in battle involved Brüggen and Marham taking one-week turns at keeping four of each ready for immediate despatch. Crews would phone-in at 0600 daily to learn if they were needed. For each aircraft sent, another would be brought forward from a larger pool of machines with the appropriate Gulf modifications. Some were Tornados which had been returned to Europe for minor servicing after a previous tour, and others were fresh from painting at St Athan. In total, therefore, at least 84 Tornado GR1/1As wore the 'Pink Panther' colour scheme between August 1990 and March 1991, of which 67 served in the Middle East and 61 were operational during the period of hostilities (17 January to 28 February).

All aircraft deployed were from RAF Germany (even those held in reserve at Marham) as these were fitted with the higher-powered Mk103 version of RB199 reheated turbofan. They retained the two-letter codes of their donor units, the initials often acting as inspiration for pet names (almost always female) assigned by the servicing crews – complete with appropriate nose-art. Typical were ZD470/DA *Dhahran Annie*, ZD844/DE *Donna Ewin* and ZD851/AJ *Amanda Jane*. Muharraq preferred to use a single letter on at least one side of the fin, hence ZA491/N *Nikki*. Another quirk of the same base was division of groups of aircraft into Snoopy Airways and Triffid Airways, the former



Main pictures: *The Tornado GR1 made the RAF's most significant contribution to Operation Desert Storm.* Stuart Osborne

Left: *The first deployment of GR1s was to Muharraq, Bahrain.* Andrew March

Above: *The JP233 equipped GR1, with its large drop tanks, was very heavily laden.* Andy Glover

Below: *Equipped with ALARM anti-radar missiles, Tornado GR1s from Tabuk were tasked with defence suppression in support of the 'bombers'.* Nick Wilcock



reconnaissance missions with equipment only slightly more mature.

As the *Desert Storm* clouds gathered early in January 1991, the RAF increased its Tornado GR1 force by one-and-a-half squadrons of aircraft and a far greater number of personnel. The old RAF Muharraq – now Bahrain International Airport – had been the first to receive GR1s when a dozen aircraft left Brüggen, Germany, on 27 August 1990. A second squadron, of Laarbruch aircraft, but mainly Marham crews, began arriving there on 19 September, but repositioned to Tabuk, in far northwestern Saudi Arabia, from 8 October onwards. Finally, it was decided to complement the interceptor Tornado F3s at Dhahran, northeastern Saudi, with a dozen more Brüggen aircraft, the first of which arrived on 3 January. The recce element, provided by Laarbruch, was of six GR1As ferried to Dhahran between 14 and 16 January.

At Muharraq, Gp Capt David Henderson was in command of the RAF detachment and No 15 (Wg Cdr John Broadbent) was the leading squadron – although crews for the 15 GR1s on the base were provided by Nos 9, 17, 27, 31 and 617 Squadrons. Tabuk's RAF station commander was Gp Capt Bill Hedges, and his leading squadron was No 16 (Wg Cdr Travers Smith), assisted by a large section of No 20 Squadron and other crews from Nos 2, 9 and 14 Squadrons (plus Nos 13 and



Tabuk, in north-west Saudi Arabia, accommodated 15 Tornado GR1s, including seven carrying ALARM missiles. Norman Roberson

additional to any other decoration. Tabuk's trade-mark was a 'sharkmouth' to complement the scantily-clad young ladies. At Dhahran, the marking of operational missions took the form of palm trees, rather than the traditional bomb silhouettes, painted on the cockpit side, whilst four were named after characters in the Blackadder TV series, such as ZD792/CF *Nursie*. The taxpayer may be assured that all was done by artistically-inclined groundcrew in off-duty periods with privately-obtained paint!

Senior staff were briefed on Coalition plans on 15 January and all aircrew the following day – hearing the code-named *Desert Storm* for the first time. There was still no indication of H-hour, but there was not long to wait, for it had been set for 0012 GMT on 17 January. At around 2200 GMT (0100 Local) on 16 January the first RAF combat missions were launched, each Tornado equipped with two JP233s and two large drop-tanks, for a take-off weight of 30 tonnes. Wg Cdr Jerry Witts of No 31 Sqn led four aircraft from Dhahran and Wg Cdr John Broadbent eight, similarly-equipped, from Bahrain, all of them bound for Tallil airfield in southeast Iraq. Taking the defences by complete surprise, the Tornados scattered their two JP233s per aircraft over the base's parallel runways and associated taxiways, then made for home without loss. One of the navigators, Flt Lt Jerry Gegg, recalled soon after landing. "It's absolutely terrifying. There's no other word for it. You're frightened of failure; you're frightened of dying. You're flying as low as you dare but high enough to get the weapons off. You put it as low as you can over the target – just to get away as fast as you can."

The second wave of the day was not so fortunate. Four Muharrag Tornados were tasked against Shaibah, close to the city of Basrah, for daylight lofting (or 'toss bombing') of thousand-pounders. One of ZD791's Sidewinders was hit by flak and exploded, forcing Flt Lts Adrian 'John' Nicholl and John Peters of No 15 Sqn to eject. "We had a bit of a laugh together", Nicholl later recalled. "We sat in the desert for a while and had a discussion". Attempts to rescue the pair from enemy territory were compromised by UK newspaper reports announcing the operation, the crew next being seen, having obviously been mistreated, on Iraqi TV in a repulsive, ill-conceived and counter-productive propaganda stunt.

Shaibah's jinx struck again that night when the Marham contingent from Muharrag sent four aircraft there and four more to Ubaydah bin al Jarrah, all of them with JP233. The Jarrah formation took off at midnight, local time, the Shaibah wave two hours later, their shorter journey demanding only one pre-

attack refuelling from a VC10. The latter raid deserves detailed description, as it is illustrative of the international collaboration which guaranteed the success of the Coalition war effort.

Overseeing each of the three regions into which the war theatre was divided was an E-3 Sentry, responsible for airspace management. Working closely with this airborne eye were fighter CAPs of USAF/Saudi F-15 Eagles or RAF/Saudi Tornado F3s ready to intercept any interference from the Iraqi Air Force. Whilst the airborne tankers were working with split-second precision to refuel and cast-off the bombers at the precise moment required in the mission planning order, a fighter sweep, perhaps of F-16 Fighting Falcons, were flying in advance. To keep the defending radars off the air, F-4G *Wild Weasel* Phantoms and Tabuk-based Tornado GR1s with the new ALARM radiation-seeking missile were roving the area. Any defence-related radio communications which the Iraqis attempted were jammed by USAF EF-111A Ravens and their carrier-based equivalent, the EA-6B Prowler.

As the Tornados sped towards Shaibah at 550kt (1,019 km/h), they relied only on the radar altimeter to keep them 200ft (61m) above the desert, and a map to locate the electricity pylons to the north and east of the field. There remained only the densely packed short-range airfield guns and SAMs to be dealt with, and the USAF was distracting these in fine style. A mere 20 seconds before time-on-target, F-111E laser designators and Navy A-6E Intruders bombed an oil refinery just one mile north of the Tornados' track, creating an explosion, the immensity of which appears to have surprised friends almost as much as foes. All weapons were released satisfactorily as gunners were still gathering their wits, but three minutes later ZA392, flown by No 27's commander, Wg Cdr Nigel Elsdon, was seen to crash into the ground, killing both pilot and the navigator, Flt Lt Max Collier. The remaining three landed back at base after 1 hour 55 minutes in the air, news of their loss having already been broadcast on bulletins at home.

The Jarrah contingent had its share of heart-stopping moments, too. Having taken-on fuel at above 10,000ft (3,050m), the Tornados dropped to 300ft (91m) crossing the Iraqi border and steadily descended to 200ft (61m) during a black and uneventful low-level flight of 30 minutes over the desert. The target was sighted in a blaze of anti-aircraft activity a full five minutes before the attack went in, the softening-up force having also woken-up the defenders. Flying parallel to the runway, the formation was in 'card four', the leading pair two miles apart, the trailing pair 30 seconds' flying time behind them. Turning now towards the airfield, the spacing was closed up to

one mile and the interval to 15 seconds, then further tightened to ten.

With one minute to go, Fg Off Ingle and Flt Lt McKernan in ZD744 felt a bump and thought they had been hit, but the aircraft continued to fly, albeit reluctantly. At 550kt (1,019km/h) the Tornados swept over the runway, Nos 1 and 2 dropping their JP233s at one-fifth and three-fifths along its length, the others at the two-fifths and four-fifths points. All aircraft released two sub-munition pods, each with 30 SG3657 concrete-cratering bomblets and 215 HB876 area-denial mines which would explode during the following 12 hours to deter repair parties. Other Tornados would be back the next day to take-out the taxiways.

After turning for home, Ingle was having difficulty flying his aircraft and could not maintain control above 350kt. Eventually finding the tanker he could only maintain formation by adopting 45 deg wing sweep, but managed to complete the journey to Muharrag without further incident. Inspection then showed that a birdstrike had removed a large section of the port wing's leading edge, so the Tornado was immediately patched and flown back to Brüggen for repair. A mere three days later, it was re-delivered to the Gulf and went on to complete 35 missions, most of them from Tabuk.

The next night, 18/19 January, Muharrag Tornados visited Tallil air base. Four had JP233 and were preceded one minute before dropping by their companions lofting eight thousand-pounders each, fused for an air burst 15ft (4.5m) above the gun emplacements. This had the effect of stirring up the hornets' nest and, after release of their bombs some three miles from the base, Flt Lts David Waddington and Robert Stuart of No 27 Squadron in ZA396 were hit by a Euromissile Roland SAM which they had tried unsuccessfully to out-maneuvre. Waddington was knocked unconscious by the explosion of the missile, but Stuart used the command ejection system to catapult both men clear of the stricken aircraft at 540kts only 180ft above the ground. Their ejection injuries were treated well in an Iraqi hospital and they were repatriated after the end of the war.

At Tabuk, Wg Cdr Travers Smith, CO of No 16 Sqn, was first away in ZA473 at 0210L on 17 January, leading three more Tornados towards Al Asad airfield, which was given the JP233 treatment despite one of the aircraft returning early with technical trouble. Their support, as described in an accompanying article, was two more GR1s making the first use of the ALARM anti-radar missile for defence-suppression. A second wave of four visited Al Taqaddum airfield the same night, whilst eight JP233 bombers returned to Al Asad on the evening of 17 January. A new



Above left: Faces familiar to TV viewers – Flt Lts Adrian 'John' Nicholl and John Peters of No 15 Squadron who were shot down on the second mission from Muharraq, and survived capture by the Iraqis. PRM Above right: Tightly packed formation of Tornado GR1s with underslung JP233s. Mike Lumb

tactic tried against H-3 airfield early on 18 January was to send four ALARM aircraft in five hours before the raid and accompany three JP233 Tornados with another four ALARMs. Whatever ALARM did to the SAM radars, the flak was so intense that the bombers abandoned their attack and brought the JP233s home. Use of 1,000lb bombs began at Tabuk when H-2 airfield was attacked on the evening of the 18th, these weapons assisting the ALARM aircraft in defence suppression whilst four more Tornados made Tabuk's last use of JP233.

This was the pattern at the other Tornado bases as JP233 missions gave way to dropping of free-fall bombs in lofting attacks. When the change of tactic became public, on 21 January, there were reports that near-suicidal attacks with JP233 had forced abandonment of the anti-runway missions, but that was incorrect. With up to 20 AAA sites, each of three or four guns, airfields were a formidable target, but only one of the three aircraft lost by then had been carrying JP233, and even that crashed well after leaving the target area.

As if to underline the point, a lofting attack

by eight Tabuk Tornados with 1,000lb bombs on Ar Rutbah radar site claimed the lives of a No 16 Sqn crew, Sqn Ldrs Garry Lennox and Paul Weeks in ZA467, during the early hours of 22 January. The following day, Dhahran lost its only Tornado of the war (ZA403) when Plt Off Simon Burgess (at 23 the youngest RAF pilot in the conflict) and Sqn Ldr Bob Ankerson of No 17 Squadron were downed by premature explosion of one of their own bombs. Families and friends of the pair were cruelly deprived of news of their fates until both were released as PoWs on 5 March.

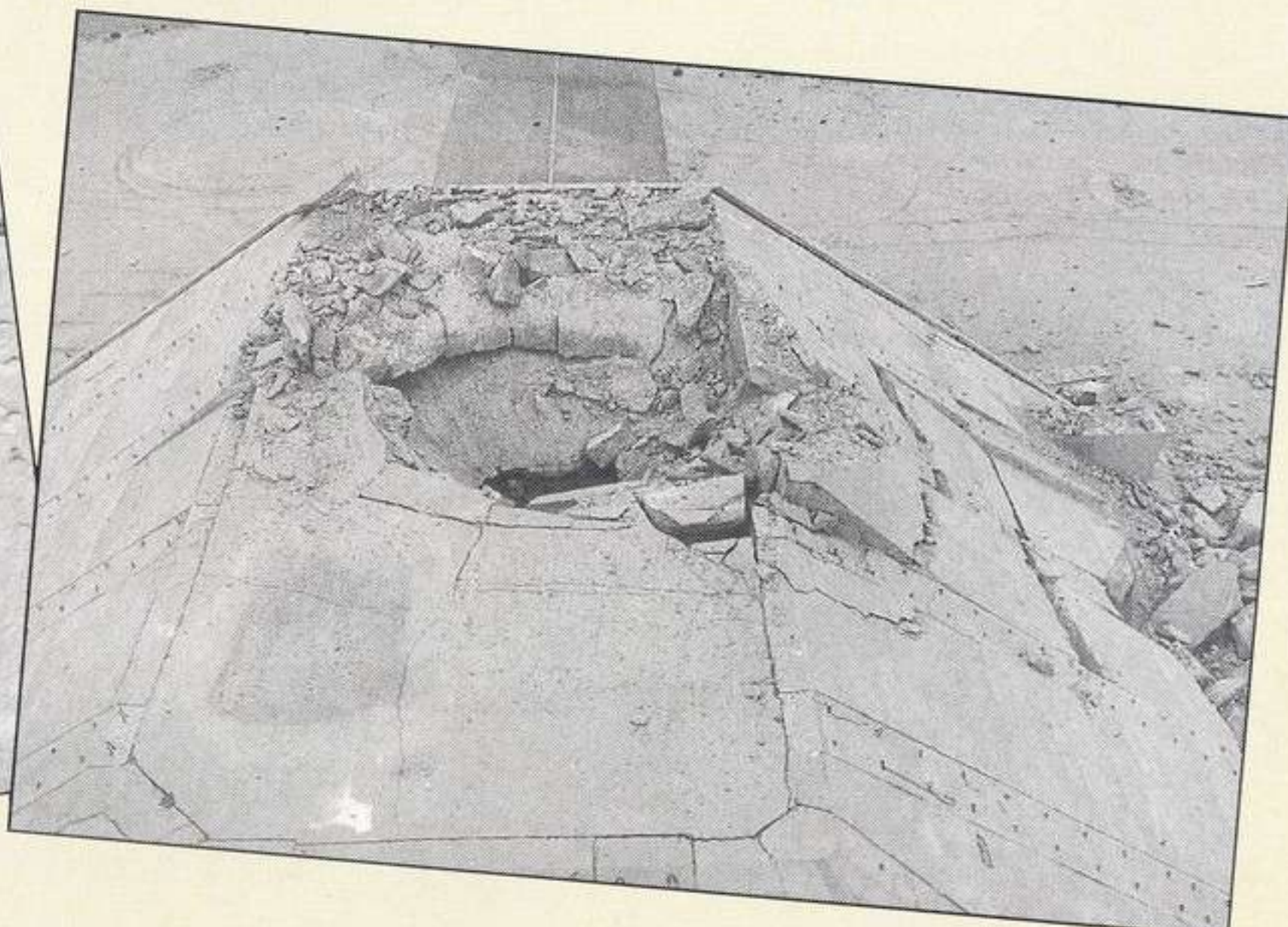
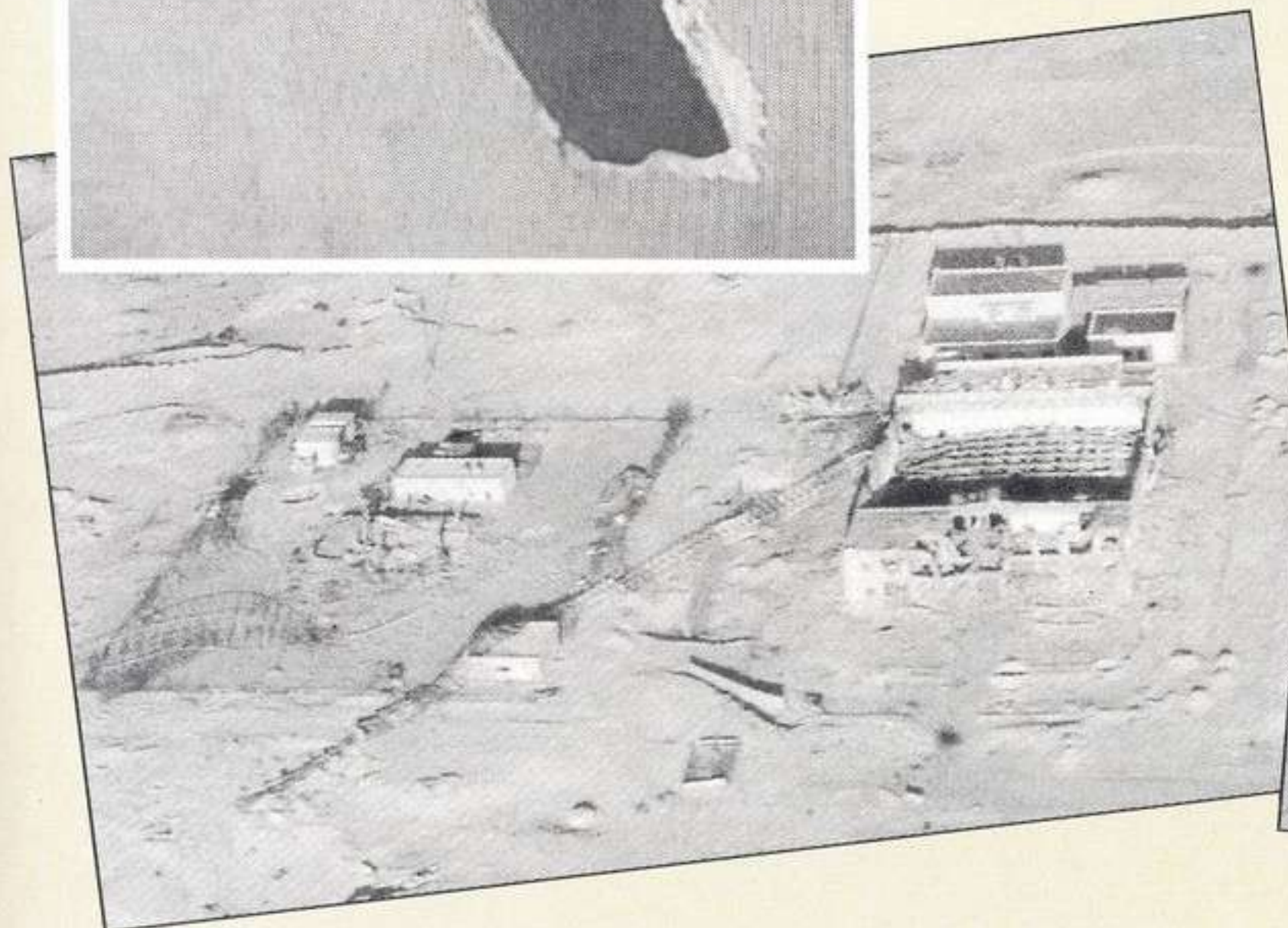
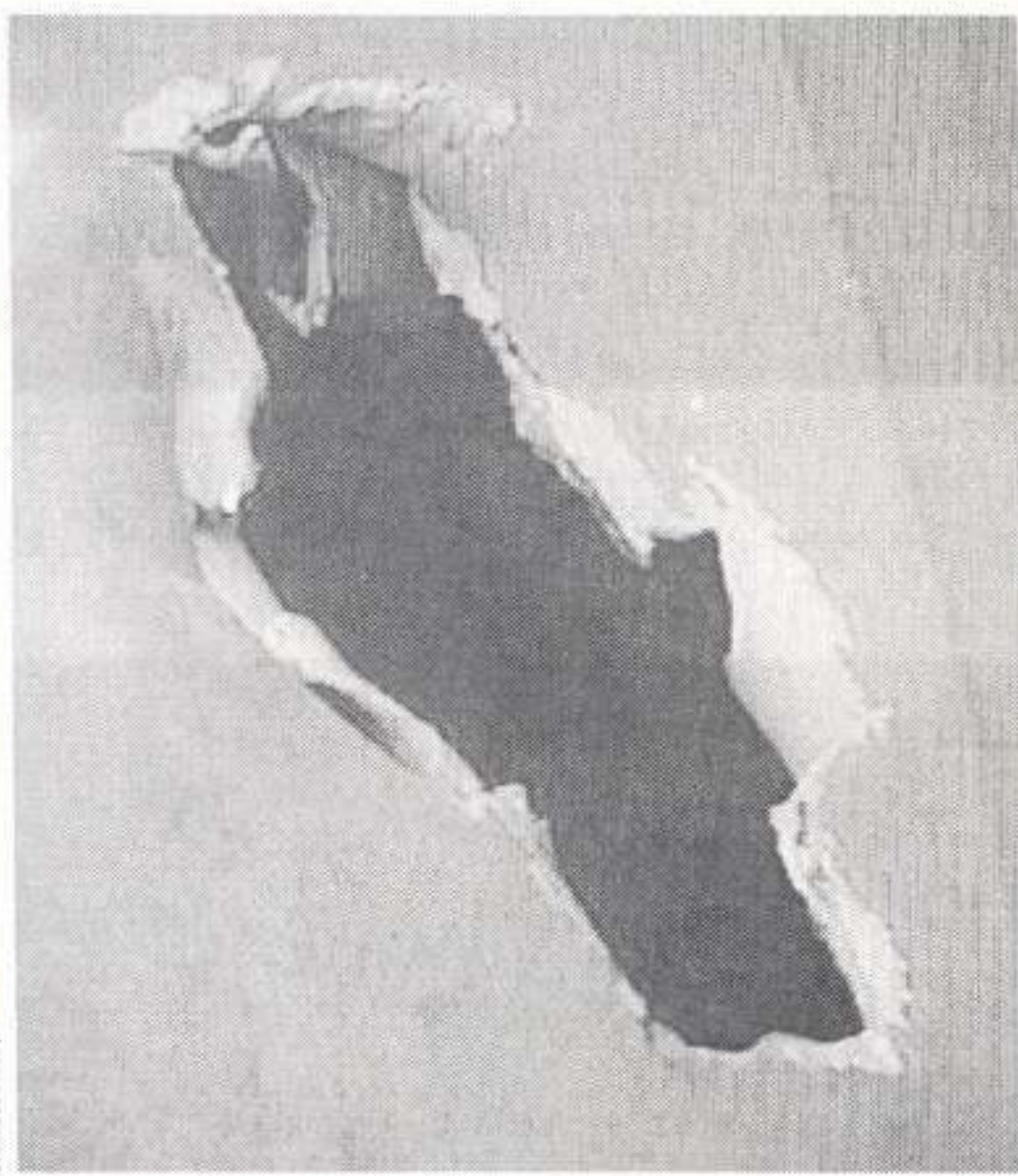
By 23 January, five aircraft had been lost in combat: the Tornado force represented just four per cent of the Coalition air strength, yet had suffered 26 per cent of the casualties. (Another, ZD893, had been deliberately abandoned by Sqn Ldr Peter Battson and Wg Cdr Mike Heath of No 20 Squadron when it suffered a control restriction problem shortly after taking-off from Tabuk on the evening of 20 January.) It was the low point in the Tornado's war service, made all the more galling as crews could not discuss the details of losses with the media. Muharraq's RAF station commander, whose forces had been hardest hit by losses, rebutted media suggestions that the Tornado was unsafe for anti-airfield missions. Gp Capt David Henderson admitted, however, that, "The opposition has some extremely effective anti-aircraft artillery defences on the airfields and it does mean – particularly for those crews who are having to fly over the airfield – that they are going into a wall of tracer". The density of flak was

mentioned by many aircrew when interviewed. One remarked that on the first night of the war, the gunners appeared to have set their weapons vertically, then switched on to automatic fire and dived into a bunker, with the result that the airfield under attack looked like a fibre-optic table-lamp. On the second and subsequent nights, guns continued to blaze at random, except that their operators had now learned to fire almost horizontally, so greatly increasing the danger to low-flying aircraft.

General Norman Schwarzkopf, the Coalition commander, on being asked to comment on the sacrifices of Tornado crews remarked, "Their contribution has been absolutely superb. I am damn glad they are with us". The senior RAF officer in the Gulf, AVM Bill Wratten declared, "We have suffered a high rate of attrition in comparison with other forces, there's no denying that . . . Our losses overall have been astonishingly low, considering the number of sorties flown and the co-ordination which has surrounded those sorties. But I will say that we have been extremely unlucky – and bad luck does not last for ever".

Thus it proved to be. The switch to medium altitude bombing brought Tornados out of the range of almost all the murderous flak, only 100mm guns being able to reach above 20,000ft. Fighter CAPs sitting over Iraq kept the Iraf in its hardened shelters or flying in the opposite direction – to Iran – and ALARM and the USAF *Wild Weasels* made radar and SAM operators jittery almost to the point of ineffectiveness. The new tactics were

Left: Damage to ZD843/DH from a SAM was extensive, but the crew managed to get it back to Dhahran. PRM Below: Apart from airfields, attacks were made on oil refineries, fuel and ammunition stores and other military sites like this communications centre (left). Mark Robinson Hardened aircraft shelters, like this one in Kuwait (right), were hit with great precision. Jeremy Flack/API



brought in between 21 and 23 January, but immunity was not guaranteed, a fact brought home to the crew of a Muharraq-based GR1 (ZD843) which made an emergency landing at Dhahran on 24 January with severe damage from a nearby SAM explosion. "From that point, the aircraft started to tumble", said one member of the crew. "It rolled almost into the upside-down position and started to come down towards the ground. We were both looking to see what damage had been done and if there were any more incoming missiles – which there were. We saw about half a dozen coming towards us and, basically, we flew the aircraft trying to avoid them the best we could".

Carrying eight free-fall bombs under the fuselage, the Tornado GR1 took to medium altitude missions like a duck to accountancy. Optimised for precision delivery of weapons from low level, it required new techniques of bombing to be introduced. Not least of these was revised software for the weapons computer which was unable to cope with corrections for (say) a 100kt wind at dropping altitude, but only a light breeze on the ground. Bomb-load was soon cut to five to permit greater speed and altitude to be attained. As a means of improving accuracy, dive-bombing was tried. Starting from 24,000ft (7,320m), the Tornado was rolled onto its back (to maintain positive g) and dived at 30 deg whilst the pilot acquired the target in his HUD. Pull-out was achieved at about 16,000ft (4,880m) – still above SA-8 SAMs most of the light flak – the aircraft's computer determining the correct moment of weapon release.

Airfield targets were mixed with petro-chemical plants, fuel and ammunition storage, barracks and radar sites during the closing days of January, Tabuk sending a six-ship to drop 30 bombs on the Ruffah Fuwad Scud missile test site on the 30th of the month. Muharraq aircraft caused a satisfying fire at Al Azzizyah oil refinery on the night of 1/2 February, but it was obvious that precision-guided weapons were the only means of efficient attack if the Tornado force was to remain at medium level.

Two TIALD laser-designation pods were being rushed through trials in the UK for Gulf deployment, but far more was needed in this line. On the morning of 23 January, just as the Tornado force was standardising on the new tactic, Lossiemouth was detailed to send six Buccaneers to the Gulf with all haste. Three days later, the initial pair took off for a non-stop flight to Muharraq, from where the first mission with their Pave Spike designators was flown on 2 February. Henceforward, Tornados flew by day as well as night (in fact, Pave Spike is a day system only), the Iraqi Air Force's disinclination to contest air supremacy making such missions comparatively safe. Also on 2 February, the force entered a new phase with its first attack on a bridge, when two Buccaneers and four Tornados with three laser-guided bombs (LGBs) each successfully struck Al Samawah's road bridge over the River Euphrates.

By 8 February, 12 Buccaneers were in theatre and flying for Dhahran and Muharraq bomber forces. The campaign to sever Baghdad's communications with Kuwait slowed after 11 February, when airfields again came under attack. This time, however, individual hardened aircraft shelters (HASs) were hit with precision, for which it was soon established that two bombs per Tornado per shelter were sufficient. A mission comprised a Buccaneer and two Tornados in the lead, plus a similar formation a minute or so behind. When four Buccaneers and eight Tornados were first tried against al Taqaddum airfield on the morning of 14 February, the mission became unduly complex. Despite variations in heights and approaches, the defenders were able to knock down ZD717 with two SA-2 SAMs whilst the crew was preoccupied with the attack. Flt Lt Rupert Clark of No 15 Squadron later recalled, "The first one got us as we were trying to evade and then the second one also hit. The whole cockpit was shattered. The instruments were gone, as were both engines. We tried to glide for a minute or two, but the controls froze-up and then I ejected". Flt Lt Steve Hicks, the navigator, was killed. Double-sized raids were

not tried again. Out to the west, Tabuk had to wait longer for its laser-designators to arrive. There was a short, but intensive campaign against ammunition dumps, petrol refineries and power stations during early February, ending with seven aircraft dropping 35 bombs on an artillery plant at Habbaniyah on 10 February. Later the same morning the TIALD designation pod was used for the first time, fast becoming the only means by which based aircraft released their bombs. Just four more 'dump' bombing missions were flown from Tabuk,

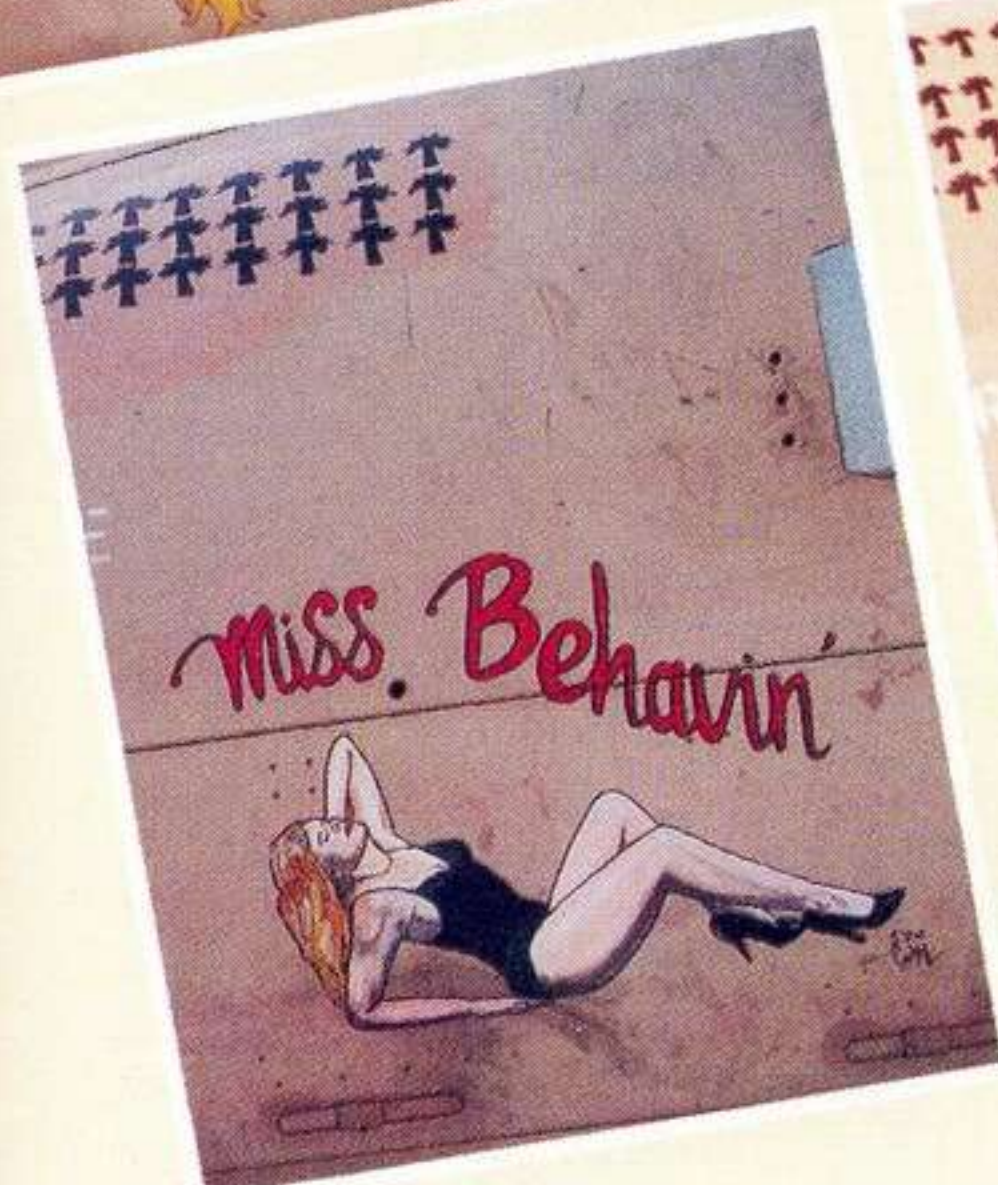
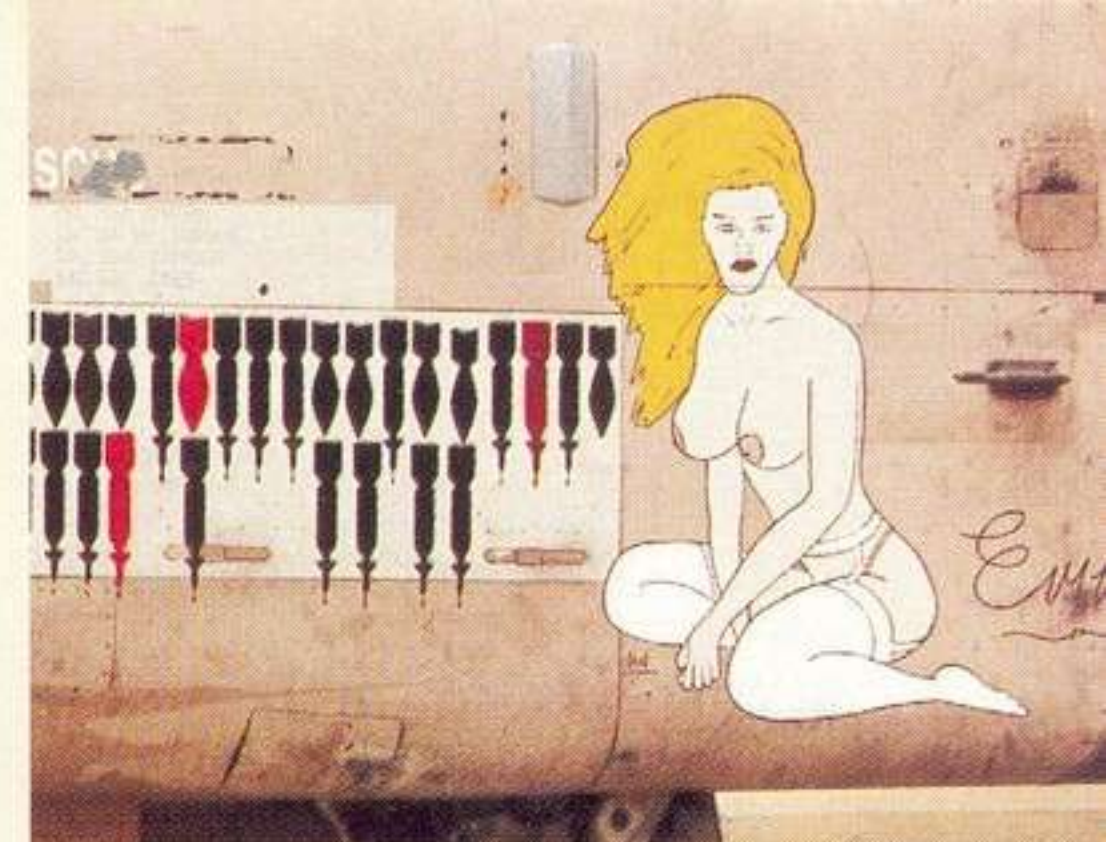
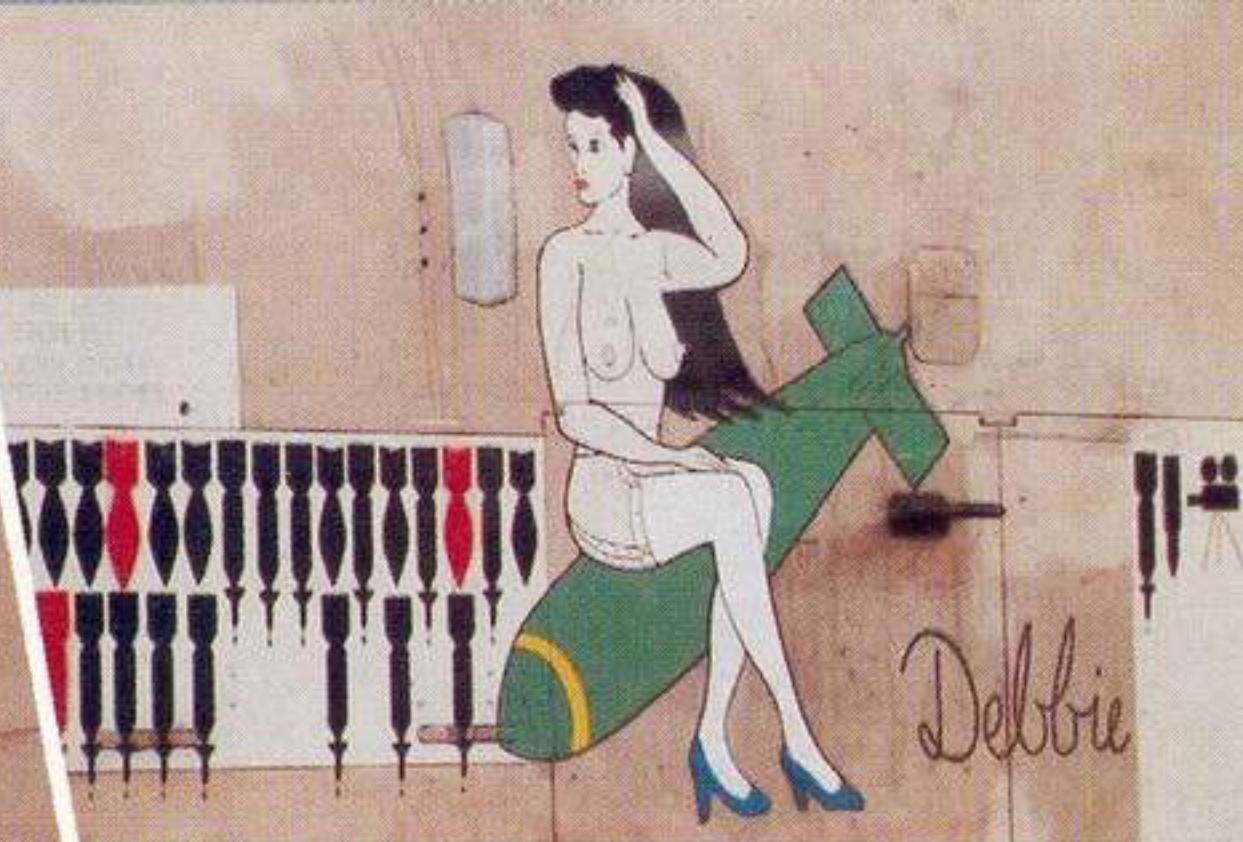
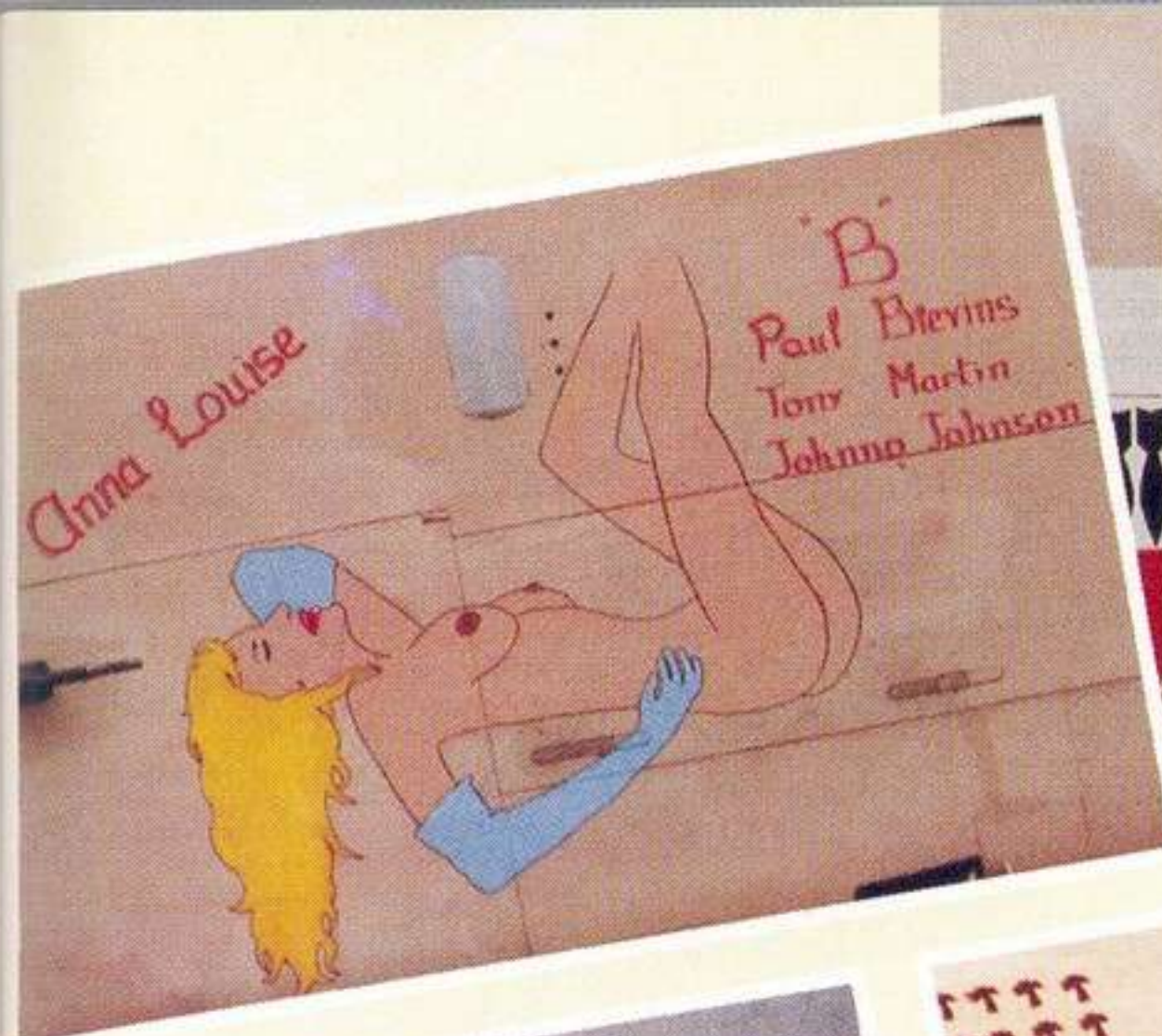
On this first TIALD mission, the lead aircraft had a laser failure approaching H-3 Southwest air base and its two accompanying Tornados dropped their total of six bombs without guidance. First to release bombs 'in anger' using TIALD were therefore Flt Lts Hogg and Fisher of No 9 Squadron in ZD748 and Flt Lt Smith and Fg Off Coleman (son of the TV sports presenter) of No 20 Sqn in ZA447, the designation coming from Flt Lts Walker and Frost of No 617 Sqn flying ZD739.

With the exception of the occasional bridge at Falloujah, Ar Ramadi and As Samawah, it was Iraqi airfields which received the attention of the Tabuk TIALD force until the end of hostilities. Fighter and jamming support in this area usually came from USN carriers in the Red Sea, but when attacks were made on bases out near Kuwait (such as Shaibah), Gulf-based vessels provided a similar service, beginning on 21 February. Uncharacteristically poor weather, linked with strict prohibition on blind bombing in order to protect civilian lives, resulted in many aborted missions. Two TIALDs and four bombers had literally a lucky break when they approached H-3 Southwest airfield on 17 February, tasked with attacking shelters at the east and west ends of the runway. On the first pass, the air base was obscured by cloud which was seen to be clearing from the west, so the six Tornados made a ten minute circuit. During this second pass, shelters at the western end were hit, but the eastern element was still frustrated. Another ten minute circuit by the six-ship to give the cloud a little more time, and the opposite corner received its postponed strike. Three circuits of a target in broad daylight are made only



Left: Buccaneers operated from 2 February to give the Tornados laser designation for their 1,000lb bombs (actually 1,210lb), seen (below) ready for loading onto a GR1. Mike Rondot/Stuart Black





Colourful nose art was applied to many of the Tornados. Some related to the twin code letters carried by Dhahran and Tabuk based aircraft such as 'AL' Anna Louise (top left). Muharraq's single codes gave rise to 'D' Debbie and 'E' Emma (top). Dhahran's GR1s wore palm trees to denote missions as on Miss Behavin and Black Magic (left). Tabuk based GR1s frequently carried 'sharkmouth' markings like Mig Eater (above). Norman Roberson, Andrew March, Mike Rondot, S Isherwood, PRM

when one is very, very sure of air supremacy.

Having led the first mission from Tabuk, Wg Cdr Travers Smith was in on the last when four bombers and two TIALD carriers took off to raid Habbaniyah air base on 27 February. Unfortunately, No 16's 'Boss' had to return early with an unserviceable aircraft and so was not among the three which attacked at approximately 22.30hr – dropping the final RAF bombs in *Desert Storm*. The Buccaneer-led force in the east ended the same day's work in the late afternoon by attacking Skayka Mayhar airfield. Six more Pave Spike missions planned for the 28th were cancelled at 0300L because the first would have taken place after the cease-fire came into effect. Muharraq had already loaded Tornados with a new weapon, the American CBU-87 cluster-bomb (used previously by Jaguars), in preparation for the 28th's missions, but the first delivery (by four aircraft on to a SAM site, augmented by two Buccaneers and four LGB Tornados) was timed just 10 minutes after the cease-fire, at 0810L.

Of the three Tornado GR1 detachments, Tabuk flew 650 sorties, of which 545 attacked their targets. The base expended 32 JP233s in 23 sorties (five missions); 123 ALARM missiles in 52 sorties (24 missions), 1,451 free-fall bombs in 288 sorties (35 missions) and 360 laser-guided bombs (LGB) in 192 sorties supported by 95 TIALD sorties (48 missions). Dhahran flew 567 sorties, comprising 439 interdiction (dropping 14 JP233 containers and 1,045 free-fall bombs), 305 to release 288 LGBs and 128 reconnaissance. Muharraq housed a dozen Jaguars dropping conventional bombs and 12 Buccaneers which delivered a small number of LGBs, the base's Tornados contributing approximate totals of some 1,700 free-fall bombs, 340 LGBs and 50 JP233s to the Coalition effort. Dhahran's conscientious statisticians additionally deduced that its aircraft had expended 310 infra-red flares and 21,330 bundles of chaff whilst consuming 3,830 tons of fuel, including 2,200 tons taken from aerial tankers.

Reduction of the RAF presence started

almost immediately after Iraq had conceded defeat. Evacuation of Tabuk and Dhahran began on 11 March, but a dozen Tornado GR1s (including some from the two previously mentioned bases) were maintained at Muharraq for a few months. The lessons which the Tornado force learned during its time in the Middle East will prove valuable if acted upon in sensible fashion – stand-off weapons and more laser-designation being two apparent priorities. To attempt to reach other conclusions would be unwise. Neither the aircraft nor its crew was intended to dispense bombs from medium altitude over a nation whose air force was on vacation in the next-door country. Once the message of the high initial high losses had sunk in, the Tornado aircraft and its personnel adapted to the new scenario with alacrity, and a week later were again dropping bombs with great precision. After hostilities, ACM Sir Peter Harding, Chief of the Air Staff, was to admit that Tornado losses were 'a fraction' of those he had feared. Clearly, the Tornado GR1 surprised its friends as well as confounding its enemies.

TOP Tornado

The Tornado GR1 with the highest number of missions (49) was ZA465 *Foxy Killer*. First flown on 23 August 1983, '465 was delivered initially to St Athan for storage, then issued to No 16 Squadron at Bruggen in June 1984. Since then it has always worn the code letters 'FK'. It was flown out to Tabuk on 4 January 1991 and there completed two JP233, 28 free-fall and 19 laser-guided bombing missions, during which it released a total of four JP233 containers, 158 1,030lb free-fall bombs and 35 1,210lb LGBs, for a total of 100 tons of ordnance dropped. The aircraft wears only 44 mission symbols, as five LGB sorties were cancelled after take-off due to poor weather over the target.



Main picture: The RAF deployed Puma HC1s from Nos 33 and 230 Squadrons and Chinook HC1s (inset) from No 7 Squadron for the Support Helicopter Force Middle East. Patrick Allen and Jeremy Flack/API



ROTARY SUPPORT

Patrick Allen

Operation Granby saw the largest overseas deployment of British military helicopters in history. Capable of day and night operations, their availability, mobility and firepower proved vital to the speed and success of the campaign.

Land and sea based helicopters were available and used in all theatres of the operation. Their firepower and mobility proved essential to the execution of one of the finest military operations ever undertaken. They helped provide the allied forces with the mobility, depth of action and firepower, so evident by the speed and decisiveness of the coalition force's victory. The ability of modern battlefield/attack helicopters to insert heliborne troops in division strength, and to conduct night attack missions deep within enemy territory, was a significant factor in helping to reduce the land battle to only 100 hours. UK Army Air Corps and Royal Navy attack helicopters equipped with night vision systems and armed with TOW anti-tank and Sea Skua anti-ship missiles, plus the Support Helicopter Force, were important assets for the Commander British Forces, Middle East. Their availability, day and night, allowed

General Sir Peter de la Billiere the flexibility and mobility of planning which had not previously be afforded to other Generals.

From early August 1990, as the crisis deepened, there was a steady increase in the numbers of UK helicopters deployed into Saudi Arabia and the Persian Gulf. RAF, Army, and RN helicopters were airlifted, from the UK and Germany, by USAF transport aircraft or transported to the Gulf by ships. By January 1991 the Army Air Corps, RAF and Royal Navy all had significant numbers of helicopters in Saudi Arabia.

On land, the British 7th Armoured Brigade was reinforced with the deployment of the 4th Armoured Brigade to form the 1st (British) Armoured Division. This included additional mechanised infantry battalions artillery and numerous supporting units which increased troop levels to 30,000 plus. This, in turn, required an increase in the Support Helicopter Force. They provided the logistic lift and resupply for the Division as well as undertaking other more specialist tasks.

At sea the three Royal Navy helicopters, originally deployed as part of the ten year *Armilla* patrol, were reinforced in five stages

until, by the time of the cease fire, 32 Fleet Air Arm helicopters were operating in the Persian Gulf. Royal Navy Commando Sea Kings were also deployed into the desert to bolster RAF Puma and Chinook helicopters in their support of the 1st (BR) Armoured Division.

From early planning stages a priority was to be given to the rapid evacuation of injured troops away from the front line. With such a serious risk of large scale chemical or biological attacks the system needed to be flexible enough to cope with large numbers of casualties. This would require sufficient trained personnel to provide the intensive care needed for the effective treatment of chemical/biological attack victims. A carefully structured staging system was devised to cope with this contingency. Injured troops would move along staging routes taking them from front-line company aid posts down to regimental aid posts, then to field dressing stations and finally on to field hospitals depending on their injuries. Helicopters would provide the speed to ensure injured troops received hospital-standard care within hours, day or night. This was the priority task for the Support Helicopter Force (Middle

East) as well as undertaking their standard support helicopter tasks. 'Beans and bullets up to the front – casualties back to the rear'.

The Support Helicopter Force, Middle East originally comprised around 15 RAF Puma HC1s taken from Nos 33 and 230 Squadrons, plus a flight of Chinooks from No 7 Squadron deployed by USAF C-5A Galaxy transport aircraft in October/November 1990. The crisis deepened and the original RAF Puma force was increased in early January 1991 with the arrival of additional RAF and Navy support helicopters aboard the *Atlantic Conveyor II*. They comprised more

RAF Puma HC1s, plus Chinook HC1s from Nos 7/18 Squadrons and from No 240 OCU. In all 17 RAF Chinooks were eventually operational forming a composite squadron.

Two squadrons of Royal Navy Commando Sea King HC4s also joined these helicopters to form the 'Support Helicopter Force – Middle East'. The 12 Commando Sea Kings came from 845 and 848 Naval Air Squadrons (NAS) based at RNAS Yeovilton the latter having been reformed at on 6 December 1990. The Squadron had last been active in 1982 when it saw action in the Falklands. The Commando Helicopter Operations and Support Cell (CHOSC) was also deployed. Their task was to integrate the RN helicopters into the combined RAF/RN Support Helicopter Force.

Arriving at Al Jubayl on the 6 January 1991 the Navy and RAF helicopters undertook an intensive period of training as maintainers and aircrews became acclimatised to desert operations. This involved desert style tactical flying techniques and night vision goggle training. By the end of the short training programme all pilots and aircrew were capable of undertaking safe night operations transitting low level across the desert wearing AR5 NBC respirators and night vision goggles.

All the UK helicopters received additional operational enhancements for their desert deployment. Pilots had little time to learn the capabilities of this recently delivered equipment. Featureless desert is notoriously difficult to navigate, particularly at night and to overcome this helicopters received satellite navigation equipment. Camouflage was considered extremely important for desert operations and all UK helicopters were painted in desert camouflage prior to arrival. Some of the Chinooks experimented with differing pink and black camouflage patterns to find the best one for night operations. New equipment also included sand filters, NAVSTAR Global Position System (GPS) linked to the latest Tactical Air Navigation (Super-TANS 2) system, improved communications, a comprehensive Defence Aids Suite which included Radar Warning Receivers (RWR) and chaff and flare equipment. Most helicopters were fitted with 7.62mm door guns and all capable of Night Vision Goggle operations.

On 22 January the Puma and Sea King

Left: *Sea King HC4 being loaded onto a C-5A Galaxy at Yeovilton, destined for Saudi Arabia.* Patrick Allen

Below: *Special equipment and distinctive camouflage was used on some Chinooks for night operations* Patrick Allen



Main picture: *Support Helicopter Force Pumas provided rapid deployment of troops.* Crown copyright

Inset: *The use of night-vision goggles (NVG), here by a Sea King crew, proved invaluable for round-the-clock operations.* Patrick Allen



force left Al Jubayl and headed west for King Khalid Military City. Here they undertook numerous exercises supporting 1st (BR) Armoured Division as newly arrived troops were brought up to battle readiness and the Division rehearsed its role. This training included numerous rehearsals at breaking through Iraqi style positions. This defensive obstacle zone included oil filled anti-tank ditches and berms. Numerous casevac exercises were undertaken as medics and helicopters perfected their roles. Additional medics were carried as part of the helicopter's crew and stretcher bearers, doctors and medical orderlies all needed to practise their individual skills, particularly at night or under simulated NBC warfare conditions.

As the Division moved westward so the Support Helicopter Force followed, moving troops and equipment. By 'G' Day pm Sunday 24 February they were prepositioned at their respective Forward Operating Bases, instantly available for tasking as Operation Desert Sabre began.

Thankfully allied casualties were low, although helicopters were involved in moving enemy casualties. The helicopter force was kept busy, however, in their troop moving and re-supply role. With large numbers of prisoners of war (EPW) being taken by the advancing troops, helicopters were used to take them to rear holding areas and moving guard forces around the battlefield. As the allies moved north and eastwards encircling the 42 Divisions of the Iraqi army, so the helicopters followed. The British destroyed over 200 Iraqi tanks in numerous engagements as they quickly moved to close the trap. For the next two days the Division and their Support Helicopter Force advanced until they were based 50 miles inside Iraq. During this short period the SHF also moved over 3000 prisoners of war.

After the advance, and Kuwait City had been liberated, elements of the SHF again moved to a new position within the Army's divisional area about ten miles north west of Kuwait City. Here they transported essential personnel which included Explosive Ordnance and Demolition (EOD) teams who were essential in helping to make the city safe.

Like the smaller Pumas and Sea Kings the RAF Chinook Squadron trained at Al Jubayl for several weeks on arrival in Saudi Arabia,



This Puma HC1 took senior British staff into Kuwait City after it had been cleared of Iraqi forces.

Squadron technicians and crews became acclimatised to desert conditions. New equipment such as the recently delivered sand filter/engine intake particle separators were also fitted to the aircraft.

The Chinook has a tremendous rotor down draft and desert flying techniques were practised to help reduce this. They included towering take-offs and zero-zero landings as well as desert NVG operations. After their short training period the Squadron moved to a desert site north of King Khalid Military City. Here they worked with the Division undertaking logistics resupply tasking. Like the other SHF helicopters the foreseen medevac role was not required. During the land offensive the Chinooks concentrated on their logistics lift role. In all they moved in excess of one million kilos of stores. These included netted loads, seven ton ISO containers, engines spares for armoured vehicles, troops, ammunition for armoured and artillery units and reloads for the Multiple Launch Rockets Systems (MLRS). They also recovered a damaged Puma and Sea King helicopter from the desert.

One unusual phenomenon encountered by the Chinooks in the desert were the bright statically charged lights made by the rotors hitting dust particles. This would occur as the helicopter came to a hover. So much light could be generated from these sparks as dust particles burnt off the leading edges of the composite rotor blades that they effected

the performance of the NVGs. This was particularly a problem during night NVG underslung load operations where the helicopter would have to hover for a long period.

As the Division advanced north, the Chinooks moved with them operating from self-supporting forward operating bases. They regularly undertook sorties lasting up to ten hours as priority stores and equipment were moved up from their logistic bases in Saudi Arabia north to Kuwait. Helicopter transits were on average around 100 miles as the Chinooks 'humped and dumped' for the Division. EPWs were moved 50 at a time back to rear holding areas. Towards the end of the campaign there were so many EPWs that the Chinooks started to bring food up to them in Iraq and Northern Kuwait. The Chinooks were also used to undertake other specialist roles, often at night, for the Special Forces. Two No 7 Squadron Chinooks and three Royal Navy Sea King helicopters from 846 NAS were used to deploy troops on to the roof of the British Embassy in Kuwait City prior to the return of the Ambassador. Once offensive operations had been suspended on 28 February, support helicopters remained busy cleaning up the battle field, moving EOD teams and undertaking battlefield tours.

Army Air Corps helicopters arrived in Saudi Arabia over the Christmas period, including 4 Regiment Army Air Corps. Equipped with TOW armed Lynx AH7 anti-tank, and Gazelle AH1 reconnaissance helicopters from 654, 659 and 661 Squadrons, their task was to provide anti-tank support for the 1st (British) Armoured Division. All the Army helicopters were painted in a two tone sand coloured camouflage and fitted with additional operational enhancements. These included sand filters, IR heat deflectors for Gazelles and IR suppressors for the Lynx helicopters plus navigational and defensive aids which were also fitted to the other UK helicopters. The Lynx was armed with a pintle mounted 7.62mm GPMG to provide additional ground suppression if required.

This was the first occasion that the Lynx had been deployed into a combat zone to undertake its anti-tank role, although it had been widely used in secondary roles of utility and troop transport etc. 4 Regiment's role was to provide anti-tank/combat aviation support, armed escort, forward reconnaissance, utility and casevac duties for the 1st (BR) Armoured Division. This required the Army helicopters to operate close to the forward edge of the battle area taking out Iraqi defensive positions, strong points, artillery and armoured concentrations. They also provided additional firepower and



reinforcements to the armoured infantry.

On their arrival at Al Jubayl Army pilots spent several weeks perfecting new desert tactics and night vision goggle flying techniques. Relying on trees, forests and highly contoured landscapes for approaches to their fire positions was now impossible in a featureless desert. Gazelles had to be more covert in their reconnaissance, forward air control/artillery spotting missions and careful battlefield preparation was essential prior to calling up Lynx teams from their forward holding positions. Lynx attack helicopters were no longer able to hide behind trees before firing their missiles, but had to fire from longer stand-off distances and use the agility of their helicopters to 'shoot and scoot'.

With the help of REME technicians the AAC managed to rush through and test numerous modifications which were essential for the Gulf role. One of the most important of these fitted to the Lynx helicopters, was the TOW missile Thermal Image sighting system. This, together with Night Vision Goggles, gave the Army Gazelle and Lynx helicopters a full night fighting capability.

From Al Jubayl, 4 Regiment moved in early January to an area about 50 miles north of King Khalid Military City. During the land offensive phase Army helicopters operated alongside the leading Armoured Battle Groups as they sped north. Gazelle and Lynx operated Armed Reconnaissance Patrols working with the 16/5th Lancers. Their task was to provide a screening force for the Armoured Division as it advanced. Army helicopters were also tasked in the casevac role, anti-tank reserve force and command and control. Their night operating capability proved invaluable. Helicopters undertaking command and control tasking prior to the ground offensive delivered maps and other sensitive material to units throughout the Battle Group. The newly fitted GPS navigation system and NVGs proved invaluable as helicopters flew to the more distant units.

During the land offensive Gazelles and Lynx were kept busy with Lynx TOW missiles destroying Iraqi armour which included T55s and several Command vehicles. The speed of the advance proved a challenge for the logistics support chain who worked hard to keep up. Fuel bowser drivers, and those supporting the Forward Arming and Refuel Points (FARPS), were having a hard job. Army helicopters working with the leading Battle Groups were refuelling and re-arming at the nearest FARP possible until the logistics chain had time to catch up. After the battle Army helicopters helped to secure the battlefield area, survey enemy equipment, move prisoners (EPWS) and undertake numerous other tasking.

The Royal Navy had been operating helicopters in the Persian Gulf well before the start of *Operation Granby*. Ship based Lynx and Sea King helicopters had been an important part of the *Armilla* Patrol and had been used in support of mine sweeping duties during operation *Cimnel* in 1987. *Operation Granby*, however, saw the steady increase of RN helicopters into the region.

In August 1990, two Sea King HC4s of 846 NAS based on the RFA *Fort Grange*, plus two Sea King HAS5 helicopters from 'C' Flight 826 NAS based on the fleet tanker RFA *Olna*, were sent to the Gulf. The ASW Sea King HAS5s of 826 NAS were modified to undertake the surface search role and proved vital in the mine spotting role. Operating from several ships, which included a two month

spell in the Dutch naval tanker *Zuiderkruis*, the 826 NAS Sea Kings finally deployed aboard RFA *Sir Galahad* and helped in locating and clearing mines from Kuwait ports. There were estimated to be over 1,200 mines deployed by the Iraqis in ten discreet crescent-shaped areas around the Kuwait coastline.

By January 1991 there were at least five Lynx HAS3s deployed aboard Royal Navy destroyers and frigates in the Gulf. On 15 November 1990 four more 846 NAS Commando Sea Kings from 'C' and 'D' Flights arrived aboard the 28,400 ton aviation training ship RFA *Argus* which had been converted into a 100 bed Primary Casualty Receiving Ship (PCRS) for *Operation Granby*. The Squadron's task aboard *Argus* was to provide a dedicated medical evacuation/air ambulance service for the ship. 846 Squadron's remaining two helicopters from 'A' Flight became part of the reformed 848 NAS and were sent into the desert with the Support Helicopter Force.

The first UK helicopters to become involved in direct action were the ship-borne Royal Navy Lynx HAS3s. They proved invaluable in helping to maintain UN sanctions against Iraq by policing and searching merchant shipping operating in the region. Sea Skua armed Lynx proved highly effective in attacking and destroying Iraqi Exocet armed Patrol and Support vessels off Kuwait and Iraq.

By early February over 250 sorties had been undertaken by RN Lynx helicopters. They worked closely with US Navy helicopters and attack aircraft undertaking Surface Searches (SURSEARCH), locating targets, and co-ordinating attacks. One of the most potent threats to the Allied fleet were the Exocet armed TNC45 patrol boats. The RN Lynx helicopters, including those from HMS *Cardiff* and *Gloucester*, destroyed 15 Iraqi naval vessels which included five Exocet armed TNC45s, two TA3 Minesweepers, two LSLs, four Zhuk/Spasilac Patrol boats and two assault boats. During the first Sea Skua night attack HMS *Cardiff's* Lynx was supported by RAF Nimrod aircraft and by HMS *London's* Lynx who provided night time surveillance with her *Yellow Veil* jamming equipment and *Sandpiper* Thermal Imaging System. During this attack a Zhuk patrol boat

was destroyed.

The most active Lynx during the early stages of *Desert Storm* were those from HMS *Cardiff*, *Gloucester*, *Manchester* and *London*. During a successful Sea Skua attack on an Iraqi support vessel HMS *Gloucester's* Lynx was locked onto by a SAM-7 shoulder launched missile. Using the helicopters defensive aids and IR jammers it successfully evaded the missile. Sea Skua armed Lynx helicopters from HMS *Cardiff*, *Gloucester* and *Brazen*, assisted by HMS *London's* Lynx. Gulf enhancements for the Lynx fleet included a 0.50 machine gun to meet possible threats by small armed craft and the Demon camera mine hunting video system used to find moored mines near the surface.

Along with the land based helicopters, the importance placed upon casevac helicopter tasking was evident by the deployment of RFA *Argus*. Over 25% of deployed personnel for *Operation Granby* were assigned to medical duties, the largest percentage ever

Sea Kings received operational enhancements including the installation of a .50 machine gun in the door. Patrick Allen



Army Air Corps Gazelles from 4 Regiment were tasked with providing a screening force.
Jeremy Flack/API



Left top: Royal Navy Lynx HAS3 with Yellow Veil jamming equipment and Sandpiper thermal imaging system. Both Jeremy Flack/API

Left: Commando Sea King HC4s from Nos 845, 846 and 848 Sqns played a full part in the SHFME. Patrick Allen

Right: During the advance, the forward arming and refuelling points were kept extremely busy. Jeremy Flack/API

Far right: After the ceasefire, RAF and RN helicopters assisted in the immediate clearance of mines in Kuwait and Iraq. Crown copyright



known. Both wheeled ambulances plus the fleet of RAF/RN/Army and US Army/Marine Corps medevac helicopters were tasked to undertake casualty evacuation duties.

RFA *Argus* was deployed into the Gulf to provide fast initial treatment of casualties. This could include life/limb saving surgery with casualties being taken from maritime or land based action. One of her two large aircraft hangars was converted in autumn 1990 to provide a two storey 100 bed air-conditioned hospital. She was not classed as a hospital ship, but as a Primary Casualty Receiving Ship (PCRS). This avoided any undue restrictions placed on hospital ships by the Geneva Convention. *Argus* did, however, have several operating theatres and was well equipped to provide comprehensive medical support. Her large five spot flight deck proved ideal for medevac helicopter operations and she was also large enough to accommodate the extra medical personnel, which increased the ship's complement from 160 to 380. The most important aspect of the Primary Casualty Receiving Ship (PCRS) concept was her dedicated helicopters. They

provided the speed essential for the treatment of casualties and could undertake search and rescue missions, pluck casualties straight from the decks of damaged or sinking ships, or directly out of the sea. They could also fly to any land based action and collect casualties.

The Sea King HC4 was an ideal choice for the maritime casevac role as it can accommodate up to nine stretchers and two medical attendants, or up to 28 troops or evacuees. The RN Commando Squadrons who usually support the Royal Marine Commando Brigade in the amphibious role are equally happy to operate at sea or on the land. 846 Naval Air Squadron was chosen for the role as most of the squadron's pilots were experienced in both land/desert/sea operations using the latest Nite-Op Gen 3 NVGs. Although based on *Argus* there was always the possibility that helicopters would be deployed ashore or be required to recover casualties from desert locations.

Thankfully, like the land based helicopters, *Argus* was not put to the test regarding large scale casualty evacuations and treatment.

The ship and her helicopters were, however, kept busy undertaking numerous other essential tasks. Between the 16 January and 28 February 1991 846 NAS flew over 1000hr, undertaking over 500 sorties which averaged 80 per week. These included assisting the USS *Tripoli* and battleships USS *Missouri* and *Wisconsin*. One of the biggest threats to the battleships, as they pounded Iraqi positions, were from mines or Exocet and shore based 'Silkworm' missiles. Iraq had launched hundreds of free-floating mines known to the Allied sailors as *Daisies* and they were carried in large numbers down the Gulf posing a significant threat.

Both the USS *Tripoli* and USS *Princeton* were hit by mines. 846 NAS helped to lift the injured from the USS *Princeton* back to *Argus* for treatment. With the mine threat so high, 846 NAS undertook continuous mine searching patrols in front of *Argus*, particularly when conducting a resupply at sea.

During their searches 846 helicopters found two mines. Once detected, the position was marked and the Sea King remained on station until the arrival of an EOD team which was based on the USS *Tripoli* or USS *Missouri*. 846 NAS made good use of its Night Vision Goggle (NVG) skills and the accuracy of its NAVSTAR equipment. They helped in the night search and successful recovery of a USMC F-18 Hornet pilot who, once located, was picked up by a USN Sea Hawk. During the securing of Kuwait City they were used to deploy specialist troops onto the roof of the British Embassy. The Squadron operated around the Kuwait City area for over ten days undertaking numerous tasks which included transporting the Prime Minister and the Defence Secretary during their visits.

As this feature is being prepared RAF Chinook and RN Sea King helicopters that took part in Operation Granby have been sent to Turkey/Iraq on Operation Haven. Here the helicopter's humanitarian role is again demonstrating the versatility and value of British military helicopters and well trained crews operating in hostile or difficult environments providing essential support.

Casevac helicopters would have flown casualties to HMS *Argus*, acting as a primary casualty receiving ship. Patrick Allen



Lawrence OF A RAPIER

Squadron Leader Bill Lacey



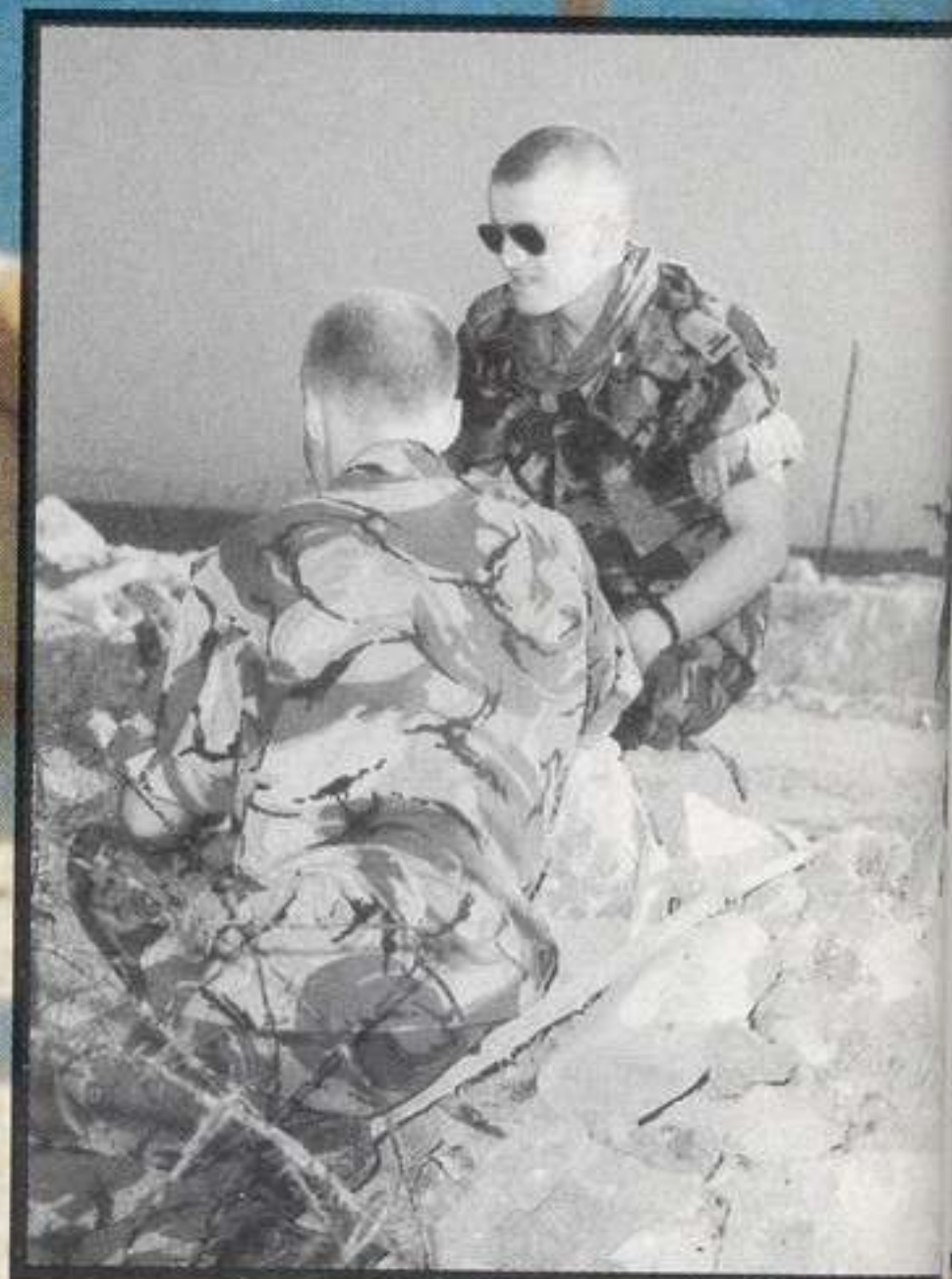
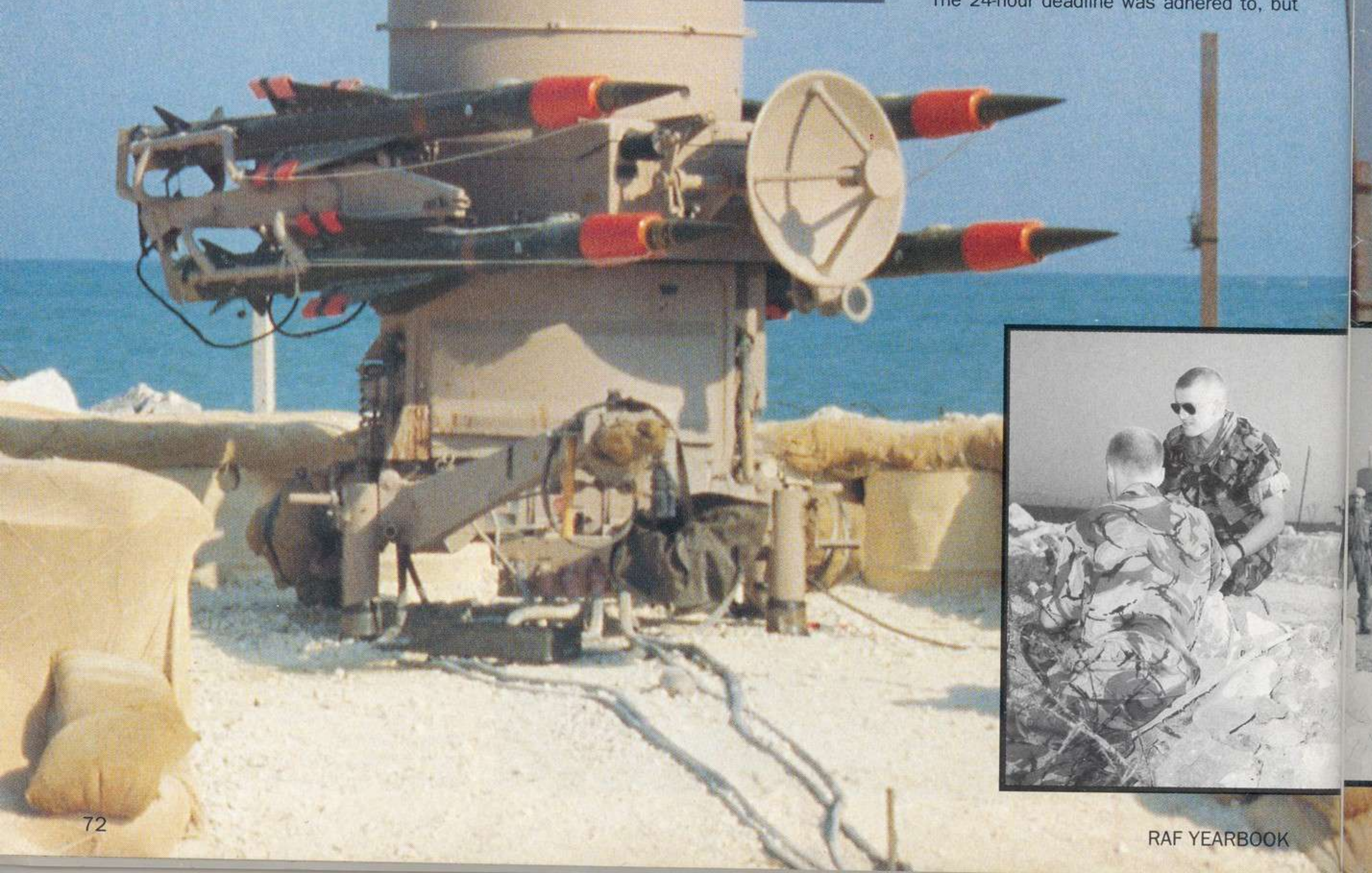
On 8 August 1990, just six days after the Iraqi invasion of Kuwait, 20 Squadron RAF Regiment was warned that a Rapier unit would be required to protect RAF Tornados deploying to Saudi Arabia and that 20 Sqn was top of the list. The squadron was to be ready to deploy within 24 hours and should aim to be as self sufficient as possible.

This was the start of what turned out to be a three-months deployment to Bahrain in support of *Operation Granby*. It was the first operational service undertaken by the squadron since it was reformed in 1985 and in the weeks and months that followed the members of the squadron were to firmly uphold the motto of the Regiment; *Per Ardua – by hard work*.

20 Sqn is based at RAF Honington and is one of three RAF Regiment squadrons sponsored by the United States Air Force to defend US bases in war time. Fortunately the squadron was one of the first to convert to the new Field Standard B1 (M) Rapier in 1989. This equipment retains the combat proven Rapier missile but has a significantly improved capability and availability over the standard B1 radar. In addition, in Spring 1990 the squadron had completed a comprehensive and successful programme of live missile firing at the RA Range Hebrides, so operator skills were slick and crew confidence was high.

Although the fire units are routinely moved by air, at this stage no-one had ever moved a complete Rapier squadron by air and many of the specialist vehicles (specifically the command, supply and 2nd line repair vehicles) were found not to be air-portable in their normal work. However, after a brainstorming session by the Movements Officer, and frenzied activity by the squadron and Station suppliers it was able to move sufficient equipment to support operations, albeit not quite in the style to which they were accustomed.

The 24-hour deadline was adhered to, but



the squadron was now 'put on hold' until 15 August when four fire units deployed to Cyprus to provide Short Range Air Defence (SHORAD) for RAF Akrotiri, followed rapidly by the rest of the Squadron who were placed on standby for future redeployment.

20 Sqn was the first formed ground unit to leave for the Gulf and there was considerable press coverage throughout its preparation and deployment period. A press facility held just before departure led to many front page stories, some of which concentrated on Cpl Crispin Hatch who had brought his wedding forward in order to make his fiancée his wife before leaving for active service. In all there were seven impromptu 20 Squadron weddings in the week before deployment and the press interest was to be sustained for the rest of the detachment in distinct contrast to the usual low profile adopted by the RAF Regiment.

Several weeks of intensive work followed as the deployment around Akrotiri was utilised to exercise the Squadron in the various aspects of extended SHORAD operations. Base Defence Zone (BDZ) exercises helped HQ Flt streamline some command, control, communication and airspace management cobwebs while F-4 Phantoms, deployed from RAFG (drawn from Nos 19 and 92 Squadrons), flew realistic attack profiles against the airfield to enable the fire unit crews to carry out engagement and tracking practice.

In addition, the Squadron aircraft recognition instructors worked hard to bring the crews up to standard on aircraft rarely encountered in East Anglia but common in the Gulf, such as those of the US Navy and the various Arab Air Forces.

Within two weeks the Squadron was well prepared and at a high standard of readiness and on 30 Aug 1990 the order came to deploy four fire units to provide SHORAD for Muharraq International Airport in Bahrain. The remaining FUs of the Squadron were to stay in Cyprus to provide air defence cover for the Sovereign Base Area. As usual the move was undertaken at very short notice (less than 24 hours) but by now the Squadron was well practised at quick airmoves, so all went smoothly. The



OC No 20 Sqn, Sqn Ldr Bill Lacey, conducts a media interview, with a Rapier launcher as backdrop.

Squadron was sent to Bahrain rather than to a base in Saudi Arabia because the Saudi bases already had excellent air defence cover which was provided by the US Army and the Saudis themselves. By contrast, Muharraq's only defences before the arrival of 20 Squadron consisted of a handful of well maintained, but elderly, Oerlikon and Bofors guns operated by the Bahrain Defence Force (BDF).

The advance party led by the Officer Commanding 20 Squadron, Sqn Ldr Bill Lacey, arrived in Muharraq on 31 Aug 1990 to find the RAF Tornado detachment engaged in frenetic activity in intense heat and debilitating humidity. They were greeted by the Detachment Commander, Gp Capt 'Rocky' Goodall, with the immortal line; "I hope you've got lots of missiles, we're going to war soon!" This sobering thought acted as an excellent spur as the Squadron now endeavoured to set up a credible SHORAD for what was effectively a civil airport. The priority task was to set up good sites for the Rapier fire units backed up by secure and reliable control and logistic support, and to develop a coherent air defence plan for the Bahrain sector.

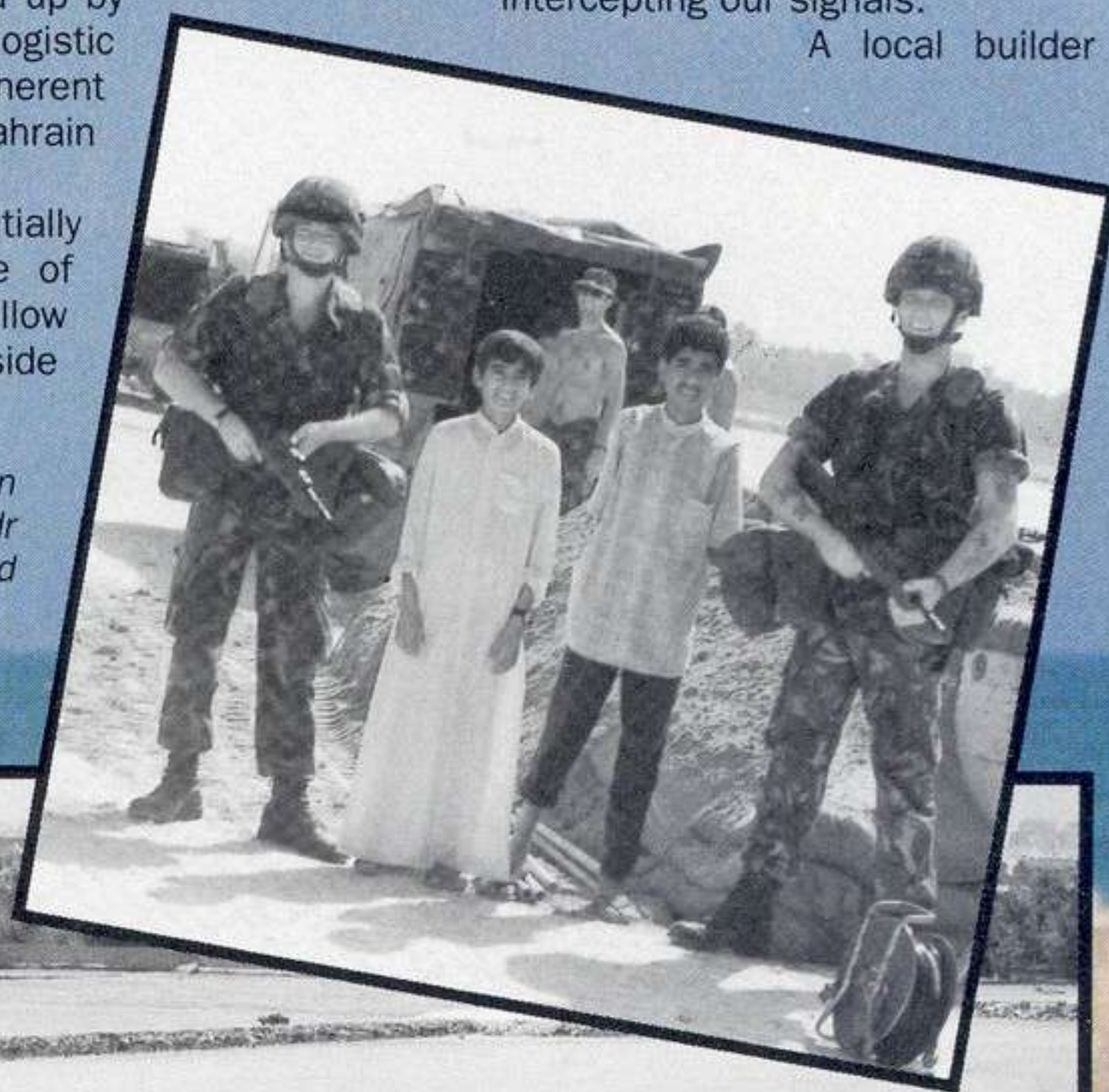
Siting of the Rapiers was initially complicated by the reluctance of the Bahrain Government to allow non-BDF troops to operate outside

military bases. Whilst this did not affect the bulk of the RAF detachment, it was very significant for 20 Squadron as, to achieve best coverage, Rapiers are usually sited well outside the airfield that they are to defend. A side effect of this was a distinct feeling of unreality as one changed into civilian clothes for the ten minute drive to a five-star hotel in Manama after a very sweaty 12-hour plus day on a busy operational airfield!

The initial site reconnaissance had to be done wearing civilian clothes and using a civilian car and accompanied by a BDF minder. However after much discussion with authorities the Squadron received clearance to start preparing the sites for occupation and this signalled the advent of a massive field engineering programme. Technicians of the Royal Signals and the Bahrain Telephone Company laid telephones to each site to allow rapid, reliable and secure communications without violating the strict 'emission control' measures that were designed to prevent the Iraqis from intercepting our signals.

A local builder

Main picture: A Rapier launcher site in Bahrain. Stu Black. Opposite page: SAC Davy in reflective mood. Below left: A visit by CDS to a Rapier site, accompanied by Sqn Ldr Lacey, OC No 20 Sqn. Below right: Lacey's Causeway. Right: SACs Swindle (left) and Benson (right) with Bahraini children, frequent visitors to the unit. 20 Sqn



(rapidly christened *Arthur Daley* by the Squadron) was contracted to drop hundreds of sand-filled 45 gall oil drums at each site. Known as *Burmails* (a corruption of Burma Oil) these could be rapidly stacked up to form robust blast walls which would protect the equipment and personnel on site from stray shrapnel. The airmen lived in air-conditioned Portacabins which were delivered to the sites by the ubiquitous 'Arthur'. Although not luxurious, these provided a reasonable degree of comfort for the seven day periods of duty endured by the Rapier crews, who had to maintain a very high state of readiness, 24 hours a day, for extended periods.

The most impressive piece of 20 Squadron engineering came about when it became apparent that there was no suitable site on the NW corner of the base, and that the ideal position was some 400m out to sea! After realising what was required, 'Arthur' pointed out that, for a price, he could extend a small fishermen's causeway and build a Rapier site on the end of it. How long would this take? After a few minutes of chin-stroking Arthur shrugged "two days?" A deal was struck and within an hour the first of many trucks arrived and started dumping rubble into the sea. True to his word, 'Arthur' had the work finished within 48 hours, and site 19 which became known as 'Lacey's Causeway' became a regular feature on national news bulletins from Muharraq, enhancing 20 Squadron's reputation as the 'PR Sqn'.

While the building work was in progress, Sqn Ldr Lacey and the Instructor of Gunnery (IG), Flt Lt Mark Driver, were concentrating on developing the air defence plan for Bahrain. In its final form this involved the US Marine

Corps having Tactical Air Control (TACON) for the Bahrain sector, whilst within this 20 Squadron operated its own autonomous BDZ around Muharraq. Obviously this system was closely integrated with the BDF forces. With three different nationalities and six different types of air defence system operating in close harmony, the air defence of Bahrain was a good example, in microcosm, of the kind of co-operation that went on throughout the Coalition forces.

As work continued on sites and the Air Defence plan, it became more and more apparent that four fire units were insufficient to provide a robust and flexible SHORAD for Muharraq. As a result, in mid-October 1990 the remaining personnel and fire units were flown over from Cyprus, thus the Squadron was reunited. This coincided with the Squadron receiving clearance to permanently deploy fire units outside the airfield, so the Squadron now utilised its full compliment of manpower to deploy, and man six fire units while the rest of the Squadron were held in reserve to continue training and preparation. It was at this stage that the Squadron Unit Mobility Officer, Fg Off Dave Williams, despatched his 73rd load of equipment by Hercules in less than a year's service to set what is, so far as we know, a record for the Regiment.

Now that the whole Squadron was together again, with one Rapier Flt permanently deployed, life slipped into a steady routine for the first time on the detachment. Most Squadron personnel managed to take two days stand-down in every 14, which many used to explore a very different culture. Most became very proficient at haggling with the stall owners in the 'souk', which nearly

provoked a minor diplomatic incident when a group of airmen found what they thought was a stall selling shoes and started trying on its wares. Fortunately the owners of the shoes, who were praying in the local mosque, were fairly good tempered when they returned from their devotions to find several Gunners walking up and down the street in their footwear!

With weekly BDZ exercises and round the clock manning the Squadron had by now achieved an extremely high standard of proficiency, and the crews were cheerfully ensconced in secure and fairly comfortable sites. The initial heat and humidity of midsummer had cooled to a pleasant warmth and the fire units in particular could enjoy the cool sea breezes and colourful sunsets from its beach locations. It was thus with somewhat mixed feelings that the Squadron prepared to handover the SHORAD of Muharraq in mid-November and return to the cold skies, but warm welcome, of the UK.

When the Squadron first deployed in August it was as a very young, inexperienced unit with about half its personnel on their first tour. When it returned it was still a young unit, but now all were more mature, confident and vastly more experienced after three months of intense work in an unfamiliar environment and under considerable stress. Operation Granby required a massive effort from all the members of the Squadron, but it was the most significant episode in the history of the Squadron, and the Squadron rose to the challenge in fine form. Its effects are still being felt, but the experience gained should stand the Regiment in good stead for many years to come.

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According to the saying, "Behind every successful man there is a woman." So far as the RAF is concerned, however, every successful operation has a maintenance unit behind it. For *Granby*, one such key supporter was St Athan in South Wales, where the Aircraft Engineering, General Engineering and Engineering Plans and Development Wings are responsible for an incredibly broad spectrum of third-line tasks outside the normal capabilities of operating squadrons.

Tornado was the central RAF combat aircraft in the Gulf, St Athan's normal duties including overhaul and modification of both the interdictor and air defence versions. Involvement with *Granby* was therefore immediate and long-term, and was to grow in intensity as additional, related tasks were given to the station. Nor should it be forgotten the base's similar responsibilities for diverse types of aeroplane and helicopter also

allocated to the RAF in the Gulf. St Athan's role in the conflict may therefore be summarised as support given to the Tornado squadrons; regular duties undertaken with increased priority; and transfers of personnel to reinforce other units.

Aircraft Engineering Wing's 2 and 10 Squadrons handle Tornado overhaul work of a regular nature, the GR1 featuring most prominently in view of the F3's comparative newness. Major overhauls every 2,000 hours are the responsibility of 10 Squadron, whilst 2 Squadron has a parallel role in what may be termed 'preventative maintenance'. This involves replacement of certain structural components at 5, 10 and 25% of the aircraft's fatigue life: the 5FI, 10FI and 25FI programmes.

Alerted in September 1990 to the possibility of sizeable Tornado GR1 deployments to the Gulf, the wing planned an

acceleration of its activities by adopting a 12-hour shift pattern. As the unit was running-down 10FI work and standing-by to begin 25FI, it was not as difficult as it might otherwise have been to switch three of 10 Squadron's four work-lines to *Granby*. There remained, however, the prodigious task of planning, involving a tight schedule of dates to be given to outside suppliers of components, as well as integration of services from other parts of the station.

A further factor to be considered was the civilian workers at St Athan, who then numbered 1,024 within a total station strength of 3,734. Outside the orbit of military discipline, they could not be ordered to work the overtime necessary to keep the *Granby* effort on schedule. In fact, civilian personnel generated nothing but praise from their departmental heads for unswerving support far beyond the normal terms of

Paul Jackson describes RAF St Athan's vital role in supporting *Operation Granby*

THIRD LINE—FIRST RATE

Right: 'Bolting-on' flare dispensers to the Tornado F3's engine bay doors is a term which does not do justice to the amount of preparation work required from St Athan's civilian workforce. An RAF technician points to the completed raised mounting before the door is returned to BAe's aircraft modification line. RAF St Athan



Below: 'BY' ZD712, the last of the 'buddy-buddy' programme aircraft, was delivered to Bruggen on 6 March. Andrew March



employment. All deserved the short Christmas break that could be spared – although the decision that this time-off be given was not taken until a few hours before the workshops closed.

A sizeable proportion of Granby back-up involved help to operational squadrons unable to undertake the considerable fitting-out task on Tornado GR1s bound for the Gulf. In this respect, St Athan makes no claim to unique contributions, as it was but one of many bases undertaking the same work. Basic upgrading of GR1s for desert operations was known as Phase 1 and involved 23 modifications and a further 19 Special Trial Fits (STF). The mods concerned embodiment of changes already in the peacetime pipeline, whilst the STFs were, in many cases, planned mods which had not yet been through the more normal procedure of consideration by the Mods Committee. Due to parts availability, however, the average aircraft received only 18 mods and 13 STFs before despatch.

Among the more significant changes was the addition of Radar-Absorbent Material (RAM) at strategic points, in order to make the Tornado a little more 'stealthy' from a frontal aspect. Most difficult was fitment of RAM tiles (looking just like black floor tiles) inside the engine air ducts, this requiring removal of both powerplants before the steel-backed squares could be bonded to the surface immediately ahead of the first-stage fan. Leading edges of the wings, weapon pylons and fin received a coat of Surface Wave Absorbent Material (SWAM) for a similar anti-radar purpose. This black substance gives a finish like underseal on a car, except that it is a far denser material: two men are needed to carry a five-litre tin!

(RAF Leeming made similar modifications to Tornado F3s, but SWAM was less obvious on the GR1s as it was camouflaged-over.)

For commonality with the large number of American aircraft in the Coalition force, all RAF aircraft had their Mk X IFF identification equipment (Cossor SSR-3100) replaced by the Mk XII Mode 4. The mod was a simple one requiring extra wiring and substitution of one black box for another. In the category of planned mods not previously embodied, a nitrogen-purging system was added to the fin fuel tank. That fuel is used first, and if the tank is not then filled with an inert gas, it will contain an explosive fuel/air mixture during the time the aircraft is being shot-at over enemy territory.

Greater range was obtained for the GR1 by replacing its 330 gallon (1,500 litre) underwing drop-tanks with 495 gallon (2,250 litre) tanks from the Tornado F3. Whilst the attachments are identical, the latter's automatic wing-sweep system is aware of large tanks being fitted and electronically limits the angle of sweep to prevent the tank from fouling the tailerons. The solution in the GR1 was a little more basic, taking the form of a metal stop in the manual selection mechanism which limited the angle to 63° instead of the normal 67°.

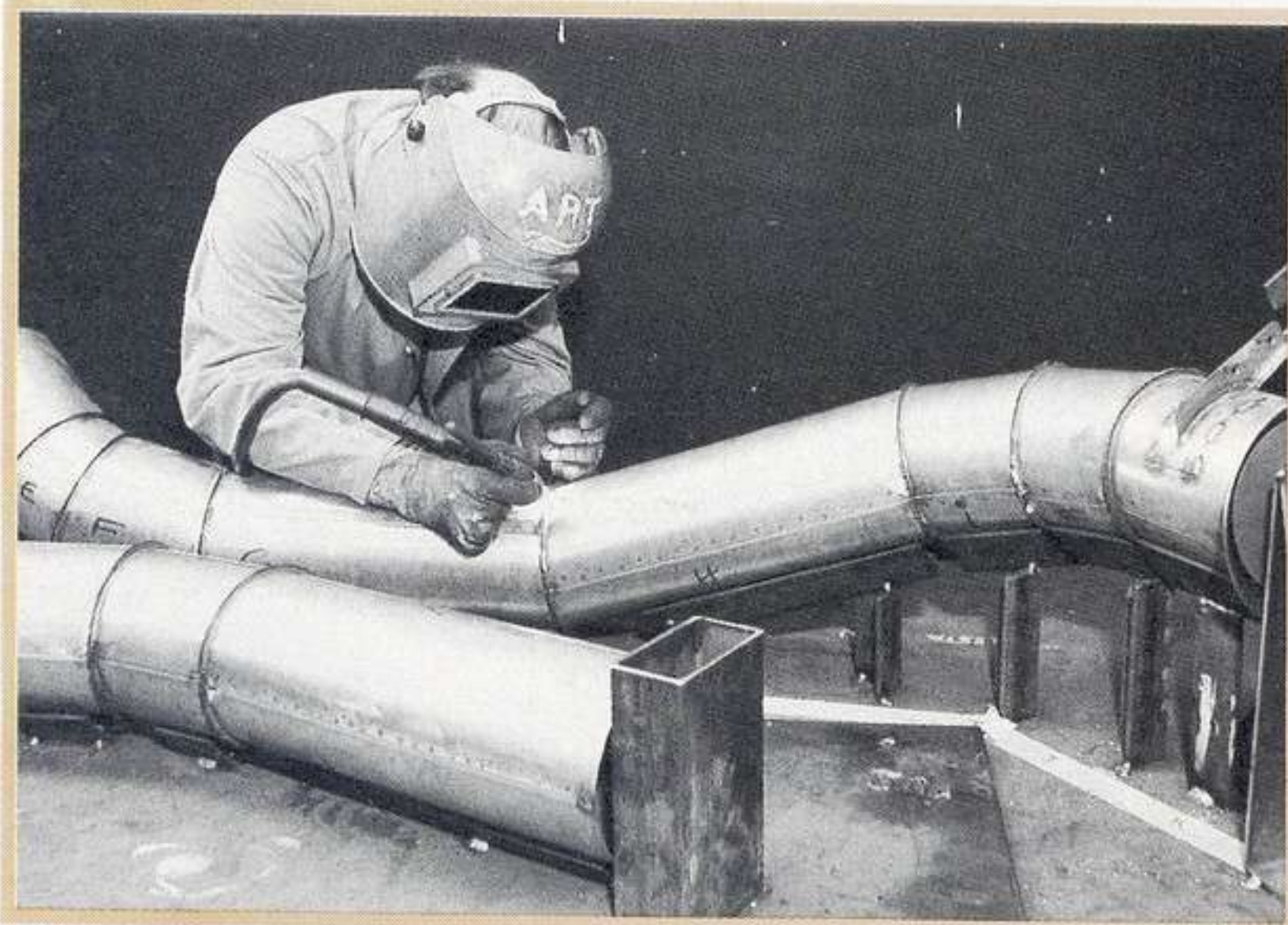
Phase 2 of the programme referred specifically to provision for 'buddy-buddy' refuelling (STF No 238) which might have been required if some of the Gulf-based tankers were lost or further Tornados deployed to over-stretch resources. The RAF acquired 15 Sargent-Fletcher 28-300 hose-reel pods from the German Navy's Tornado force and RAF Honington undertook the first modification. The pod, which was used operationally by Italian Tornados in the Gulf,

contains a 55ft (16.76m) hose and weighs 725lb (329kg) excluding the 250 gallons (1,136 litres) of fuel held by its reservoir. Fitment is to the aircraft's centreline pylon, but as the pods are rapidly detachable, none needed to be delivered to St Athan. Work involved extra electrical wiring and a cockpit control box, all recipients of STF238 being dual-control Tornados.

Eight Phase 1 conversions were undertaken by 2 Squadron, of which three aircraft were retained to become the major proportion of the unit's four Phase 2s. The contribution by 10 Squadron was 11 Phase 1 and five Phase 2, with only one aircraft common to both upgrades. Work began on 22 October when ZD707 and ZD744 arrived at 10 Squadron for both 10FI mods and Phase 1, '707 being the first out on 23 November. Phase 2 re-delivery started with ZA410 from 2 Squadron on 13 January. Finally, Phase 2s ZD712 and ZA367 left 2 and 10 Squadrons, respectively, on 6 March 1991 to end the programme after 22,000 man-hours, including 1,000 hours of civilian overtime. Typical turn-round time for Phase 1 was 18 days, or half that for Phase 2. Aircraft mostly were sent to St Athan by squadrons in Germany, but one was in for a Major overhaul and went straight on to the Phase 1 line when that was finished.

The most obviously Granby modification was the 'Pink Panther' desert camouflage scheme. Application at St Athan of what is more correctly known as ARTIF (Alkali-Removable Temporary Finishing) paint, manufactured by Trimite, was assigned to 'B' Flight of 1 Squadron which sprayed 15 of the 24 Tornados to pass through 2 and 10 Squadrons, plus one other.

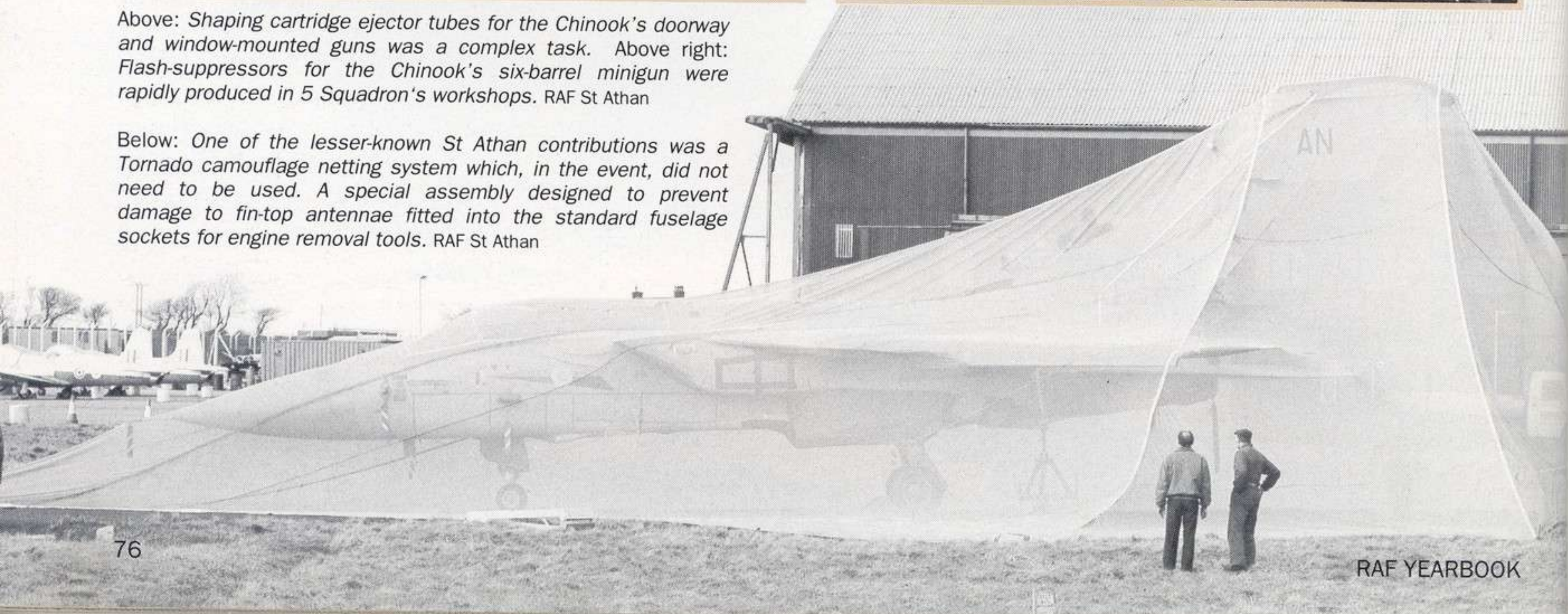
Other elements at St Athan helped the



Above: Shaping cartridge ejector tubes for the Chinook's doorway and window-mounted guns was a complex task. Above right: Flash-suppressors for the Chinook's six-barrel minigun were rapidly produced in 5 Squadron's workshops. RAF St Athan



Below: One of the lesser-known St Athan contributions was a Tornado camouflage netting system which, in the event, did not need to be used. A special assembly designed to prevent damage to fin-top antennae fitted into the standard fuselage sockets for engine removal tools. RAF St Athan





Top: This Chinook has the St Athan-made tube below the door. Patrick Allen Above: SWAM on the leading edges is revealed on this GR1 which has 495gal underwing drop tanks normally carried by F3s, after its return from Dhahran. Val March Inset: Tracor AN/ALE-40 flare dispenser on the lower engine door of a Tornado F3 at Dhahran. Paul Jackson

Granby effort in their own ways and sometimes in ways strange to them. With no RAF Phantoms required for Gulf service, 4 Squadron reduced its overhaul line to a skeleton staff and transferred many personnel to Lyneham to provide two shifts for servicing Hercules. After a steep learning curve, they were 'turning-round' C-130s in one-third of the normal time, so greatly assisting the vital airlift of men and equipment to supply the war effort. Meanwhile, at St Athan, people were moved between squadrons to boost those working on priority programmes.

No less involved was General Engineering

Wing, comprising 5 Squadron manufacturing equipment and spares; 6 Squadron servicing electronics; 7 Squadron repairing and modifying aircraft components; and 8 Squadron overhauling modules of RB199 engines for Tornados as well as the Jaguar's Adour. Granby was only a few days old when 7 Squadron was brought in to fit Tracor AN/ALE-40 flare dispensers to Tornado F3 lower engine doors so that the aircraft of No 11 Squadron could begin deploying from Leeming on 29 August. The detachable doors were brought by Chinook helicopter from Leeming and returned in the same way.

Simultaneously, nickel-chrome leading

edges were being manufactured and fitted to Tornado GR1 and F3 taileron leading edges. This was another accelerated mod programme, introduced when it was found that firing AIM-9 Sidewinder missiles caused pitting and eventual burning-through of the original aluminium. Despite losing one-quarter of manpower to Lyneham, No 7 Squadron was able to ensure that the Tornados left on time and were fully supported throughout their time in the Gulf.

The diversity of tasks assigned to 5 Squadron beggars description. Its large engineering shop with computer-controlled milling machines is required to make almost any one-off or small-batch item of aircraft or support equipment – ranging from bolts of a specific size to packing boxes for transporting missiles. Indeed, the humble bolt formed one of the first orders for Granby, the urgency of the task requiring finished items to be flown to BAe at Warton by Jet Provost every 32 hours for the Tornado F3 modification line. Soon after this began, it became clear that BAe would be unable to

finish the mods on time, so St Athan was given half the job of fitting ALE-40s, as described above.

Chinook helicopter modifications were featured prominently and included flash-suppressors for door- and window-mounted M134 0.3in (7.62mm) Miniguns as well as metal chutes to prevent spent cartridges from being sucked into the giant rotors. (The chutes were no mere pieces of bent scrap

metal; each had to be of precisely the right length, despite having several bends.) During October, special frames were constructed for the Chinook's rear door to enable five ropes to be hung over the side for multiple abseiling by SAS parties.

A couple of days before Christmas, 5 Squadron was called upon to design and manufacture stretcher carrying frames which could be used in both military and requisitioned civilian aircraft. After considerable effort and sacrifice of holiday leave by some staff, the task was satisfactorily completed just six days before hostilities began.

In another case, earlier in the operation, Tornado cockpit canopies refused to close properly in the desert heat. Plans for a modification kit arrived at St Athan at 3pm on a Friday and were put into uninterrupted production over the weekend.

In total, 161 Granby-related jobs were received by 5 Squadron, of which six did not proceed and eight were still in progress a month after the cease-fire. To make life a little more interesting, it often transpired that the ideal materials were not to hand when urgent jobs were received, and a frantic search would have to be made to obtain alternative supplies. In other words, St Athan was where the proverbial 'flexibility of air power' began.



GULF MEDICS

Wing Commander Dai Fares



During hostilities, the objectives of the Medical Services are to prevent disease, treat casualties, so that they may remain at or return to duty, and provide a casualty evacuation system from the point of wounding to full recovery. Through long years of co-operation and practise with our Army medical colleagues, the RAF Medical Service has developed sound operating procedures. Plans, although tailored to meet the requirements of a war in Europe, were adapted quickly to meet the needs of the war in the Gulf.

During August 1990, the first RAF aircraft flew into the Gulf region, in rapid response to the Iraqi invasion of Kuwait. RAF medical officers and their support staffs, together with Environmental Health Technicians were deployed with them.

As the crisis deepened and more British troops and aircraft reinforced the bridgeheads in Saudi Arabia and the neighbouring Gulf states, more medical staff were deployed in support. RAF Medical and Nursing Officers, together with specialist medical tradesmen, were seconded to Army medical units and even to Saudi Arabian facilities. In total, nearly 900 RAF medical/dental personnel were deployed in theatre during the crisis, with many more providing the infrastructure and essential medical support within the United Kingdom and in Cyprus. In addition, RAF musicians were tasked with providing vital support to the RAF medical formations deployed. This was a new role for them and it was undertaken with great enthusiasm and

without which the RAF medical effort could have been compromised.

From the beginning of the crisis, the Joint Medical Operations Cell (Jt Med Cell), in the Joint Headquarters (JHQ) at RAF High Wycombe, was established to co-ordinate the deployment of medical assets and played a vital part in the logistics planning of *Operation Granby*. JHQ was the lead headquarters for the Operation. Elsewhere, other Med Ops Cells were being organised, such as in the Ministry of Defence, HQ United Kingdom Land Forces (UKLF) and HQ Royal Air Force Support Command (RAFSC), each having their own responsibilities but each linking to the nerve centre at JHQ.

In late autumn, it was decided that the strength of British forces on the ground was to be increased and this meant that the medical support element needed to be increased also. Several Army hospitals were deployed into the field but they could not provide the total number of in-theatre beds considered necessary.

It was decided to activate elements of No 2 RAF War Hospital. Hitherto, the war role of this unit, formed mainly from personnel based at The Princess of Wales RAF Hospital Ely and Princess Mary's RAF Hospital Halton, would have been to support medical operations in any North European conflict. These elements of No 2 RAF War Hospital were re-designated RAF War Hospital (RAFWH) Muharraq, a 100-bedded field hospital. This unit was deployed first to the Royal Army Medical Corps Field Training unit near Chester, for some very intensive training

(including nuclear, biological and chemical defence) and then, on 27 December 1990, out to Bahrain.

Besides the War Hospital, the RAF's priority was to establish an aeromedical evacuation organisation. This had to provide flights from the Gulf to the UK, staging through Cyprus when necessary, and also casualty evacuation by helicopter in the theatre of operations.

It was decided that at each in-theatre departure airhead, a section of an aeromedical evacuation squadron would be deployed. Initially, No 1 Aeromedical Evacuation Squadron (AES) was to take on the job but it soon became obvious that this small squadron could not cope with the expected size of the task. At this point, the Secretary of State for Defence decided upon a limited call-up of Reserve forces, this being No 4626 (County of Wiltshire) Aeromedical Evac Sqn RAuxAF. With personnel from this specialised and highly motivated unit, the airheads could be covered.

Casualties would receive first aid 'buddy care' initially, then they were to be evacuated rearwards through Field Dressing Stations, Field Ambulance units (both tracked and wheeled) to Field Hospitals further back. Puma and Chinook helicopters from the RAF and Sea Kings from the Royal Navy were to be used for in-theatre medevac. RAF 'medics' acted as in-flight medical escorts for these flights along with medical staff from the other two medical services. After receiving appropriate treatment, sometimes involving surgery, the casualty would be assessed for

Decontamination training in the UK prior to deployment. Flt Lt Dalby



Dutch and RAF medics during a resuscitation exercise. Wg Cdr Geoff Davies





Above: Tracked and wheeled ambulances showing Red Cross and Red Crescent symbols. Cpl Surgey

evacuation back to the UK. The RAFWH in Muharraq was an important part of this evacuation chain.

RAF and RNZAF Hercules were to run a 'collection' service for some casualties in theatre and take them to the reinforced medical facility at RAF Akrotiri in Cyprus. There, further medical procedures could be carried out if required and facilities for holding onto the more seriously injured were available. From Cyprus, civilian aircraft were chartered and fitted for an aeromedical evacuation role. Flights from Cyprus would take casualties back to the UK. Additionally, some casualties could have been evacuated direct from the Gulf to the UK in TriStars of No 216 Sqn and VC10 C1s of No 10 Sqn converted for aeromed use.

At the departure airfields in the Gulf were elements of the Aeromed Evac Sqns, No 1 AES and No 4626 Sqn RAuxAF. It was their task to supervise the casualty loading and hand over the casualties to the in-flight Aeromed Escort teams. The escort teams were made up by personnel from the Medical, Nursing and Dental Branches and Trades and were drawn from all parts of the RAF both in the UK and Germany. They also had to look after and document the casualties during the flight back to Cyprus and/or the UK. Control and organisation of the Aeromed operation was co-ordinated by the Headquarters staff at JHQ and UKLF.

More than 20 UK airfields had been identified for the reception of the casualties. Planning always took the 'worst case' scenario, therefore it was assumed that casualty numbers would be greater than they were.

Under these plans, it was clear from the outset that the Defence Services' hospitals may not have been able to cope with a large influx of casualties, especially given that many of the hospitals' personnel were committed already to operations elsewhere. For a number of years, the National Health Service and the Defence Medical Services had been planning for mutual support in time of war. Although the country was not at war *per se*, the NHS and the Defence Med Services proved invaluable in organising the UK end of the evacuation chain.

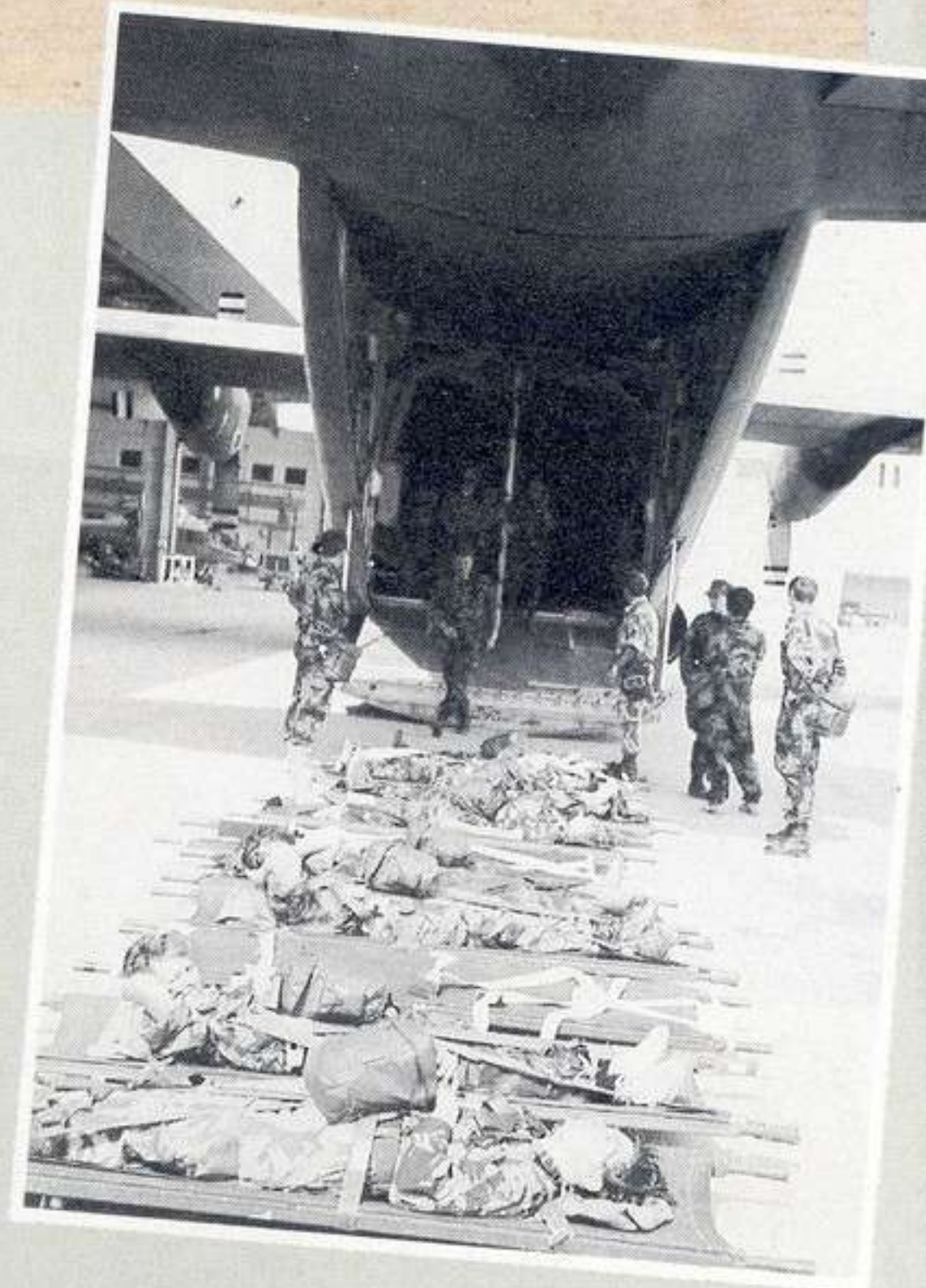
Each UK airfield had been surveyed with the help of the Department of Transport. Local reception facilities were arranged and the local Health Authority, along with Ambulance, Police and other support groups were co-ordinated. The Defence Services provided stretcher crews, service welfare links and Airfield Medical Reception Teams (AMRTs).

The plan was that whenever an inbound aeromed aircraft was known, its destination UK airfield would be decided by the Med Evac Cell (MEC) at HQ UKLF. NHS representatives at the MEC provided advice as to which NHS Region would be best placed to receive the casualties. Once the airfield had been identified, the AMRT and other reception

organisations would be activated. After landing, the AMRT would supervise the unloading of the casualties and hand them over to the NHS. The name of the destination NHS hospital then would be transmitted to the relevant Service Personnel Records Office. In this way, the next-of-kin would be kept informed of where the casualties had been taken.

In the event, mercifully, casualties in the Gulf War were light. Had it been otherwise, however, there is every confidence that the Defence Medical Services' plans would have been effective. The RAF Medical Service played a full part not only in the formulation of these plans but also in their execution. Although the brunt of the operational work was borne by those who were deployed to the Gulf, those who were deployed elsewhere: to Cyprus, at The Princess Mary's Hospital and at RAF Akrotiri; the in-flight aeromed escort teams and, within the UK at various Headquarters such as JHQ, UKLF and RAFSC also had a key role.

Another group of people who deserve mention are the staff left behind at units throughout the RAF who were left short-handed because their colleagues had been deployed on *Operation Granby* duties. They had to work long hours to compensate for the loss of manpower, so that the routine RAF Medical Service could be maintained for as long as possible. Their involvement, while not as newsworthy as the others, nevertheless played its part in the overall success of the grand Medical Support Plan. That the medical evacuation chain was not



Practising load/unload procedures at Al Jubail. SAC(W) Wheeler

required was welcomed by all. Those who took part in the planning of it, however, can feel confident that it would have been successful had it been put to the test. All in all, the RAF Medical support to *Operation Granby* can be summed up as an outstanding team effort by many dedicated professionals.

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RAF and New Zealand personnel sharing ward duties. Wg Cdr Geoff Davies

