AIRCRAFT OF THE ACES: MEN & LEGENDS

GULF AIR WAR 1991

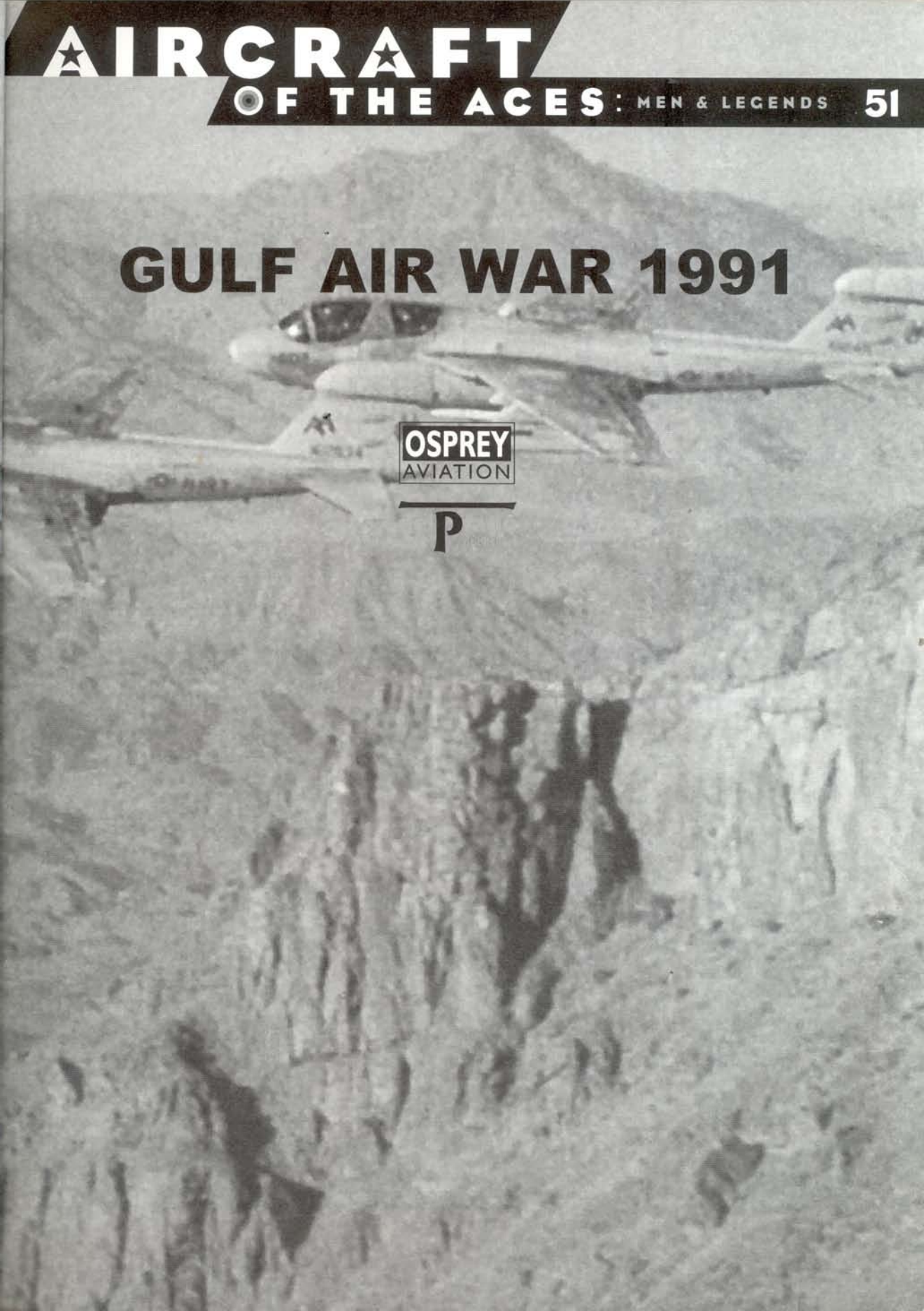
del Prado publishers

OSPREY AVIATION

GULF AIR WAR 1991

AIRCRAFT OF THE ACES: MEN & LEGENDS 51

GULF AIR WAR 1991



OSPREY AVIATION

Publisher: Juan María Martínez
Editor-in-Chief: Juan Ramón Azaola
Based on: *Gulf Air War 1991*

Text by Christopher Chant
Cover painting by Keith Woodcock
Aircraft Profiles by Mark Rolfe

DISTRIBUTION:
UNITED KINGDOM
Customer service, including subscriptions, back issues and binders: WOODGATE
PO Box 95
Hastings
TN35 4BZ
Distribution: COMAG Magazine Marketing
The price of each part is £ 4.95
(with the exception of No 1 at £ 1.95).

AUSTRALIA
Distribution: GORDON AND GOTCH LIMITED
Subscriptions: KIRIN DIRECT MARKETING
Reply paid 1900
Aircraft of the Aces Subscriptions
P.O. Box 1900
Mona Vale NSW 1658
Hot line: (011) 265 4444
Fax number: (02) 9979 7107
Back issues: These can be ordered through your newsagent, or write to **Aircraft of the Aces**, Gordon and Gotch Limited, PO Box 290, Burwood, Victoria 3125. Please enclose cover price plus A$ 1.50 p&h per issue.

NEW ZEALAND
Distribution: GORDON AND GOTCH (NZ) LIMITED
Subscriptions: KIRIN DIRECT MARKETING
Freepost 108466
Aircraft of the Aces Subscriptions
P.O. Box 47863
Ponsonby, Auckland 1034
Telephone number: (09) 377 3798
Fax number: (61 2) 9979 7107
Back issues:
Gordon and Gotch (NZ) limited
PO BOX 24013, Royal Oak, Auckland,
New Zealand

SOUTH AFRICA
Distribution: RNA
Subscriptions and back orders:
JACKLIN ENTERPRISES
Private Bag,12
Centurion, 0046
Hotline.: 011 265 4444
Fax.: 011 314 2984
Subscriptions Email Address:
Subscribe@jacklin.co.za

I.S.B.N (for the whole work): 84-8372-433-2
I.S.B.N (for this volume): 84-8372-625-4

Front cover
The 18th air-to-air 'kill' gained by the air forces of the UN-led coalition came on 26 January 1991 when Captain Anthony E. Schiavi, of the US Air Force's 58th Tactical Fighter Squadron (33rd Tactical Fighter Wing) fired an AIM-7 Sparrow medium-range AAM from his McDonnell Douglas F-15C Eagle (85-0104) to bring down a Mikoyan-Gurevich MiG-23

CONTENTS

OCCUPATION OF KUWAIT

In 1961 the United Kingdom granted formal independence to the protectorate of Kuwait, which then became the Emirate of Kuwait. This small but oil-rich nation had for long been coveted by Iraq, its much larger northern neighbour, which became completely independent of the UK's League of Nations (and later United Nations) mandate in 1958, the year in which the monarchy was overthrown by the Ba'athist republic. Iraq never recognised Kuwait, and on several occasions in the following 30 years laid claim to parts or the entirety of Kuwait. Apart from its large oil reserves, reckoned in 1995 at 96.5 billion barrels to Iraq's 100 billion barrels, Kuwait was wanted by Iraq for the fact that it had a comparatively extensive coast along the western side of the Persian Gulf's northern end, whereas Iraq proper has only a very short coast that lies within the military reach of Iran. Iraq adheres mainly to the Sunni branch of Islam and has a strong antipathy to Iran and its adherence to the Shi'a branch of Islam. Coupled with the desire to seize the oil-rich regions along Iran's western border, this was sufficient to persuade the Iraqi dictator, Saddam Hussein, to launch a major war against Iran in 1980. This conflict, which was very costly in terms of casualties and money, lasted to 1988 without any real resolution.

At the end of the war Iraq was crippled by debts, and saw in the seizure of Kuwait a chance to refill her coffers, rebuild her prestige among the Arab nations and satisfy her long-held claim to the country. After a short diplomatic offensive designed to justify her imminent action by claims of Kuwaiti encroachment on Iraqi oil reserves and Kuwaiti efforts to keep down the price of oil as a form of direct aggression against Iraq, Iraqi forces moved into Kuwait on 2 August 1990. Isolated pockets of Kuwaiti troops fought back but were unable to check the spearhead forces provided by the Iraqi Republican Guard, and by the end of the day the Iraqis were in control of virtually all of Kuwait. The Kuwaiti royal family and large numbers of Kuwaitis fled to neighbouring Saudi Arabia.

By the end of 2 August 1990 the United Nations Security Council had passed Resolution 660 demanding immediate withdrawal of the Iraqi occupation forces and the start of negotiations to end the dispute between the two countries, and the government of the USA had frozen all Iraqi and Kuwaiti assets. On 6 August King Fahd of Saudi Arabia asked for foreign military aid in the defence of his kingdom against the

In 1990 the air forces of the Persian Gulf region were equipped with a moderately large number of advanced warplanes, mostly of Western origin. The largest of these forces was the Royal Saudi Air Force, which operated from modern and well equipped bases with aircraft such as the Panavia Tornado IDS (foreground) and McDonnell Douglas F-15C Eagle (background) here flanking a SEPECAT Jaguar of the Sultan of Oman's Air Force

possibility of further Iraqi aggression, and Resolution 661 was passed to place a trade embargo on Iraq. In occupied Kuwait, the Iraqi forces began to seize the nationals of Western nations, and in Iraq Saddam said that Iraq's tenure of Kuwait was 'irreversible'. In the USA President George Bush ordered the immediate planning for Operation 'Desert Shield', which would witness the rapid despatch to the region of large American forces, starting with the air transport to Saudi Arabia of the US Army's 82nd Airborne Division.

Seen with the fuselage legend 'Free Kuwait', this McDonnell Douglas A-4KU warplane escaped from Kuwait at the time of the Iraqi occupation to serve alongside the coalition air forces

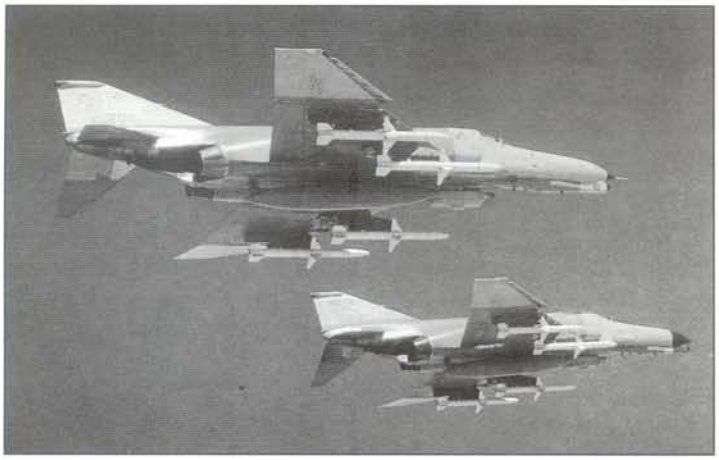
In a move to secure his eastern flank, Saddam then ordered that all Iraqi troops pull out of any Iranian territory still occupied after the 1980-88 Gulf War, and that all Iranian prisoners-of-war be repatriated. The western hostages were released on 28 August and by early December all remaining foreign nationals were allowed to leave Iraq and Kuwait, ending the possibility of 'human shields' being used to protect vital Iraqi targets.

The Iraqi Air Force

In 1991 the Iraqi air force was generally credited with being the sixth largest air force in the world, and was thought to be comparatively well trained and equipped with substantial numbers of modern warplanes, largely of French and Soviet origins. However, then as much as now, there was surprisingly little in the way of concrete information on the disposition and exact strength of the Iraqi air force. When the two sides came to blows in January 1991, the Iraqis mustered some 550 front-line warplanes in the fighter, attack, bomber and reconnaissance roles. Under the command of Lieutenant General Hamid Sha'abeen al Khazraji, the Iraqi air force had some 40,000 men, and its first-line assets were divided between the Air Defence Command and the Air Support Command.

The Air Defence Command's primary responsibility was the defence of

The great range of the Grumman F-14A Tomcat air-superiority fighter allowed the type to operate over Iraq from aircraft carriers deployed in the Red Sea. This is a machine of the VF-32 'Swordsmen' squadron, part of CVW-3 (Carrier Wing-3) operating from the USS *John F. Kennedy*



Suppression of Iraq's large, complex and potentially devastating ground-based combination of surface-to-air missiles and anti-aircraft artillery was a very high priority for the coalition air forces. for the American contribution to the air effort, this all-important SEAD (Suppression of Enemy Air Defences) role was entrusted largely to the McDonnell Douglas F-4G 'Wild Weasel' version of the venerable Phantom II multi-role fighter. These two F-4G warplanes, operated by the 35th Tactical Fighter Wing home based at George Air Force Base in California, each carry a quarter of AGM-88A HARM (High-speed Anti-Radiation Missile) weapons

the country's air bases and its targets of strategic significance. For this task the command had all of the air force's interceptor units together with the air force manpower operating the nation's air surveillance radars and the control and reporting system through which radar data were turned into a cohesive air-defence scheme. The Air Defence command also controlled the various parts of the Iraqi army tasked with the protection of strategic targets with surface-to-air missiles and anti-aircraft artillery. On the outbreak of hostilities, the Air Defence Command had some three Adnan AWACS aircraft, which were Ilyushin Il-76 'Candid' transport aircraft locally adapted to carry a French radar equipment, the Thomson-CSF Tigre. The real capability of these technically important aircraft is still not known as they were not used in the air campaign over Iraq and Kuwait. One of the Adnan aircraft was badly damaged on the ground, and the other two flew to the physical safety of neutral Iran.

In overall terms, the Iraqi air force has never concerned itself in any detail with the arcane problems of differentiating friend from foe in confused tactical situations: in the Gulf War between Iraq and Iran, the Iraqi army created an anti-aircraft missile and gun shield over its ground forces, and all approaching aircraft were treated as hostile. Despite its lack of sophistication, the system was apparently so 'effective' that more than 75 per cent of Iraqi aircraft downed during that conflict were the victims of 'friendly' fire! In this situation, compounded by the coalition's almost total destruction of Iraq's command and control system, it seems highly likely that any Iraqi warplanes that did take-off and head toward the front were engaged by both sides until they landed once more.

The task of the Iraqi air force's Air Support Command was support of surface operations by the army and navy. The Air Support Command therefore ran the operations of all attack, bomber and reconnaissance units within the air force. There is some dispute about the most effective type in the Air Support Command inventory, the Sukhoi Su-24 'Fencer' interdictor, which is in the same class as the Tornado. If the Iraqi air force had tried to undertake an attack with chemical weapons against Israel or the coalition forces, it was the Su-24 that was the type with the best chance of success. For this reason, therefore, the coalition air forces made the air bases thought likely to support the Su-24, together with the hardened aircraft shelters accommodating these important warplanes. It was

Throughout Operation 'Desert Storm', the members of the coalition forces were on a high state of alert for any Iraqi use of 'weapons of mass destruction'. These two pilots of a Fleet Air Arm Westland Sea King HC.Mk 4 helicopter are wearing NBC (Nuclear, Biological and Chemical) protection suits complete with electrically powered portable air filtration units

The significant level of damage inflicted on Iraqi ammunition storage bunkers by McDonnell Douglas F-15E warplanes is a testimony to this attack warplane's excellent basic navigation, radar and FLIR systems, which can also be augmented by the two pods of the LANTIRN system for added night and adverse-weather capability at low level

thought at the beginning of 1991 that the Iraqi air force had between 10 and 16 Su-24 warplanes received shortly before the imposition of the UN's embargo on the delivery of weapons to Iraq, and it was only after the end of hostilities that Iraq revealed that it had sent 24 Su-24 warplanes to Iran. This places coalition intelligence in a poor light.

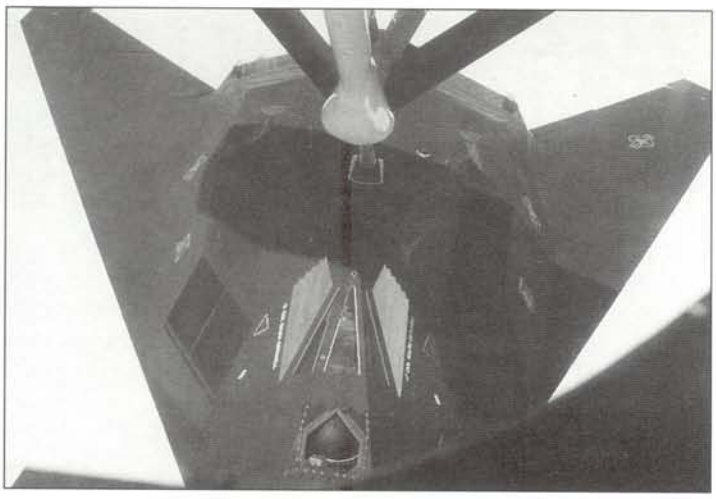
In a country with a generally poor transport infrastructure, air transport generally enjoys a high level of official support, and this was certainly the case with Iraq. The air force had its own transport arm with some 45 aircraft, most of them supplied by the USSR, and could also call on the aircraft operated by the state-owned Iraqi Airways as well as some 40 freighters.

All battlefield helicopter units, and also all of Iraq's 'Scud' and other surface-to-surface missiles, were the responsibility of the army.

In keeping its mixed force of aircraft, acquired largely from France, the USSR and China (the last providing a number of Soviet types built in that country), at a high level of serviceability the Iraqi air force faced major problems. Their greatest difficulty was that Iraq's warplanes were not bought to a planned system but rather on the basis of who was prepared to sell to Iraq when the necessary finance was available. As a result the Iraqi air force flew 15 different types of fixed-wing warplanes. Except for the Dassault Mirage F1, the Mikoyan-Gurevich MiG-21 'Fishbed' and the Sukhoi 'Fitter' (in its Su-7, Su-20 and Su-22 versions), orders had always totalled less than 60 aircraft. It was even worse in the case of the Iraqi forces' rotary-wing aircraft, for the air force and army between them flew no less than 16 types of helicopter.

There is no precise information on the serviceability rates of the aircraft in Iraqi service even before the occupation of Kuwait and the breakdown of relations with the rest of the world. The Iraqis are a technically capable and inventive people, however, and have now been revealed as adept in the task of keeping weapons serviceable under adverse conditions. In

these circumstances, therefore, it is possible that the serviceability rates of the Iraqi air force were higher than had generally been assumed, even though the implementation of the UN embargo must have made the task much harder that it would otherwise have been and forced the 'cannibalisation' of a few of each type of warplane to keep the rest of the force airworthy.



A major contribution to the coalition air effort against Iraq was made by the Lockheed F-117A 'stealth' attack warplanes of the 37th Tactical Fighter Wing based well beyond Iraqi retaliatory efforts at Khamis Mushait Air Base in the south-western corner of Saudi Arabia. The 37th TFW was tasked with the destruction of strategically vital targets such as Iraq's nuclear and biological weapons production centres as well as the devastation of Iraq's centralised command, control and communications capability

It is worth noting that according to a report from a Russian press agency on 25 January 1991, but unconfirmed by other sources, that the commanding officers of the Iraqi air force and the Air Defence Command had both been shot for failing to perform their duties adequately. What is known with certainty, though, that General Mezahim Sa'ib took over command of the Iraqi air force in this period.

During the course of the war that was shortly to erupt, some 148 Iraqi aircraft (including 115 warplanes) were flown to Iran during the conflict.

History was now about to teach the Iraqi air force that the mere possession of large numbers of aircraft does not constitute an effective and combat-capable air arm. As events were soon to confirm, the Iraqi air force was perhaps combat-capable – but only by the standards of about 1970. What the Iraqi air force had not learned, even in its long campaign against the Iranians, was that weapons technology and air warfare thinking had progressed virtually out of recognition since 1970s. Thus they were fated to enter combat against opponents who not just more sophisticated in terms of their hardware but more importantly in terms of their air warfare thinking and training. There is no doubt that many of the Iraqi pilots flew and fought with courage and determination, but were outclassed by the planners and pilots of coalition air forces, which comprised the best units that the various members of the coalition could provide. As General Tony Peak, USAF chief-of-staff, later put it: 'I think [the Iraqi air force] did rather well under the circumstances. They're a pretty good outfit. They happened to be the second-best air force in the fracas. Having the second-best air force is like having the second-best poker hand - it's often the best strategy to fold early. I think they folded early.'

It is believed that pilots of McDonnell Douglas F-15C Eagle fighters shot down at least five examples of the excellent Mikoyan-Gurevich MiG-29 'Fulcrum' fighter in a clear example that in combat it is training and experience that count as much as the theoretical capabilities of a warplane and its weapons

THE COALITION GATHERS: 1990

General H Norman Schwarzkopf was the US Army officer selected to lead the coalition forces, with a British officer, Lieutenant General Sir Peter de la Billière, as his deputy. By far the largest numbers of warplanes available to the coalition forces' command for offensive operations into Iraq when hostilities finally broke out were those provided by the US Air Force and the US Navy, supplemented by air strength provided by the US Marine Corps and the US Army. There *follows an assessment of some of the non-American units that made a* contribution large or small to the coalition.

SUPPORT FROM THE BRITISH

The British government was quick to condemn Iraq's initial aggression against Kuwait, and almost immediately followed this with the decision to send air, land and sea units to bases in the states on the western side of the Persian Gulf. This plan got off the ground on 9 August 1990 when Tom King, the Secretary of Defence in the Conservative government, announced that the first tranche of the British effort would comprise 12 examples each of the Tornado F.Mk 3 interceptor and Jaguar GR.Mk 1A attack warplane. The Tornado aircraft were already in Cyprus for an armament practice camp, while the Jaguar machines were in a state of constant readiness for short-notice deployment, which allowed the air-

By far the largest number of warplanes available to the coalition were provided by the USA. Carrying an underwing load of cluster bombs, a Vought A-7E Corsair II of the US Navy is caught on the moment of launch commitment from the flight deck of an aircraft carrier

Though optimised for the reconnaissance role with a considerable weight of mission equipment on its one underfuselage and four underwing hardpoints, the SEPECAT Jaguar GR.Mk 1A clearly needed a self-protection capability against attacking aircraft, and therefore carried a pair of AIM-9 Sidewinder short-range AAMs on its two overwing hardpoints

craft to depart to the Middle East with considerable speed. The build-up of the British air component at Dhahran Air Base in Saudi Arabia began on 9 August with the arrival of essential administrative and support personnel flown in by Lockheed TriStar, and it was two days later that the Tornado squadron arrived. As with all other RAF detachments to the Persian Gulf theatre, this squadron comprised aircraft and personnel from more than one unit, and was thus named as No 5 (Composite) Squadron because the senior officer was the commanding officer of that unit.

The Tornado F.Mk 3 interceptors were at first used with aircraft of the USAF and the Royal Saudi Air force in carrying out four-hour combat air patrols (CAPs) along the Saudi border with Iraq and Kuwait. During the course of these CAPs, the Tornado interceptors were refuelled in the air by BAe VC10 tankers which arrived at Bahrain on 27 August. VC10 aircraft also delivered the personnel and initial equipment of the Jaguar squadron to Thumrait Air Base in Oman on 13 August, then moved to Seeb Air Base on 29 August. Given the distance of Oman from the probable location of overt hostilities with Iraq, it was inevitable that the Jaguar unit would soon be moved farther north, and this in fact took place between 7 and 10 October, when the unit moved to Bahrain. Back at Seeb, three BAe Nimrod MR.Mk 2 maritime patrol aircraft arrived from 13 August to co-operate with coalition warships in the maritime blockade of Iraq.

Up to this time the Jaguar warplanes constituted the only offensive element of the British contribution to the coalition air force, but on 23 August, the Ministry of Defence announced that a squadron of Tornado GR.Mk 1 interdictors would be despatched. Departing from bases in Germany on 27 August, the composite unit made for Bahrain, the aircraft already sporting the desert pink camouflage first seen on the Jaguar warplanes. Tasked with the role of attacking Iraqi air bases, the Tornado GR.Mk 1 suffered serviceability problems related to heat and sand,

although these were eventually overcome. A second squadron, whose despatch was revealed on 14 September, departed for Bahrain in two elements during 19 and 26 September, but later moved to Tabuk Air Base, in the west of Saudi Arabia, during 8 October.

The deployment of Tornado GR.Mk 1 warplanes was increased to three squadrons shortly before the 'Desert Shield' build-up turned into the 'Desert Storm' operation and the third unit reached Dhahran between 3 and 4 January 1991. Six Tornado GR.Mk 1A aircraft, with reconnaissance rather than interdiction as their primary responsibility, reached Dhahran between 14 and 16 January. The British forces for offensive air operations thus totalled some 50 Tornado and 12 Jaguar warplanes on three bases.

This was only part of the British build-up, however, for a Lockheed Hercules detachment came into existence at Riyadh on 1 November 1990 as the core of an intra-theatre distribution network for the mass of supplies now being delivered into the theatre in increasingly large quantities by Hercules, VC10 C.Mk 1 and TriStar transport aircraft. The strength of this Hercules unit was boosted to nine aircraft by the middle of January 1991, including two aircraft supplied and crewed by the Royal New Zealand Air Force. Another five Hercules transports operated from a base in the United Arab Emirates to support covert operations.

The RAF's in-theatre VC10 tankers (both K.Mk 2 and K.Mk 3 variants) were bolstered from 14 December by examples of the BAe Victor K.Mk 2 as they started to arrive at Bahrain. Six Victor tankers were available by 16 January, by which time the VC10 force of nine aircraft had been collected at Riyadh for one month.

Strengthening of the RAF in the theatre after the air war had started was designed to remedy the force's perceived lack of any precision attack capability with laser-guided bombs. The Tornado attack aircraft could carry such weapons but lacked the means to designate the target, so 12 elderly BAe Buccaneer S.Mk 2B aircraft, each equipped with the 'Pave Spike' laser-designation pod, were flown to Bahrain, which the first two aircraft reached during 26 January. These aircraft provided the required illumination capability for the laser-guided bombs of Tornado warplanes based at Bahrain and Dhahran, but those based at the Tabuk co-operated with five specially equipped Tornado GR.Mk 1s that arrived from 6 February together with two TIALD (Thermal Imaging Airborne Laser Designation) reconnaissance/designation pods. In overall terms, therefore, the RAF in the middle East had available to it a total of 62 Tornado GR.Mk

Invaluable support was lent to the forces operating in the northern reaches of the Persian Gulf and the shore adjacent to it by the Westland Sea King HC.Mk 4 utility and transport helicopters of the Fleet Air Arm. This machine is seen lifting off from the helicopter support ship RFA *Argus*

The Tornado F.Mk 3 air-superiority fighter's counterparts were the Tornado GR.Mk 1 long-range interdictor and, as seen here, the Tornado GR.Mk 1A reconnaissance type. Provided by either No. 2 Squadron at Laarbruch in Germany, this has a horizon-to-horizon IR system in place of the interdictor's two 27 mm cannon, and in additional to two drop tanks carries under the port and starboard halves of the wing a Marconi Sky Shadow ECM pod and a BOZ-107 chaff/flare dispenser pod respectively

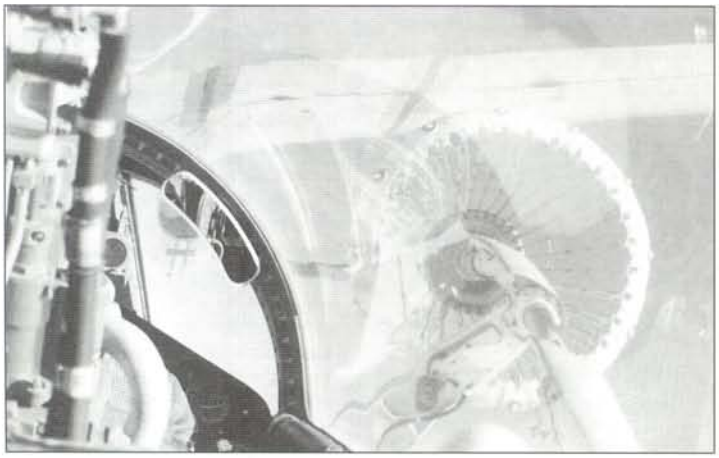
Logistic and personnel support for the British forces in the field were provided by the Lockheed Hercules in its C.Mk 1P short- and C.Mk 3P long-fuselage forms each fitted with an inflight-refuelling probe over the flight deck

1/1A aircraft from a figure of at least 87 such aircraft that were earmarked for such service and accordingly painted in desert pink camouflage.

Support from the French

Another country that decided at an early date that it would need to join the coalition was France. On 9 August the French government decided that sensible first moves would be the strengthening of its forces already in its ex-colony now the Republic of Djibouti, and the forward movement of at least part of its Force d'Action Extérieure (FAE, or rapid deployment force), including the support and attack helicopters essential for modern mobile operations. Two days later additional elements were also sent to Djibouti to boost the capabilities of the Armée de l'Air units already there: including mobile radar, Crotale surface-to-air missile systems and Transall C.160NG transport aircraft modified for the inflight-refuelling role as vital secondary assets, but also primary assets such as the Dassault Mirage F1C fighters of Escadron de Chasse 4/30 'Vexin' and the Aérospatiale Alouette II helicopters and C.160 transport aircraft of Escadron de Transport d'Outre Mer 88 normally allocated to Détachement Air 188.

How exactly to react was a more difficult situation, for France's general policy was to a pursue a line generally independent of those urged by any major power bloc, and in addition there were major figures in the French



Inflight refuelling is an essential part of modern air warfare: this is the view from the navigator's (rear) seat of a Panavia Tornado as his pilot flies the warplane's starboard-side probe into the basket drogue at the end of the fuel pipe lowered from a BAe Victor K.Mk 2 tanker

Carrying the standard 'desert pink' camouflage of British warplanes allocated to the coalition air force, this SEPECAT Jaguar GR.Mk 1A based at Bahrain is already armed with two AIM-9 Sidewinder short-range AAMs and two CBU-87 cluster bombs above and below the wing respectively, and is about to be fitted with an ALQ-101(V) radar jamming pod under the outer hardpoint below the port half of its wing

establishment (including Jean-Pierre Chevènement, the minister of defence) who wanted for a variety of reasons to find an accommodation favourable to Iraq.

The French operation to build up its forces in Saudi Arabia was code-named 'Salamandre', but the indeterminate nature of the French commitment to the theatre meant that it was only days short of two months before the various components of the FAE and their helicopters became firmly based in and around the King Khalid Military City in the north-eastern region of Saudi Arabia not far from the border with occupied Kuwait. The peripatetic nature of the French commitment is indicated by the fact only eight days after the Iraqi occupation of Kuwait 30 Aérospatiale Gazelle light and 12 Aérospatiale Puma medium helicopters of the Aviation Légère de l'Armée de Terre's 5ème Régiment d'Hélicoptères de Combat, allocated to the FAE, arrived on the French navy's aircraft carrier *Clemenceau* at Toulon. The embarkation of this force meant that the carrier had to leave in France much of its normal fixed-wing air strength (Vought Crusader fighter and Dassault Super Etendard attack aircraft), retaining only its four Dassault Alizé anti-submarine aircraft in addition to a pair of Aérospatiale AS 365F Dauphin planeguard and SAR helicopters. The carrier sailed during 13 August, in case evacuation of French nationals from Kuwait should prove necessary. The carrier passed along the Suez Canal into the Red Sea but then remained at Djibouti between 22 and 28 August while the ALAT helicopters participated in training exercises with the forces already in Djibouti. The carrier then proceeded around the Arabian peninsula undertaking further exercises with the forces of the United Arab Emirates before sailing back to the port of Yanbu on Saudi Arabia's western coast.

On 9 September (two weeks before the *Clemenceau's* docking at Yanbu) a Boeing Model 747F freighter of Air France had joined two Hercules and four C.160F transports of the French air force in delivering two Aérospatiale SA 330B Puma medium and four SA 342M Gazelle light helicopters of the 3ème RHC, together with part of the regiment's personnel, direct to Yanbu from France.

After the Iraqi occupation forces in Kuwait had forced their way into the French embassy, the French government decided to offer a more significant contribution to the coalition forces assembling in Saudi Arabia.

The *Clemenceau* finally unloaded her helicopters at Yanbu between 22 and 25 September, and a few days later the heavier equipment for the 6ème Division Légère Blindée (light armoured division) arrived by ship from France to be manned by 4,200 personnel airlifted from the division's base near Nîmes to take up position in the north-eastern part of Saudi Arabia.

Seen on the ground below a hovering Aérospatiale Puma HC.Mk 1 utility transport helicopter, the Aérospatiale Gazelle AH.Mk 1 was operated in unarmed form to scout for the armed Lynx AH.Mk 7

All 48 French helicopters flew to the King Khalid Military City on 26 September, and two C.160 transports aircraft delivered HOT anti-tank missiles for the SA 342M machines from Djibouti to the same destination. Four days later, on 30 September, the ALAT declared operational its force of nine SA 341F/Canon gunship, nine SA 341F scout, 32 SA 342M Gazelle/HOT anti-tank and 18 SA 330B Puma helicopters.

This completed the first phase of French reinforcement for Saudi Arabia, but already it was planned to load the second wave at Toulon onto four merchant ships. This comprised 20 SA 342M helicopters of the 1ème and 5ème RHCs, based at Phalsbourg and Pau respectively, together with four SA 330B helicopters of the 4ème Régiment d'Hélicoptères de Commandement, de Manoeuvre et de Soutien (command, transport and support helicopter regiment) based at Nancy; a third wave of 40 more helicopters (including the Orchidée experimental machine with ground surveillance radar) followed at the beginning of the war.

Meanwhile, President François Mitterand had decided on 14 September that France should also make a contribution to the coalition's fixed-wing aircraft strength. On the next day the Armée de l'Air began Operation 'Daguet', the despatch of aircraft and personnel under the command of Général de Brigade Aérienne Jean-Pierre Gellibert. Unlike the American and British delivery of warplanes to Saudi Arabia, that of French was notably slow, wholly as a result of continued political hedging, for the first four Dassault Mirage 2000C fighters of the 5ème Escadre de Chasse at Base Aérienne 115 (Orange-Caritat) and four Dassault Mirage F1CR reconnaissance aircraft of the 33ème Escadre de Reconnaissance at BA 124 (Strasbourg-Entzheim) did not lift off from the staging point provided by BA 125 (Istres-Le Tubé) until 3 October, together with two Boeing C-135FR tankers of the 93ème Escadre de Ravitaillement en Vol. The eight warplanes refuelled three times in the course of their 2,750 mile (4.425 km) flight to Al Ahsa Airport, a civilian establishment outside Al Hufuf some 225 miles (360 km) south of Kuwait, where they came under the immediate command of Colonel Jean-Pierre Job (promoted to général de brigade aérienne on 1 December) under the overall local command of the Commandement des Eléments Français (French command) located in Riyadh under Général de Corps d'Armée Roquejeoffre with Gellibert as his deputy for air matters.

Even as the units of the ALAT, Commandement Air des Forces de Défense Aérienne (CAFDA, or air defence command) and Force Aérienne Tactique (FATac, or tactical air command) were deploying into Saudi Arabia, the Commandement du Transport Aérienne Militaire (CoTAM, or military air transport command) inaugurated support flights between France and Saudi Arabia, the command's C.160, C-130H and DC-8-72 aircraft being aided by chartered civil aircraft. The CoTAM also created an intra-theatre network of logistic flights, beginning with an initial deployment of three C.160 aircraft to Yanbu early in October 1990. This network eventually increased to five C.160 aircraft that were later based at the incomplete Terminal 4 of Riyadh International Airport, which also became the base for the C-125FR inflight-refuelling tankers supplied by the Commandement de Forces Aérienne Straégiques (CoFAS, or strategic air command) to support operations by tactical warplanes. After hostilities started, the C.160 force was increased to 10 aircraft and bolstered by a pair of C-130H transports in the task of keeping mobile ground forces and their tactical air support supplied with equipment, food and ammunition.

So far as fixed-wing tactical aircraft are concerned, some five days after the first French warplanes landed at Al Ahsa, a second group of four Mirage 2000C and four Mirage F1CR aircraft arrived at the same base. On 15 and 17 October, these machines were complemented by two batches of four Jaguar A attack aircraft of EC 11 from the BA 136 (Toul-Rosières) base and in November by two SA 330Ba search-and-rescue helicopters of the Escadron d'Hélicoptères 1/67 'Pyrénées' from the BA 120 (Cazaux) base and by one C.160G GABRIEL electronic reconnaissance aeroplane of the Escadron Electronique 54 'Dunkerque' from the BA 128 (Metz-Frescaty) base. French aircraft continued to arrive in the theatre, and by the time the UN deadline for the Iraqi departure from Kuwait arrived, the French air force had at Al Ahsa 24 Jaguar, 12 Mirage F1CR, 12 Mirage 2000C, two Puma and one C.160G aircraft in Saudi Arabia, together with light cannon mountings and SAM batteries for airfield defence, and at Riyadh five C-135FR tankers, five C.160 transports, one

Carrying two examples each of the Super 530 medium- and Magic short-range AAMs under its wing, this warplane preparing to take-off on a combat air patrol is a Dassault Mirage 2000C of the French air force's EC 5 unit

Dassault Mystère 20 command transport and one Aérospatiale N262 liaison aeroplane. Moreover, the French air force also located at the King Khalid Military City one Système de Détection de Contrôle Tactique (SDCT, or tactical detection and control system) radar protected by Crotale SAMs.

As soon as they had arrived at Al Ahsa, the pilots of tactical warplanes began intra-theatre familiarisation flights leading the way to the operation of CAPs, of which the first was flown on 12 December with the support of C-135FR tankers for inflight refuelling. During this time, when the coalition command was not yet certain that the French air elements would be committed to offensive operations after the expiry of the 15 January deadline, the most important French contribution was the reconnaissance capability provided by the aircraft of the Mirage F1CR force, whose Thomson-CSF Raphael side-looking radar and Super Cyclope IR linescanner provided an electronic and thermal 'look' deep into Iraq and Kuwait as the machines flew on the Saudi Arabian side of the border. In this way the French aircraft provided a capability complementary to that of the American RF-4C aircraft with the LOROP (Long-Range Oblique Photography) system.

OTHER MEMBERS OF THE COALITION

The British and French contributions were second only to that of the USA. The other nations that played a part in the coalition, and in shielding it from interference, are now treated alphabetically.

Argentina provided one Boeing Model 707 transport aeroplane and two C-130 Hercules transports for intra-theatre service. The destroyer ARA *Almirante Brown* was deployed in the Red Sea as part of the coalition's efforts to halt blockade-running, and lost her Aérospatiale Alouette III helicopter in a ditching on 1 November, while another Alouette III was based on the destroyer ARA *Spiro*.

Australia's major contribution was a pair of warships, initially the frigates HMAS *Adelaide* and HMAS *Darwin*, which each operated one S-70B Seahawk in addition to an unarmed Aérospatiale AS.550B Ecureuil provided by No 723 Squadron. In December they were succeeded by the similar frigate HMAS *Sydney* and the destroyer HMAS *Brisbane*, the latter an older ship without helicopter capability. A more

Longer-range missions by French warplanes were facilitated by the availability of Boeing C-130FR inflight-refuelling tankers

limited contribution was provided by C-130E Hercules transport aircraft of No 37 Squadron.

From a time late in August, Belgium contributed two C-130H Hercules transport aircraft of No 20 Squadron based at Melsbroek, used mainly for the removal of refugees from Jordan to Egypt. In September Belgium offered another four Hercules, but a plan to send F-16A fighters to the region foundered in the face of political opposition and the air force's revelation that the aircraft lacked adequate electronic countermeasures for service in the Middle East.

Canada's initial contribution was five Sikorsky CH-124 Sea King helicopters of No 423 Squadron based on the destroyers HMCS *Athabaskan* and HMCS *Terra Nova* (two helicopters each) and the supply ship *Protecteur*. However, after Iraqi troops had gutted the Canadian embassy in Kuwait City, Canada despatched 18 McDonnell Douglas CF-18A Hornet dual-role warplanes of No 409 Squadron from CFB Söllingen in Germany to Qatar. Their task was protection of the two Canadian warships by interception, if required, of Iraqi Mirage F1EQ anti-ship warplanes armed with the AM.39 Exocet missile. A rotation then meant that No 409 Squadron was replaced by No 439 Squadron also from Söllingen, and this by No 441 Squadron from CFB Cold Lake. Other Canadian air assets included two Canadair EC-144A Challenger machines of No 414 Squadron and one Lockheed CP-140 Aurora of the Greenwood Wing. One of the EC-144A machines was later redeployed to Muharraq, where a CC-130 Hercules transport also operated in the support role.

Egypt made an offer of Mirage 2000 and F-16 Fighting Falcon fighters during October, but these were not deployed into Saudi Arabia.

Germany contributed no first-line elements to the coalition forces, but nonetheless undertook a small support role with C.160D transport aircraft operating from RAF Mildenhall in England delivering equipment to other USAF bases in Europe, thereby freeing American aircraft for service in the Arabian peninsula.

Greece's involvement with the coalition was limited to the frigate *Elli*, later replaced by the *Limnos*, which operated in the anti-blockade runner role in the Red Sea with two Agusta (Bell) AB.212ASV/ASW helicopters.

One of the most tactically important contributions made by France to the coalition air campaign was its Dassault Mirage F1CR reconnaissance aeroplane. The type was also used, as illustrated here, as the bomb-carrying mothership for packages of less well equipped Jaguar A attack aircraft (background)

In Operation 'Locusta', Italy moved eight Tornado IDS interdictors of the 154° and 156° Gruppi from Gioia del Colle to Al Dhafra (Maqatra). The warplanes left Italy on 25 September, and were refuelled in the air en route to Abu Dhabi by VC10 tankers of the RAF. The detachment was declared operational on 6 October. Eight replacement aircraft were ferried out, again with British help (in this instance by Victor tankers) during November. The Italian naval contribution was four warships including the frigates *Libeccio, Orsa* and *Zeffiro.* Stationed in the Arabian Gulf, these ships each had provision for one AB.212ASV/ASW or Agusta (Sikorsky) ASH-3H helicopter provided by the 6° Reparto Elicotteri.

Kuwait, whose occupation by Iraqi forces was the proximate cause of the entire crisis, was also able to make a contribution. A number of Kuwaiti pilots had managed to escape the advancing Iraqi forces in their aircraft, allowing the creation in Saudi Arabia of the 'Free Kuwait Air Force', which flew as an element of the Royal Saudi Air Force but retained Kuwaiti markings. The Free Kuwait Air Force comprised two composite squadrons at Dhahran, one with 18 A-4KU Skyhawk II single-seat and two TA-4KU Skyhawk II two-seat aircraft previously of Nos 9 and 25 Squadrons, and the other with 15 Mirage F1CK single-seat warplanes previously of Nos 18 and 61 Squadrons. Other available Kuwaiti aircraft included six BAe Hawk two-seat trainers and, based at Al Jubail, 22 Aérospatiale helicopters in the form of 12 SA 342K Gazelle, six SA 330 Puma and four AS 532C Cougar machines.

In September 1990 the Netherlands was due to have despatched 18 F-16A Fighting Falcon warplanes flown by pilots of Nos 315 and 313 Squadrons based at Twenthe. The Dutch naval effort comprised a single frigate (HrMS *Pieter Florisz* replaced in November by HrMS *Philips van Almonde)* carrying two Westland Lynx helicopters.

New Zealand's contribution was of C-130H aircraft and crews of No 40 Squadron at RNZAF Whenuapai; these were attached to the RAF air Transport Detachment at Riyadh/King Khalid International Airport.

A final European contribution was provided by the Air Combat Europe (ACE) Mobile Force, a multi-national NATO organisation created for 'fire brigade' rapid intervention duties in protection of a member of the NATO alliance threatened with attack. Fearing the possibility of an Iraqi attack, Turkey requested support from the ACE Mobile force during December 1990. The air strength then deployed to Turkey included 42 aircraft from Belgium, Germany and Italy: Germany contributed 18 Dornier/Dassault Alpha Jet A light attack warplanes of JBG 43 at Oldenburg, Belgium provided 18 Dassault Mirage 5BA attack warplanes of No. 8 Squadron at Bierset, and Italy supplied six Lockheed RF-104G Starfighter reconnaissance aircraft of the 3° Stormo at Villafranca.

The Gulf states that also contributed to the coalition air effort were Bahrain, Qatar, Saudi Arabia and the United Arab. Finally South Korea, provided a C-130H transport from a squadron thought to have been based at Pusan.

The pilots of the 'Free Kuwait' A-4KU force flew with great determination against the Iraqi forces, and for a time before the outbreak of hostilities were denied weapons lest their aggressive patrolling spark open war before the coalition was ready

BUILDING UP THE 'DESERT SHIELD'

As the United Nations' deadline of 15 January 1991 for Iraq to pull her forces out of Kuwait passed, the combination of the USA's Operation 'Desert Shield' and the equivalent operations of America's coalition partners had led to the basing of huge forces, air, land and sea, in Saudi Arabia and the Arab nations to her east and south-east. Vast numbers of coalition aircraft were now in the theatre, and this strength was very much larger than had ever been anticipated by the Arab states for their own purposes. Thus there was need for expedients such as the rapid semi-completion as military bases of civil airports that were still under construction.

US Air Force

The first US Air Force response to the Iraqi invasion of Kuwait had been the hasty despatch of several Tactical Air Command (TAC) defensive units from the USA to bolster the protection of strategic bases in the Gulf region. This first deployment was followed by the advent of TAC offensive units to increase overall capability, in the process allowing coalition planners to start the consideration of military moves to expel the Iraqi forces from Kuwait if diplomatic measures failed, and also to deter the possibility of further Iraqi aggression.

After this further USAF units were moved to the theatre, mainly from the USA and Europe but with a smaller number from the Far East. One of the first units to arrive in Saudi Arabia was the 1st Tactical Fighter Wing (TFW), two of whose McDonnell Douglas F-15C Eagle air-superiority fighters flew into Dhahran Air Base (AB), where they were later joined by the 58th Tactical Fighter Squadron (TFS) of the 33rd TFW, and by at least one squadron from Bitburg in Germany.

General Dynamics F-16C Fighting Falcon air combat and multi-role fighters from two squadrons of the 363rd TFW, deployed to Sharjah, and the 4th and 421st TFSs of the 388th TFW, flew into a Saudi Arabian base to join the 69th TFS of the 347th TFW. Two F-16 units of the Air National Guard (ANG), in the form of the 138th TFS, and the 157th TFS, were called into active service and also self-deployed to the Persian Gulf theatre during December.

Delivery and projection of the US Marine Corps' ground and air forces is the task of US Navy vessels such as the amphibious assault ship USS *Saipan* with a flight deck capable of accepting machines such as the Boeing CH-46 Sea Knight medium assault and utility helicopter (in the air), Sikorsky CH-53 Sea Stallion heavy assault and logistic transport helicopter (left on the flight deck) and McDonnell Douglas/BAe AV-8B Harrier II close air support warplane (right on the flight deck)

The 336th TFSs of the 4th TFW flew to Thumrait with its F-15E 'Beagle' (Bomber Eagle) warplanes early in August, but then shifted to a new base in the eastern part of Saudi Arabia, when it was joined by its sister squadron, the 335th TFS. Further tactical close support and far more impressive anti-tank capability was offered by the Fairchild Republic A-10A Thunderbolt II. Warplanes of this type operated by two squadrons of the 23rd TFW, flew out on 27 August, and were followed by the OA-10A forward air control aircraft of the 602nd Tactical Air Control Wing (TACW), during November. On 27 December 18 more A-10A warplanes, in this instance provided by the 511th TFS of the 10th TFW at RAF Alconbury flew out to the Gulf from England, and at about the same time additional A-10A capability arrived in the theatre in the form of the 706th TFS of the 926th Tactical Fighter Group (TFG) of the Air Force Reserve (AFRes).

The standard short-range weapon carried by the McDonnell Douglas F-15 Eagle and other American fighters was the AIM-9M Sidewinder missile, an effective missile with all-aspect engagement capability

The 561st TFS of the 35th TFW flew to Saudi Arabia in its specially equipped McDonnell Douglas F-4G Phantom II 'Wild Weasel' aircraft, arriving on 16 August for the SEAD (Suppression of Enemy Air Defences) role vital to the reduction of the enemy's surface-based threat to other attacking warplanes, and was soon supplemented in this vital role by the identical aircraft of the 52nd TFW's 23rd TFS usually based at Spangdahlem AB, Germany.

Control of these and other air assets was entrusted to a force of five Boeing E-3B/C Sentry AWACS aircraft provided by the 552nd Airborne Warning & Control System (AW&CS) Wing. The AWACS aircraft were airborne on an almost continual basis and, in order to avoid severe encroachment into the fatigue lives of these essential 'force multiplier' aircraft, the Sentries were rotated back to the USA on a weekly basis.

Another high-technology air asset rapidly deployed to Saudi Arabia were the Lockheed F-117A Night Hawk 'stealth' attack warplanes of the 415th TFS of the 37th TFW from its secret base on the Tonopah Test Range in the vast Nellis AFB of Nevada. The first 20 of these aircraft, virtually impossible for the Iraqis to track and therefore to engage in the air, arrived at Khamis Mushait AB deep in south-western Saudi Arabia, on 20 August. In November, President Bush's Secretary of Defense, Dick Cheney revealed in November that another F-117A squadron would soon be operating in the Gulf theatre, in the form of the 416th TFS.

A tactical and operational capability which the USAF could not adequately provide was reconnaissance. To bolster the coalition's ability to detect and localise the huge strength of men, armour and artillery that the Iraqis were massing on their side of the border with Saudi Arabia and in Kuwait, the USA activated a number of ANG units. The first of these was the 117th Tactical Reconnaissance Wing's 106th Tactical Reconnaissance Squadron (TRS) of the Alabama ANG, whose RF-4C

Phantom II aircraft flew into the Persian Gulf theatre only a few days after the start of the crisis. The 152nd Tactical Reconnaissance Group's 192nd TRS from Reno, Nevada, reached Saudi Arabia on 1 December.

All the other ANG units activated at an early stage of the 'Desert Shield' build-up were transport and inflight-refuelling tanker outfits flying Lockheed C-130 Hercules and Boeing KC-135 Strato-tanker aircraft respectively. In December, however, two F-16A fighter units of the ANG were called to the colours, these being the 169th TFG's 157th TFS at McEntire ANGB, South Carolina, and 174th TFW's 138th TFS at Syracuse/Hancock International Airport, New York. At this same stage of 'Desert Shield', with plans now firmly based on the need for offensive rather than defensive action, the 926th TFG's 706th TFS was activated at NAS New Orleans. Equipped with A-10A warplanes, the 706th TFS was the first Air Force Reserve fighter unit ever activated.

One of four HARM-carrying F-4G 'Wild Weasel' warplanes is seen taking on fuel from a Boeing KC-135R Stratotanker, one of the two primary types of tanker aircraft operated by theUS Air Force for the support of strategic as well as tactical warplanes in the air campaign against Iraq

To supplement the efforts of the F-4G SEAD aircraft, the USAF also moved to Saudi Arabia the Grumman (General Dynamics) EF-111A Raven electronic warfare aircraft of the 41st Electronic Combat Squadron (ECS) of the 66th Electronic Combat Wing (ECW) from RAF Upper Heyford, England, and of the 366th ECW's 390th ECS from Mountain Home AFB, Idaho, the former unit supplemented by the same wing's 43rd ECS with EC-130H aircraft normally based at Sembach AB in Germany.

Twelve ANG and AFRes (Air Force Reserve) transport squadrons were activated soon after the beginning of 'Desert Shield' to supplement the efforts of the USAF's Military Airlift Command (MAC). Included among these units were the 756th Military Airlift Squadron (MAS) of the 459th Military Airlift Wing (MAW) with the Lockheed C-141B StarLifter, along with 433rd MAW's 68th MAS, and the 439th MAW's 337th MAS, both operating the huge Lockheed C-5A Galaxy. The aircraft of these three AFRes squadrons were supplemented by those of two ANG squadrons, namely C-5A machines of the 105th Military Airlift Group's 137th MAS at Stewart ANGB, New York, and the C-141B machines of the 183rd MAG's 172nd MAS Jackson Airport, Mississippi. Aircrew from at least five AFRes (Associate) squadrons were also made available to boost the numbers of personnel available for

Ground crew prepare to change the Lycoming T56 turboprop engine in the starboard inner position of a Lockheed C-130 Hercules, the complete workhorse of the tactical airlift role in Operations 'Desert Shield' and 'Desert Storm'

The primary heavy search-and-rescue helicopter operated by the US Air Force from Saudi bases was the Sikorsky MH-53J, a type that was well armoured and armed, featured a retractable inflight-refuelling probe as well as drop tanks for additional range, and possessed a cockpit fitted with advanced sensors and instruments for low-level flight under any and all weather conditions

the heavy schedule of transport flights between the USA and the Persian Gulf theatre.

Five AFRes and three ANG transport squadrons flying the C-130 Hercules turboprop-powered tactical transport were activated either for service in the Gulf region or in Europe, where the availability of these reserve units allowed MAC C-130 transport assets to be redeployed to the Gulf. The C-130E and C-130H transport aircraft of MAC, the AFRes and ANG undertook the lion's share of transport within the Gulf region, but the main burden of flying equipment and personnel into the theatre from Europe and the USA was borne by the C-5 Galaxy and C-141 StarLifter fleets of turbofan-powered heavy transport aircraft. The airlift was a high-intensity effort to the primary bases in Saudi Arabia, namely Dhahran and Riyadh, but for lack of ramp area at these Saudi bases many of MAC's operations staged through Frankfurt/Rhein Main and Ramstein ABs in Germany as well as Torrejon AB in Spain on their outbound and inbound flights. So intensive was the required effort, moreover, that an estimated 3,400 sorties in the course of the first two months of the 'Desert Shield' were not adequate and additional capacity had to be provided by the Strategic Air Command (SAC), whose KC-135 tankers were operated in their seldom-employed secondary role as transports for the delivery of lighter weapons, equipment and personnel.

The daily rate of MAC sorties declined to about 70 from the middle of September, and this allowed crews to be rested and their aircraft to receive deferred unit-level maintenance. So far as the movement of heavy freight loads is concerned, it is also worth noting that some 500 sorties were undertaken by aircraft of the Civil Reserve Air Fleet during the first two months of 'Desert Shield'. The MAC also supplied two other units, the 375th MAW's 1401st and 1402nd MASs, with Learjet C-21A light transports in five detachments at the bases at Riyadh and the King Khalid Military City for the staff transport and liaison roles.

Only a few weeks after it had become a command of its own, the Special Operations Command (SOC) despatched a number of different aircraft types to Saudi Arabia. These were initially the MC-130E machines of the 1st Special Operations Wing's 8th Special Operations Squadron (SOS) and the HC-130N/P machines of the same wing's 9th SOS, followed in September by the AC-130H 'Spectre' gunships of the wing's 16th SOS and then in November by the Sikorsky MH-53J and Sikorsky MH-60G helicopters of the wing's 20th and 55th SOSs. The 8th, 16th and 20th SOSs were moved up from Hurlburt Field in Florida, and the 9th and 55th SOSs from Eglin AFB, also in Florida.

Panavia Tornado IDS interdictor, s/n 766, Royal Saudi Air Force

A machine of the Royal Saudi Air Force's Nos 7 or 66 Squadrons based at Dhahran Air Base in Saudi Arabia.

General Dynamics F-16C Fighting Falcon, 4th Tactical Fighter Squadron, US Air Force

This air combat and multi-role fighter, s/n unknown, was from the 4th or 421st Tactical Fighter Squadron of the US Air Force's 388th Tactical Fighter Wing. Normally based at Hill Air Force Base, Utah, the slightly restyled 388th TFW (Provisional) when parent to the 69th TFS of the 347th TFS (Moody AFB, Georgia) was located at Al Minhad in the United Arab Emirates.

Fairchild Republic A-10A Thunderbolt II anti-tank and close support warplane, s/n 80-186 'Tiger 1', 23rd Tactical Fighter Wing, US Air Force

This was the aeroplane of the commander of the US Air Force's 23rd Tactical Fighter Wing. Normally based at England Air Force Base, Louisiana, the 23rd TFW was located at King Fahd Airport, Riyadh, throughout the whole 'Desert Shield' and 'Desert Storm' period.

McDonnell Douglas F-15D Eagle, s/n 82-046, 27th Tactical Fighter Sqn, US Air Force

An air-superiority fighter of the 27th Tactical Fighter Squadron of the US Air Force's 1st Tactical Fighter Wing (27th and 71st TFSs). Normally based at Langley Air Force Base, Virginia, the 1st TFW was located at Dhahran International Airport in Saudi Arabia between August 1990 and March 1991.

McDonnell Douglas F-15E Eagle, s/n 89-0489, 335 Tactical Fighter Squadron, US Air Force

The 335th Tactical Fighter Squadron was part of the 4th Tactical Fighter Wing (Provisional). Normally based at Seymour Johnson Air Force Base, North Carolina as part of the Tactical Air Command, the 4th TFW was located at Al Kharj Air Base in Saudi Arabia between December 1990 and March 1991.

General Dynamics F-111F, s/n 70-2390 'Miss Liberty II', 494th Tactical Fighter Sqn, US Air Force

This F-111F interdictor was the aeroplane of the commanding officer of the US Air Force's 48th Tactical Fighter Wing and operated within that wing's 494th Tactical Fighter Squadron. Normally based at RAF Lakenheath in the UK, the 48th TFW was located at Taif in Saudi Arabia between August 1990 and March 1991.

Lockheed F-117A Night Hawk, s/n 813 'Toxic Avenger', 415th-416th Tactical Fighter Sqns, US Air Force

This 'stealth' attack warplane was from the US Air Force's 37th Tactical Fighter Wing (415th and 416th Tactical Fighter Squadrons). Normally based at Tonopah in Nevada, the 37th TFW was located at Khamis Mushait Air Force Base in Saudi Arabia between August 1990 and March 1991.

Boeing B-52G Stratofortress heavy bomber, s/n 58-0204, 379th Bomb Wing, US Air Force

The US Air Force's 379th Bomb Wing was based at Wurtsmith Air Force Base, Michigan. This aircraft operated from forward bases indicated by the colour of the bomb-shaped mission markers on the fuselage: black for missions from Moron in Spain, while for missions from RAF Fairford in England, and white for missions from Jeddah in Saudi Arabia.

Sikorsky MH-53J 'Pave Low', s/n unknown, Special Operations Sqns, US Air Force

This special operations helicopter was one of the machines operated by the US Air Force in Saudi Arabia by the 55th Special Operations Squadron of the 1st Special Operations Wing and the 21st Special Operations Squadron of the 39th Special Operations Wing. The 1st and 39th SOWs were normally based at Hurlburt Field (within Eglin Air Force Base), Florida and RAF Woodbridge, England respectively. The 55th SOS SOW operated from unrevealed bases in Saudi Arabia between November 1990 and March 1991, while the 21st SOS operated from Incirlik and Batman Air Bases in Turkey between January and March 1991.

McDonnell Douglas F/A-18C Hornet, s/n 163508, VFA-81 'Sunliners' Sqn, US Navy

This dual-role fighter and attack warplane was a machine of the US Navy's VFA-81 'Sunliners' squadron of the CVW-17 wing embarked on the aircraft carrier USS Saratoga (CV-60), which sailed for the theatre on 7 August 1990.

Grumman F-14A Tomcat, VF-32 'Swordsmen' Sqn, US Navy

A carrierborne fleet defence and air superiority fighter, serial number unknown. The 'Swordsmen' squadron of the CVW-3 wing embarked on the aircraft carrier USS *John F. Kennedy* (CV-67), which sailed for the theatre on 15 August 1990.

Grumman A-6E Intruder, s/n 155661, VA-35 'Black Panthers' Sqn, US Navy

The 'Black Panthers' Squadron of the CVW-17 wing embarked on the aircraft carrier USS Saratoga (CV-60), which sailed for the theatre on 7 August 1990 with this carrierborne attack warplane.

McDonnell Douglas AH-64A Apache, s/n unknown, US Army

An anti-tank helicopter of the 2nd Battalion, 229th Aviation Regiment, a US Army unit normally based at Illesheim in Germany. The US Army's combat aviation arms (including two battalions of AH-64 Apache anti-tank helicopters) provided the capacity for deep strikes at the enemy's rear areas.

Panavia Tornado GR.Mk 1 interdictor, s/n ZA477 'MiG Eater', RAF

A machine of the Tornado force based at Tabuk Air Base in Saudi Arabia and comprising elements led by No 16 Squadron, RAF, but including parts of Nos 2, 9, 13, 14, 20 and 617 Squadrons normally based at RAF Brüggen and Laarbruch in Germany, and RAF Honington and Marham in the UK.

Westland Lynx HAS.Mk 3, s/n XZ 256, No 815 Sqn, Fleet Air Arm

This anti-submarine and utility helicopter was normally based at RNAS Portland in the UK. The squadron provided helicopters for destroyers' and frigates' flights, and XZ256 was allocated to HMS Brazen.

SEPECAT Jaguar A, s/n 103, Armée de l'Air

This French attack warplane was one of the of the aircraft operated by the 2ème Escadrille of the Armée de l'Air's Escadron de Chasse 2/11 'Vosges'. Normally based at Toul-Rosières, EC 5 was located at Al Ahsa Air Base in Saudi Arabia.

This Panavia F.Mk 3 carries the standard air-superiority weapons fit of four Sky Shadow 90 medium-range and four AIM-9M Sidewinder short-range AAMs under the fuselage and wing halves respectively. There are also a pair of ALE-40(V) flare dispensers scabbed under the engine access panels.

Maintenance personnel check the tip of one of the four blades on the main rotor on a Sikorsky UH-60A Black Hawk, the most important tactical transport helicopter operated by the US Army in 1990 and 1991.

Fascinated members of the crew of the updated battleship USS New Jersey watch as a BGM-109 Tomahawk cruise missile is fired from their ship. Launched from a variety of platforms, such missiles provided a very accurate means of attacking point targets deep in Iraq.

Visible on the forward fuselage of this Panavia Tornado GR.Mk 1 interdictor are the radome over the radar equipment, the dark surround of the muzzle port for the starboard 27 mm Mauser cannon, and the retracted inflight-refuelling probe.

The Iraqi air defences made extensive use of anti-aircraft artillery of various light and medium calibres firing a high proportion of projectiles fitted with tracer elements in their bases.

The greatest threat to the land offensive of the coalition forces was felt to rest with the Iraqi army's large armoured force, which therefore received special attention from the fixed- and rotary-winged aircraft of the coalition air forces, as well as the coalition's own armoured fighting vehicles and ground-based missile teams.

Seen here with two bombs extended below the pair of side-by-side weapons bays in the lower fuselage, this is the first Lockheed F-117A Night Hawk to arrive at Khamis Mushait Air Base in Saudi Arabia.

A tractor operated by a member of the flight deck crew manoeuvres a Vought A-7E Corsair II on board an aircraft carrier of the US Navy, which retired its last A-7 aircraft from first-line service soon after the end of hostilities with Iraq.

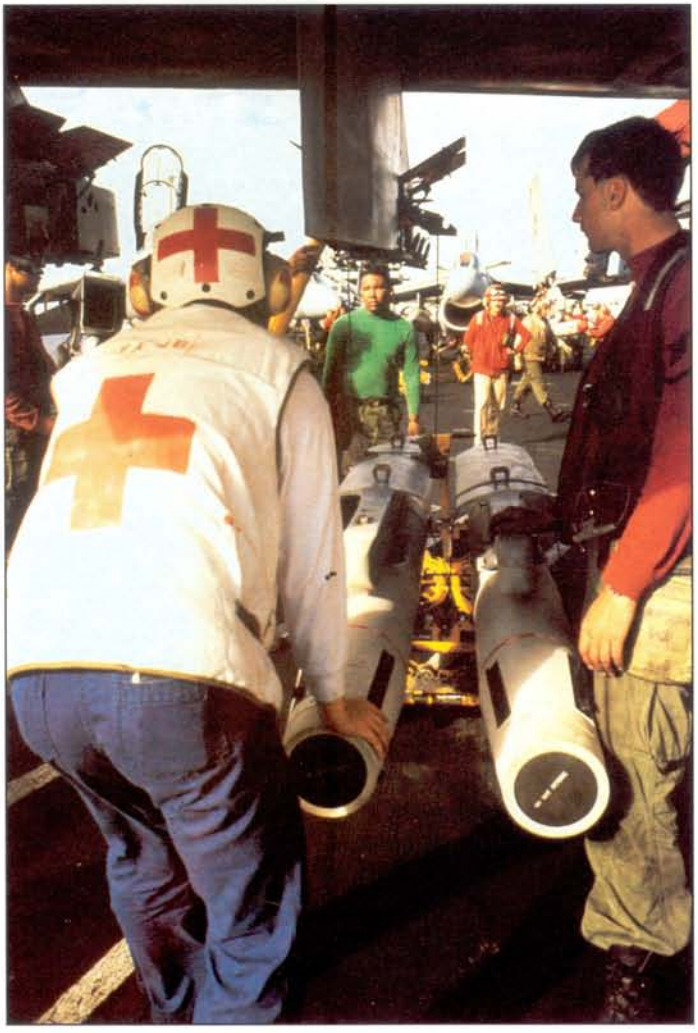
Flaps, landing gear and arrester hook lowered, a McDonnell Douglas F/A-18 Hornet prepares to touch down on its flight deck of its parent carrier. The Hornet was notably important for air operations over Iraq, for it was a dual-role type that could operate as a fighter and an attack warplane as the situation demanded.

Men of the US Army's 101st Airborne Division load AGM-114A Hellfire anti-tank missiles on a hardpoint under the stub wing of one of the divisional air brigade's McDonnell Douglas AH-64A Apache anti-tank helicopters.

Maintenance of aircraft of all types and especially modern military aircraft, was especially difficult in the conditions typical of Saudi Arabia, where great heat was accompanied by vast quantities of sand and dust seemingly eager to insinuate themselves into any and all orifices where they could cause damage to moving parts. This is the propeller of a Lockheed C-130 Hercules tactical transport with its spinner removed.

Armourers work on some of the large and diverse number of weapons required for a typical mission launched from the deck of one of the US Navy's aircraft carriers.

Carrying two AGM-88A HARM anti-radar missiles as its only weapons, the F-4G 'Wild Weasel' was vital to the survival of attack packages of coalition warplanes by detecting and destroying the radars on which the Iraqis were largely reliant for the detection of targets and the guidance of surface-to-air missiles.



Complete with the hardbacks that attach to the hardpoints on the warplane's pylons, drop stores rest on their movement trolleys for installation on Vought A-7E Corsair II attack warplanes.

With its exceptional range, even when carrying massive loads of free-fall 'iron' bombs, the Boeing B-52 Stratofortress could operate effectively from bases well outside the theatre, simplifying the logistic complexity of basing large numbers of different aircraft types in Saudi Arabia and neighbouring countries. This B-52G was captured by the camera at RAF Fairford in England, which provided a temporary home for eight Stratofortress bombers

As the American build-up continued more assets came from USAFE (US Air Force Europe). Three of the four squadrons of F-15C air-superiority fighters on the strength of the USAFE organisation were detached to the Middle East at the end of 1990 and the beginning of 1991. The squadrons were the 53rd and 525th TFS of the 36th TFW based at Bitburg AB in Germany, and the 32nd TFS of the 32nd TFG based at Soesterberg AB in the Netherlands. To bolster its strength, moreover, the Royal Saudi Air Force received 24 examples of the F-15C Eagle from USAFE stocks.

Another tactical fighter redeployed from Europe to the Middle East was the F-16C. The first such aircraft to reach the theatre, during the course of August, were the Fighting Falcon warplanes of the 401st TFW's 614th TFS normally based at Torrejon AB in Spain, and two later arrivals were the 50th TFW's 10th TFS, normally located at Hahn AB in Germany, and then the 401st TFW's 612th TFS. The first of the squadrons was then based at Doha, while the two later arrivals took up station at Incirlik AB in Turkey.

The most successful bomber of the forthcoming air campaign over Kuwait and Iraq was undoubtedly the F-111, which was able to deliver substantial warloads of 'dumb' (unguided) and 'smart' (guided) weapons, the latter in the form of the 'Paveway' series of laser-guided bombs using the bomber's own laser designation system in addition to third-party illumination of the target. The first such warplanes to reach the theatre in August 1990 were the F-111F warplanes of the 48th TFW normally based at RAF Lakenheath in England. This wing deployed the machines of its 492nd, 493 and 494th TFSs to Taif in Saudi Arabia during August 1990, and the same month also witnessed the arrival of the first F-111E machines of the 20th TFW, normally based at RAF Upper Heyford in England, at Incirlik AB. Although this wing's 79th TFS was the lead unit, elements of its other two elements, the 55th and 77th TFSs, were rotated through Incirlik. Another but somewhat differently tasked variant of the F-111 released from USAFE strength to bolster the coalition effort in the Middle East was the EF-111A electronic combat model, which the 42nd ECS operated from Incirlik after detachment from the 66th ECW's base at RAF Upper Heyford.

Another asset deemed essential to the success of the imminent coalition air effort was the heavy bombing capability that could be offered by the Boeing B-52G Stratofortress warplanes of the Strategic Air Command

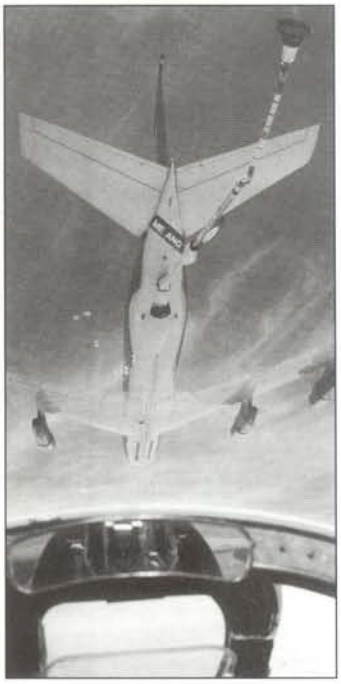
(SAC) in the USA. The first move to provide a heavy bomber force for service over the Middle East was the creation of a provisional bomb wing (BW[P]) at Diego Garcia, the British-owned island in the Indian Ocean on which the Americans had built a major forward base, to supervise the efforts of two detached squadrons: arriving in August, these were the 69th Bomb Squadron (BS) of the 42 Bomb Wing (BW) and the 328th Bomb Training Squadron of the 93rd BW. These two squadrons moved to Jeddah/King Abdul Aziz International Airport in January, their place on Diego Garcia being taken by the 97th BW's 340th BS. King Abdul Aziz International Airport was also home, at times, to the 2nd BW's 62nd and 596th BSs, the 379th BW's 524th BS and the 416th BW's 668th BS, although with their very long range and inflight-refuelling capability, the aircraft of these three squadrons also operated from RAF Fairford in England and Moron AB in Spain.

The other primary SAC assets deployed for service in the Middle East were reconnaissance and intelligence-gathering aircraft, and inflight-refuelling tankers. The reconnaissance force was based on the Lockheed U-2R and TR-1A, two very closely related types operated by the 99th Strategic Reconnaissance Squadron (SRS) of the 9th Strategic Reconnaissance Wing (SRW). The 99th SRS from August flew from Taif in Saudi Arabia with a detachment at RAF Akrotiri on the island of Cyprus. Taif was also the temporary home for the TR-1A aircraft of the 17th Reconnaissance Wing's 95th Reconnaissance Squadron, normally to be found at RAF Alconbury in England. Intelligence gathering was the responsibility of the Boeing RC-135U/V/W aircraft operated from Riyadh and the King Khalid Military City by the 343rd SRS of the 55th SRW. To complete the reconnaissance picture, it is worth adding here that another asset making its first operational appearance at this time, even though the type was still under development, was the Boeing E-8A Joint-STARS operational- and tactical-level reconnaissance platform. for service in the Middle East, the 4411th J-STARS Squadron was detached from Melbourne in Florida by the Air Force Systems Command for service from Riyadh and the King Khalid Military City.

The other main responsibility of the SAC was inflight refuelling, primarily for the command's own aircraft but to a lesser but growing extent the tactical warplanes operated by other commands. The machines were McDonnell Douglas KC-10A Extender dual-role tanker and transport aircraft flown by five squadrons, and KC-135 tanker aircraft flown by no fewer than 30 squadrons. In this context it is worth noting that the operations of all tanker aircraft, including those of the AFRes and ANG, were controlled locally by several specially created Air Refueling Wings (Provisional) set up at bases in Egypt, Saudi Arabia and Oman.

US Navy

Even as the USAF was implementing its first hastily created plan to provide air reinforcement to Saudi Arabia, the US Navy was also responding to presidential command, via the Department of Defense, in pushing several aircraft carrier battle groups into the waters of the Persian Gulf and Red Sea to provide additional strength in any air/land campaign and also to boost the embargo on goods and weapons being delivered by sea directly to Iraq or indirectly through the Jordanian port of Aqaba for



Although the Boeing KC-135 Stratotanker was designed for the refuelling of US Air Force warplanes with a rigid flying boom that was extended into the upper-fuselage receptacle of the warplane, the need to refuel tactical warplanes of the US Navy and US Marine Corps, such as this Grumman A-6E Intruder, led to the development of a short hose-and-drogue attachment

For Operation 'Desert Storm', the USS *John F Kennedy's* air wing included two squadrons equipped with the Vought A-7E Corsair II, a type making its swan song before retirement. This Corsair II carries retarded bombs under its wing and AIM-9 Sidewinder short-range AAMs on the two hardpoints on the sides of the fuselage under the wing leading edges

overland final movement to Iraq. The US Navy Middle East Group, headed by the command ship USS *La Salle* along with its supporting cruiser, destroyer and frigate force, was undertaking an exercise in the Persian Gulf even as Iraq seized Kuwait, and can thus be said to have been the first US force that could have responded to further Iraqi aggression.

Reacting with commendable speed, the US Navy rapidly assembled four carrier battle groups in the theatre, these comprising USS *Independence,* which was positioned in the Gulf of Oman while the nuclear-powered USS *Dwight D Eisenhower* was in the Mediterranean on a cruise which was curtailed so that the ship sailed for the Red Sea on 8 August. The third carrier battle group was based on the USS *Saratoga,* which departed from Norfolk, Virginia, on 7 August and steamed at full speed across the Atlantic and into the Mediterranean whence she, like the *Dwight D Eisenhower,* passed south through the Suez Canal on 23 August. Included in the *Saratoga's* battle group was the battleship USS *Wisconsin.* Once the *John F Kennedy* was on station, the *Dwight D Eisenhower* sailed for the USA. The fourth aircraft carrier involved in 'Desert Shield' was the elderly USS *Midway,* which left its home port of Yokosuka, Japan, during September. The number of carriers in the theatre was boosted to six after the USS *America* and the nuclear-powered *USS Theodore Roosevelt* departed from the eastern coast of the USA late in December 1990.

Each of these aircraft carriers carried an embarked carrier air wing. All except those on the *Midway* and the *John F Kennedy* were based on the standard pair of Grumman F-14 Tomcat or McDonnell Douglas F/A-18 Hornet squadrons for the air-superiority and offensive roles. Each carrier air wing also included single squadrons each operating the Grumman A-

An essential element in the effective tactical deployment of the US Navy's fighters was the Grumman E-2C Hawkeye airborne warning and control system aeroplane. The carrierborne counterpart of the USAF's Boeing E-3 Sentry, the E-2C has powerful radar with its antenna in a large rotodome above the fuselage, and can control a mass of operations at long range

6E Intruder attack warplane and its KA-6D Intruder inflight-refuelling tanker counterpart, the Grumman E-2C Hawkeye airborne early warning and control aeroplane, the Grumman EA-6B Prowler electronic warfare counterpart of the A-6 Intruder, the Lockheed S-3 Viking anti-submarine warplane, and the Sikorsky SH-3H Sea King missile defence, planeguard and utility helicopter. Two of the carrier air wings flew the F-14A (Plus) variant of the Tomcat, while three operated the latest F/A-18C version of the Hornet. Of the Viking squadrons, four operated the latest S-3B variant rather than the original S-3A model. The carrier air wing of the USS *John F Kennedy* included two attack squadrons flying the Vought A-7E Corsair II for what was the type's last deployment, and the carrier air wing of the *Midway* was different again with three F/A-18A, two A-6E, one E-2C, one EA-6B and one SH-3H squadrons. The carrier air wing embarked on the *Theodore Roosevelt* was boosted by the inclusion of a second A-6E Intruder squadron. The *Independence* entered the Persian Gulf on 1 October for a training exercise, and this constituted the first entry into these waters by an American aircraft carrier since the USS *Constellation* in 1974.

With no submarine threat to guard against, the Lockheed S-3 Viking could be adapted for other tasks. Here an S-3B of the *USS John F Kennedy's* VS-22 squadron is operating in the 'buddy' tanker role with a hose-and-drogue unit to refuel one of a Vought A-7E Corsair II squadron

With each carrier air wing possessing something in the order of 75 to 80 aircraft, the US Navy had between 450 and 500 carrierborne warplanes and helicopters available to it in the theatre. These were not the service's only assets in the theatre, however, for there was also a considerable number of helicopters embarked on the cruisers, destroyers and frigates also on station around the Arabian peninsula together with various support and resupply vessels. Many of the larger warships carried either the Kaman SH-2F Seasprite or Sikorsky SH-60B Seahawk LAMPS (Light Airborne Multi-Purpose) Mk III helicopter for both defence and ship-to-shore duties. The support vessels, fitted with larger helicopter platforms, carried utility helicopters such as the Boeing UH-46 Sea Knight, while the USS *La Salle* normally embarked an SH-3G Sea King from the HC-2 squadron to provide staff transport and communications capabilities for the Commander Middle East Forces at his headquarters in Bahrain.

Several shore-based types were also available. The most important of these was the Lockheed P-3C Orion maritime patrol aeroplane, which flew sorties over the waters of the Persian Gulf, the Red Sea, the Gulf of Oman and the Arabian Sea from bases such as Jeddah, Bahrain and Masirah as well as Diego Garcia. The US Navy relied on the MAC for the air delivery of larger and heavier freight loads, but relied on its own assets for the rapid movement of lighter loads such as passengers, urgent freight and mail for onward delivery to more than 100 ships operating in the theatre. This transport effort involved regular and reserve units. The VR-22 squadron at Rota flew C-130F aircraft, and the several reserve units that flew the McDonnell Douglas C-9B from Naples in Italy and both Bit-

One of the weapons used to very telling effect by the General Dynamics F-111F interdictors of the 48th Tactical Fighter Wing was the GBU-15 glide bomb, which possessed a range in the order of 80 km (50 miles) when launched at high altitude. In the nose of the weapon was either a TV seeker for day use or an IR seeker for night and adverse-weather use, the operator in the warplane locking the missile onto its target perhaps some time after launch and then leaving it to complete its autonomous attack

burg and Sembach in Germany included the VR-55 squadron from NAS Alameda, California, the VR-57 squadron from NAS North Island, California, the VR-58 Squadron from NAS Jacksonville, Florida, and the VR-59 squadron from NAS Dallas, Texas. Carrier onboard delivery (CO) duties, linking shore bases with aircraft carriers, were the responsibility of the Grumman C-2A Greyhound, the relevant aircraft being provided by the VR-24 squadron from NAS Sigonella, Sicily, the VCR-30 squadron from NAS North Island, the VRC-40 squadron from NAS Norfolk, Virginia, and the VRC-50 squadron from NAS Cubi Point, Philippines, that also flew the US-3A. The US Navy's counterpart of the USAF's C-21 for the rapid movement of VIPs and staff officers was the Beech UC-12B, examples of which were operated from NAS Willow Grove, Pennsylvania.

US Marine Corps

A capability for fast deployment has always been a hallmark of the USMC, and only six days after President Bush's order of 6 August, the USMC began to arrive in Saudi Arabia. The deployment was facilitiated by the fact that a move into the Middle East region was one of the standard scenarios around which the USA's Central Command had been planned, so pre-positioned supply ships (carrying war stocks for 30 days) were available at Diego Garcia in the Indian Ocean and arrived in Saudi Arabia on 15 August. There followed two aviation logistic support ships with the equipment and spares to permit the local maintenance of USMC aircraft. Thus it was feasible for the relevant USMC personnel to be flown in direct from the USA by C-5 and C-141 transport aircraft of the USAF to link up with their equipment at Al Jubail.

The USMC's effort was initially undertaken in support of the I Marine Expeditionary Force (MEF), which comprised the 1st, 4th and 7th Marine Expeditionary Brigades. These three brigades were the first of an initial 40,000 Marines in the theatre. The US Navy's Military Sealift Command was responsible for delivering the bulk of the USMC's heavy equipment, including armoured fighting vehicles and helicopters, many of these items coming ashore at the Saudi Arabian port of Al Jubail.

To support this growing force, which could be used in standard land warfare or alternatively for a possible amphibious landing in Kuwait, the USMC called on more than 300 fixed- and rotary-wing aircraft from the 1st and 2nd Marine Air Wings (MAWs) allocated to the Fleet Marine Forces in the Pacific and the Atlantic respectively, and also from the 1st Marine Brigade in Hawaii. This concentration of force allowed the bas-

During the 'Desert Shield' build-up in 1990 and the first two weeks of 1991, the USA committed some 1,700 helicopters to Saudi Arabia. Seen here, on a length of disused runway serving as an interim landing strip, are three machines of the US Marine Corps in the form of two Bell AH-1W SuperCobra close support and one Bell UH-1N utility helicopters

Close air support for the ground forces of the US Marine Corps was provided by the McDonnell Douglas/BAe AV-8B Harrier II, a STOVL warplane able to operate from shores offshore or beach-head airstrips immediately behind the front line

ing of seven F/A-18 squadrons at Sheikh Isa for the fighter and attack roles, of four McDonnell Douglas/BAe AV-8B Harrier II STOVL close-support warplanes at Al Jubail, two A-6E and one EA-6B squadrons at Sheikh Isa, and two Rockwell OV-10A/D Bronco squadrons at Al Jubail.

As with the USAF and US Navy, inflight-refuelling capability was vitally important to the USMC's overall scheme of air operations, and for this task three regular and two reserve marine aerial refuelling transport squadrons (VMGRs) supported the deployment of the USMC's fighter and attack squadrons to the theatre, where some tankers then remained for continued capability in the tanker role. The KC-130F/R/T variants of the Hercules transport from the VMGR-234, VMGR-252, VMGR-352 and VMGR-452 squadrons were located at Bahrain during 'Desert Shield'.

The USMC relied on four types of helicopter for its rotary-wing capability, and all of these were deployed to the theatre. To provide close air support there was the Bell AH-1W SuperCobra gunship, and this type was flown by the HMLA-367 squadron from MCAS Futenma on Okinawa as well as by the HMLA-267, HMLA-269 and HMLA-369 squadrons, which were transported to the Middle East by ship, together with their supporting Bell UH-1N 'Huey' helicopters. Several squadrons of CH-46E Sea Knight twin-rotor medium transport helicopters were also delivered by ship, these including HMM-161, HMM-263 and HMM-265, and the HMM-165 squadron. Heavy transport, including that of men, vehicles and artillery, was the responsibility of the CH-53E twin-engined and CH-53E three-engined versions of the Sikorsky Sea Stallion: these two types were operated by several units including the HMH-461, and the HMH-462, HMH-465 and HMH-466 squadrons.

A number of these fixed- and rotary-wing squadrons were brought into the theatre by ship. Among them was the USS *Saipan,* a helicopter assault ship carrying the 22nd Marine Expeditionary Unit as well as its air ele-

Men of one of the US Marine Corps' marine expeditionary brigades rush forward with BGM-71 TOW reload missiles for a Bell AH-1W Super-Cobra helicopter waiting on a forward landing strip in the desert with its rotors turning

ment. Three other assault ships that sailed from the USA on 13 August for the waters around the Arabian peninsula, were the USS *Iwo Jima,* the USS *Guam* and the USS *Nassau.*

US Army

Although both the US Navy and USMC operated large numbers of helicopters, these totals paled into obscurity by comparison with the rotary-wing air strength of the US Army built up in Saudi Arabia during 'Desert Shield'.The first types to arrive in quantity were the McDonnell Douglas AH-64A Apache, Sikorsky UH-60A Black Hawk and Bell OH-58D Kiowa machines that were moved by air for the 82nd Airborne Division, whose 1st Brigade was the first US Army unit to reach Saudi Arabia. This initial wave of deliveries was soon complemented by a flow of similar helicopters to support the arrival of further land forces in the form of the 101st Airborne Division, the 1st Infantry Division, and several Army Reserve units. The first base in Saudi Arabia to witness the build-up of significant US Army aviation assets was Dhahran, which from the beginning of 'Desert Shield' saw the arrival of the AH-64A attack and UH-60A transport helicopters of both the 82nd and 101st Airborne Divisions as well as the latter's Boeing CH-47D heavy transport, OH-58C/D scout and EH-60C electronic warfare machines.

The 'Cold War' between the two superpower blocs had recently come to an end with the effective collapse of the USSR. This lowered the level of armed tension in Europe, which had always been seen as the probable main theatre for land warfare between the NATO and Warsaw Pact blocs, and made it possible for the US Army to divert many of its helicopter assets from Germany to Saudi Arabia. This process resulted in the allocation of 55 helicopters of 2nd ACR at Feucht, including AH-1F, UH-60A and OH-58C machines, for air transport from Wiesbaden, to which the helicopters flew on 15 November. UH-60A helicopters of the 158th Aviation Regiment and the AH-64A and OH-58C machines of 6th ACR, all stationed at Wiesbaden, also left for Saudi Arabia by November. The OH-58D helicopters of the 158th Aviation Regiment from Bonames, together with about 12 UH-60A machines of sundry medical companies and two C-12C fixed-wing transport aircraft of the 207th Aviation Company, had also reached Saudi Arabia by the end of 1990.

Other helicopters of the US Army in Europe were flown to Valkenburg AB in the Netherlands for partial dismantling before being moved to Rotterdam, from where they were shipped to Saudi Arabia. The first helicopters submitted to this process, on 21 November, were 34 UH-1H, 13 OH-58D and three UH-60A machines of the 159th Aviation Regiment. The process lasted into the first week of December and saw the movement of several hundreds of UH-1H, CH-47D, OH-58, UH-60A, AH-1F, AH-64A and EH-60C helicopters from a large number of units including the 1st and 227th Aviation Regiments at Ansbach and Hanau respectively.

The US forces pay considerable attention to the rapid evacuation of wounded personnel to high-grade medical facilities. In the war against Iraq, this 'dust-off' role was undertaken for the US Army be specially equipped Sikorsky UH-60V Black Hawk helicopters

OPERATION 'DESERT STORM'

On 15 January 1991, the deadline imposed by the United Nations for Iraq to have completed the evacuation of her forces from Kuwait expired. Under the leadership of Saddam Hussein, Iraq had made no effort to comply, and indeed had continued to strengthen her defences in Kuwait and southern Iraq with a mass of fixed fortifications and oil-filled ditches behind which lurked a large and possibly dangerous army with heavy concentrations of armour, artillery and missiles.

The forces of the coalition did not respond immediately, but at the final preparations were almost complete for offensive action, in which a major air campaign would be waged to disable the Iraqi forces and Iraq's command, communications, transport and industrial capabilities. Only after these objectives had been obtained would the ground forces be committed in what it was hoped would be a short campaign to complete the crushing of the Iraqi forces and thus free Kuwait.

It was at 02.35 on 17 January that the air offensive may be said to have started, for it was at that time that a single 907 kg (2,000 lb) 'Paveway'

Whereas aircraft such as the EF-111A and, to a lesser extent, the EA-6B Prowler concentrated on the electronic suppression of Iraq's air-defence capability, a more aggressive role was played by the McDonnell Douglas F-4G 'Wild Weasel'. This used its APR-38 system to detect Iraqi radar emissions and then went for the 'hard' kill of the radar system with the AGM-88 HARM weapon

The 'Desert Storm' campaign was the first in which women saw considerable service as fully integrated members of the armed forces undertaking many of the roles hitherto reserved for men

laser-guided bomb struck its target, the AT&T communications building in Baghdad, the Iraqi capital, with devastating accuracy. The weapon had been dropped by an F-117A 'stealth' attack warplane cruising over Baghdad at only a few thousand feet but wholly undetected by the radars of the Iraqi air-defence system. This was just the first move in a highly concerted effort spearheaded by a force of F-117A warplanes, initially aided by the street lighting of Baghdad, which Saddam had not ordered to be turned off in the belief that the coalition forces would not dare to attack in the face of forces which the Iraqi dictator clearly believed to be a match, if not more so, for those of the effete Western nations constituting the backbone of the coalition.

In overall terms, the coalition governments had no fears that their forces would fail to obtain a crushing victory over Iraq. What was far more problematical was the winning of this military victory without delay and with the minimum of losses, especially of personnel, and thus of obtaining victory in the court of world opinion. It was for this reason, therefore, that a major emphasis was posed on the use of precision-guided weapons of the type that offered, in purely military terms, both efficiency and economy, and in public relations terms the opportunity for the maximum in terms of destruction of specifically military targets in combination with the minimum in terms of 'collateral damage', that is damage to civilian installations and, even more importantly, the civilian population.

Right from the beginning of the campaign, the coalition's public relations machinery was able to show that precision-guided munitions were indeed providing just this result, with imagery from attacking aircraft revealing guided weapons impacting right on their targets. This trend was confirmed by Western reporters who, before their expulsion from Iraq, were able to show that the conventional warheads of the coalition forces' guided weapons (guided bombs, air-to-surface missiles and, most impressively of all, long-range cruise missiles fired from American warships several hundreds of miles distant from their targets) were causing enormous physical destruction but only a very limited number of civilian casualties.

It was a more difficult task to judge what strategy Iraq would employ to check the coalition's air onslaught and thereby buy the time for the weight of world opinion to veer from an anti-Iraqi to an anti-coalition angle, and to engineer any situation that might split the fragile unity of the coalition. Right from the start of air operations, the Iraqi air force seemed disinclined to rise to the challenge and fight the coalition's warplanes in the air, and while this was no surprise to analysts who had frequently commented on the poor showing of the Iraqi air force in the 1980-88 war with Iran, it led to the belief in some quarters that the Iraqis were deliberately saving their air force for a decisive intervention once the coalition's armies had been committed.

At the same time it became clear that another plank of Iraq's strategy was the attempt to split the coalition by the use of 'Scud' surface-to-surface ballistic missiles, which could be armed with the biological or chemical warheads that Iraq was known to have developed. This 'Scud' missiles were fired mainly at Riyadh and Dhahran in Saudi Arabia and at Tel Aviv in Israel, the object of attacks on the former being to persuade the Saudi government that the dangers of hosting the coalition forces were too high, and of those against the latter being to trigger the Israeli armed reaction

The coalition air forces did not have things all their own way, as suggested by the damage to this Grumman A-6E Intruder. Hit by ground fire, the aeroplane returned to its parent carrier with its two crew members unharmed, but was later scrapped

that would inevitably cause Arab nations to disengage from the coalition for pan-Arab reasons. Urged strongly by the Americans, who rapidly supplied batteries of the Patriot surface-to-air missiles that were the only possible means of destroying 'Scud' missiles in the air, the Israelis refused to be drawn into military action and thereby reduced the strains on the coalition's continued unity.

Under overall control of the USAF, which was the largest single element in the theatre, the strategy adopted by the UN-mandated coalition was to rip apart the Iraqi command and control system, and at the same time to cut the physical communications between Iraq proper and her forces of occupation in Kuwait. A key element in this initial phase of the offensive was the Republican Guard formations concentrated along the border between Iraq and Kuwait, now claimed by Iraq as her 19th province. An elite force offering personal loyalty to Saddam Hussein and operating the best equipment available to the Iraqi ground forces, the Republican Guard was generally considered to be the most capable military force in Iraqi service. Fielding a higher proportion of armoured fighting vehicles and both armoured and unarmoured transport than the ordinary formations of the Iraqi army, the Republican Guard constituted a highly mobile reserve that was well positioned to intervene at any point that the coalition forces might select for their own ground offensive. Thus the Republican Guard became the immediate target of heavy carpet-bombing by B-52 heavy bombers delivering large numbers of conventional bombs.

The coalition air forces dropped some 18,000 tonnes of bombs in the first five hours of their offensive, and in the course of the first day of operations some 655 coalition warplanes completed 1,332 sorties against communication centres and 95 airfields (35 of them major centres of Iraqi air activity and the other 60 of lesser significance). The coalition forces claimed that about 80 per cent of their warplanes found and attacked their targets, and while the Iraqis said that they had brought down 60 aircraft, in fact three warplanes failed to return safely, although a larger number were of course damaged. As the reports of coalition airmen was assessed, it became clear that Iraqi fighters that did rise from their runways did so to escape to the north rather than tackle the coali-

Captain Steve Tate, of the 71st Fighter Squadron within the USAF's 1st Tactical Fighter Wing, scored the coalition's first air victory on 17 January 1991, when he downed an Iraqi Mirage F1 with an AIM-7 Sparrow from his McDonnell Douglas F-15C Eagle

tion's air armada. There was little opportunity for air combat therefore, but Captain Steve Tate of the USAF did claim a Mirage F1EQ brought down over the outer parts of Baghdad by an AIM-7 Sparrow missile from his F-15 Eagle air-superiority fighter.

Air elements of all four American forces were heavily involved in the campaign right from its beginning. The US Marine Corps' contribution started with AH-1W SuperCobra attack helicopters concentrating their efforts on Iraqi artillery batteries, whose personnel ignited the Rad al Khafji oil refinery, lying just inside Saudi Arabia, on the first day of active operations. The efforts of the attack helicopters paved the way for further attacks by AV-8B Harrier II close-support warplanes operating from land bases. The US Navy also made its strength tell, the warplanes of each aircraft carrier contributing some 150 sorties per day when they were within range of worthwhile targets. Deployed in the Red Sea were the carriers *Saratoga, John F Kennedy, Theodore Roosevelt* and *America*, while in the Persian Gulf and Arabian Sea were the Midway and Ranger. The naval warplanes most heavily involved in these first stages of the coalition's air offensive were the A-6E Intruder attack and F/A-18 Hornet dual-role fighter/attack machines, with cover provided by the F-14A Tomcat air-superiority fighter and the EA-6B Prowler electronic warfare machine. It was the Prowler that should be credited with the first operations against Iraq, for on 16 January such aircraft started an intensive programme to degrade Iraq's electronic communications network.

An important missile that was rushed into early service for the start of the coalition's campaign was the AGM-84E SLAM, which was the Stand-off Land Attack Missile development of the AGM-84 Harpoon anti-ship missile. The A-6E could carry four of these missiles, and an A-6E fired two of the weapons, which proved highly effective, against a hydro-electric plant: controlled from an A-7E Corsair II, the second of the missiles was guided straight into the hole made by the first missile, which had been fired two minutes earlier. The efforts of the US Navy A-6E and F/A-18 warplanes were complemented by those of the US Marine corps, which were land-based at Muharraq on the island state of Bahrain.

An intensive rate of operations was maintained right through the first seven days of the campaign, and while returning pilots brought back telling accounts and strike photographs suggesting a high level of damage to the Iraqi forces and Iraq's infrastructure, the presence of high-level

The US Navy's first aerial victory of 'Desert Storm' was gained on 17 January 1991 by Lieutenant Commander Mark Fox of the VFA-81 squadron operating from the USS *Saratoga*. Flying a McDonnell Douglas F/A-18C Hornet, Fox brought down a Mikoyan-Gurevich MiG-21 with the unusual combination of one AIM-9 Sidewinder short-range AAM and one AIM-7 sparrow medium-range AAM. The Sidewinder hit first and the Sparrow then flew into the fireball. Fox's wingman, Lieutenant Nick Mongillo, destroyed another MiG-21 with a Sparrow shot

cloud prevented confirmation by reconnaissance imagery by satellite or U-2R/TR-1A aircraft. The highest number of sorties was flown, of course, by the USAF, which directed many 'packages' of attack aircraft generally escorted by F-4G 'Wild Weasel' armed aircraft to detect and destroy Iraqi air-defence radar sites, and EF-111A unarmed aircraft to use their powerful onboard systems to find and jam the radar equipments of other air-defence sites. The two most important USAF aircraft types for attacks on Iraqi targets were the F-16 Fighting Falcon tactical fighter and the A-10A Thunderbolt II anti-tank and close-support warplane, each of which could carry a large and widely assorted load of external ordnance, both 'dumb' and 'smart', for attacks against a wide variety of targets.

The work of these tactical warplanes was greatly aided by the availability of both E-8A J-STARS prototypes of a type not scheduled to enter service until a few years later in the decade. The E-8A carried a large SLAR (Side-Looking Airborne Radar) in 'canoe' fairing below the forward part of the fuselage, and with the aid of an advanced operating system this allowed the operators in the fuselage of the converted Model 707 transport to 'see' small targets, both moving and stationary, at long slant ranges even in the difficult situation of looking' into ground clutter: such was the capability of the system that operators could locate targets as small as a 'Scud' launch vehicle at a range of some 160 km (100 miles), The E-8A was also fitted with data-link and control systems that allowed real-time transfer of the data to other aircraft and ground stations, and this allowed the rapid engagement and destruction of what might otherwise have been targets too fleeting for realistic engagement.

Another type based on the frame of the Model 707 transport was the E-3 Sentry, the airborne warning and control system aeroplane operated by both the USAF and the Royal Saudi Air Force. Orbiting at high altitude but well behind the front line on long-endurance missions, these aircraft used their powerful radars and advanced computer systems to direct and co-ordinate all coalition air activities within a radius of 400 km (250 miles).

The first two days of the campaign were waged by aircraft operating from points below Iraq's southern border, but on 19 January another front became active as aircraft based at Incirlik in south-eastern Turkey entered the fray from a base north of Iraq. Incirlik was temporary home to

In the air, coalition air activities were carefully co-ordinated by the highly trained crews of Boeing E-3B/C Sentry airborne warning and control system aircraft of the 552nd Airborne Warning and Command Wing of the USAF's Tactical air Command normally based at Tinker Air Force Base, Oklahoma

Manned by very highly trained personnel of the USAF's Electronic Security Command, the EC-130H 'Compass Call' version of the C-130 Hercules tactical transport undertook long-duration patrols on the edge of Iraqi airspace to jam and to confuse Iraqi radio communications

a comparatively small but well-balanced force of tactical warplanes, and attack packages from this base generally comprised F-111E and F-16 aircraft operating on the basis of reconnaissance information provided by RF-4C machines and protected by F-15 fighters as well as the electronic ministration of EF-111A machines.

Incirlik was also the base from which EC-130H jammer aircraft flew sorties undertaken within the context of a campaign to degrade if not 'blind' radar and communication systems not physically destroyed by bombs and anti-radar missiles. The first day of the coalition's air campaign was characterised by a major Iraqi effort to use its large numbers of ground-based radars to find the targets that would then, in theory, be destroyed by surface-to-air missiles and anti-aircraft artillery. So successful were the coalition's anti-radar efforts, however, that almost immediately there were virtually no Iraqi radars that survived or, perhaps, were prepared to revealed their position by searching for a possible target. Tacit agreement to this fact was provided by the Iraqis' claims to the number of

Generally known as the 'Spark Vark' or 'Electric Fox', the Grumman-developed EF-111A version of the F-111 interdictor was one of the US Air Force's most important aircraft of the war: the type carried no weapons, but as an electronic warfare type was vital for the protection of packages of attack aircraft

coalition aircraft shot down: after announcing that her forces had shot down 170 aircraft (only 14 were in fact been lost) during the first four days of the coalition offensive, Iraq then claimed almost no more victories despite the fact that very substantial numbers of aircraft were operating in the skies over the country.

In the first week of their offensive, the coalition air forces flew more than 12,000 sorties and was in the position to claim that its work was continuing to schedule despite unfavourable weather conditions. On the following day the weather improved considerably, and the coalition air forces flew no fewer than 3,000 sorties. By this time, 24 January, the coalition's strategic concept had been revised to place greater emphasis on the destruction of infrastructure targets such as electricity-generation plants and oil refineries as well as the sites at which chemical warfare weapons were likely to be produced and stored. The coalition also claimed that Iraq's nuclear weapon development capability had been wholly destroyed.

In the first seven days of operations, some 16 per cent of the coalition's air effort was undertaken by non-American air units, the primary contributions coming, in alphabetical order, from the air components of Canada, France, Italy, Kuwait, Saudi Arabia and the UK. The non-American coalition member that made the single greatest contribution was the UK, whose Panavia GR.Mk 1 force suffered comparatively high losses while undertaking attacks on Iraqi airfields with JP233 submunition dispensers at night and at heights of little more than 60 m (200 m). The attacks certainly inflicted heavy damage on the airfields, but the fact that

With drop tanks, electronic warfare pods and two AIM-9 Sidewinder AAMs under its wing, this Tornado GR.Mk 1 carried a trio of 454 kg (1,000 lb) 'Paveway' laser-guided bombs under its fuselage. The warplane lacked any organic laser-designation capability, illumination of the target being entrusted to a third party such as a BAe Buccaneer S.Mk 2B or another Tornado carrying one of the two available TIALD pods

The BAe Buccaneer S.Mk 2B was in the last stages of its service life with the Royal Air Force when its capabilities were demanded in Saudi Arabia to provide laser illumination for the laser-guided bombs carried by other warplanes. Seen in the course of grounds tests at Muharraq, this Buccaneer carries four stores under its wing: from left to right these are ALQ-101(V)10 radar jammer, a slipper fuel tank, the AVQ-23E 'Pave Spike' laser pod (with its optics covered) and an AIM-9L Sidewinder short-range AAMs for self-protection

the aircraft had to fly along the length of the runways meant that the Iraqis were able to position light and medium anti-aircraft guns at each end and put up curtains of fire through which the attackers had to penetrate. The level of British losses with this tactic, which had been designed for use against Soviet airfields in the altogether different terrain of Europe, was 26 per cent of the coalition's losses for the period between 17 and 23 January, which translates as five aircraft out of a total strength of 42 machines.

The British started to revise their tactics on 20 January, the low-level attacks with submunition dispensers giving way to medium-altitude attacks at up to 7,620 m (25,000 ft) with each warplane carrying eight 454 kg (1,000 lb) bombs. This reflected the fact that low-level missions were not required as a means of entering defended airspace under the radar net, which no longer existed in any useful form, and did serve to reduce the Tornado GR.Mk 1's loss rate, but it also emphasised the fact that significant results were difficult to obtain with free-fall 'dumb' bombs. At this time the Tornado GR.Mk 1 force lacked any capability for the delivery of 'smart' ordnance, so on 26 January eight Buccaneer S.Mk 2B aircraft of No. 12 Squadron arrived in the theatre to provide support for the Tornado GR.Mk 1 warplanes: the Buccaneer's AVQ-23 'Pave Spike' laser-designation system was used to 'illuminate' targets that could then be attacked with pinpoint accuracy by the laser-guided bombs which became increasingly the standard weapons of the Tornado GR.Mk 1 force.

By this time there was little need for further attacks on Iraqi airfields, which had virtually all been incapacitated or deserted by the surviving aircraft that should have been based on them, and the moved toward destroying the Iraqi land forces that might impede the eventual advance of the coalition's army formations. During the night of 25/26 January, for instance, Tornado GR.Mk 1 warplanes made three attacks on Republican Guard positions and supply dumps, the destruction of a fuel and ammunition dump resulting in a fireball that could be seen by the pilots of aircraft some 320 km (200 miles) distant.

After an inauspicious start, which also included the loss of single examples of generally similar Italian and Saudi Arabian aircraft, the Tornado GR.Mk 1 then began to reveal its true capabilities, and these were further enhanced by the arrival in service of the ALARM anti-radar missile. Another 'plus' for the Tornado forces was the success of the Tornado

GR.Mk 1A reconnaissance model, a development of the Tornado GR.Mk 1 with a highly capable IR system that provided good imagery under virtually all conditions including those that prevented the use of aircraft with optical imaging systems. On 18 January, for instance, a pair of Tornado GR.Mk 1A aircraft captured on IR video a mobile 'Scud' launcher of the type that was being used for the bombardment of Israel.

Given the unwillingness or, more realistically, the inability of the Iraqi air force to fly missions against the coalition base areas, the Tornado F.Mk 3 air-defence fighters of the RAF and the Royal Saudi Air Force had little or no opportunity for action, despite the fact that some of the British aircraft were used to escort attack raids. One opportunity that seemed to beckon before fading occurred on 18 January, when a Tornado F.Mk 3 combat air patrol was vectored into an area in which Iraqi fighters were detected approaching A-10A Thunderbolt II warplanes but then decamped before the British fighters could arrive.

As the weight of the offensive made itself felt, the coalition's CAPs were pushed forward over the southern part of Iraq, but still the British fighter pilots found no 'trade'. Better luck attended one of the Saudi Arabian pilots, however, for Captain Ayedh of No. 13 Squadron in an F-15C Eagle gained the war's first double victory when he was vectored into an interception that resulted in the destruction of two MiG-23 warplanes. These were escorting a Mirage F1EQ on a mission, immediately aborted, to fire an Exocet missile at coalition warships operating in the northern part of the Persian Gulf.

During the build-up of the coalition force the British inflight-refuelling capability had rested with VC10 and Victor aircraft, which were reinforced as operations started by TriStar aircraft. Although far fewer in overall number than the KC-10 and KC-135 tanker force operated by the USAF, the British tankers were soon an intrinsic part of the coalition air effort as they topped up the fuel of attack aircraft outbound for Iraq or

Seated on a zero/zero ejection seat with the screen of the HUD in his forward line of sight, the pilot of the McDonnell Douglas F-15C air-superiority fighter has excellent all-rounds fields of vision through the carefully designed canopy

Fitted with a centreline drop tank and, under the wing, outboard AAMs and inboard 'iron' bombs, this Jaguar A of the French air force is taking off in full afterburner for an attack mission

inbound after a sortie with fuel low as a result of range or damage. The British tankers supplied a wide range of aircraft including, at times, US Navy aircraft such as the F-14A Tomcat and EA-6B Prowler.

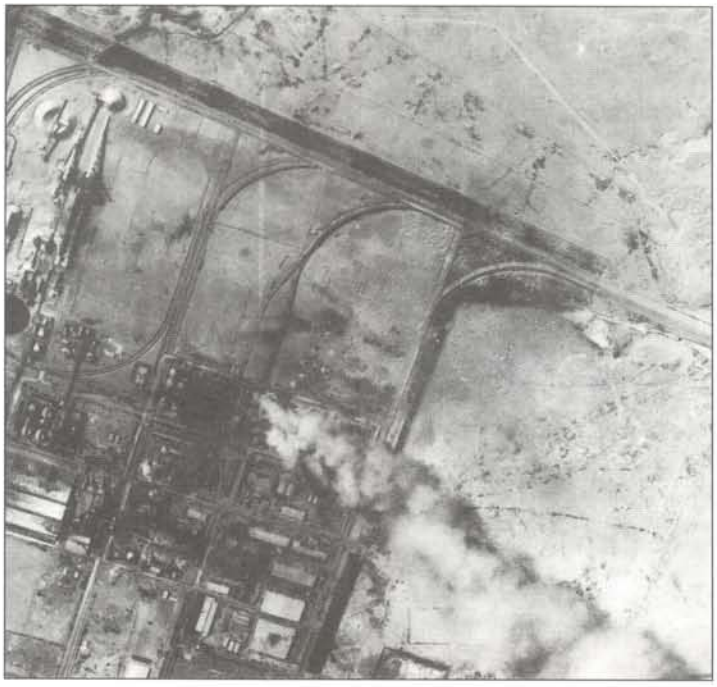
Other coalition aircraft involved in operations from the first day of the offensive were the A-4KU attack warplanes of the Free Kuwait Air Force and the CF-18 Hornet dual-role aircraft of the Canadian Armed forces, and a militarily modest but politically significant further addition came on 22 January, when Qatar committed its small Mirage F1 force to the war despite the fact that the Iraqis were flying a variant of the same basic warplane in a situation that could have been fraught with problems of misidentification. Further Arab commitment to the war on 25 January when the F-16 tactical warplanes of Bahrain entered combat, the defensive operations of the first day becoming offensive operations on the following day.

The position of the French air force component in Saudi Arabia was complicated by the fact that the French defence minister, a supporter of Iraq, ordered that no missions should be flown against Iraq. Thus the French force of Jaguar A attack aircraft was restricted to sorties against the Iraqi positions in Kuwait until 24 January, when the minister was overruled by President Mitterand and the remit of the French squadrons was expanded to include Iraq. The French warplanes then struck at the Republican Guards, whose formations were attacked with free-fall bombs even as fixed targets such as bunkers used as command centres or for the storage of ammunition were tackled successfully with AS.30L laser-guided missiles. The equivalent British force, in this instance flying the Jaguar GR.Mk 1, has been in operation since 17 January against targets in Iraq as well as Kuwait. The British generally operated by day, and used 454 kg (1,000 lb) free-fall bombs as well as 70 mm (2.75 in) air-to-surface unguided rockets on targets that included surface-to-air missile sites and, on 26 January, a Kuwaiti coastal site equipped with Chinese CSS-N-1 'Silkworm' anti-ship missiles.

As the offensive gathered pace and momentum, helicopter forces began to play an increasingly significant part. SH-60B Seahawk machines of the US Navy were used to deploy frogmen tasked with the deactivation of Iraqi floating mines that prejudiced naval operations, real and threatened, in the northern waters of the Persian Gulf, while Lynx helicopters embarked on various British warships were involved in the hunting and destruction of Iraqi fast attack craft with Sea Skua light anti-ship missiles. Two of the helicopters, in this instance from HMS Gloucester, were also

The most important anti-tank helicopter fielded by the British army was the Westland Lynx AH.Mk 7, seen here in flight with four of its eight BGM-71 TOW heavyweight anti-tank missiles visible. Guidance was provided by means of the M65 stabilised sight in the roof of the cockpit

involved in the 19 January seizure of nine maritime oil platforms held by the Iraqis. Four days later one of the Gloucester's helicopters discovered that the Iraqis were using an oil tanker off Iraq's tiny coast line as an early warning post, and the report of this fact led to the destruction of the tanker by American warplanes. On the next day the Lynx from HMS Cardiff located an Iraqi minesweeper and was about to attack with a Sea Skua missile when the effort was called off in favour of an attempt to seize the vessels with a boarding party. This was achieved with the aid of the Lynx from HMS London, and led to the first element of Kuwait's liberation when the tiny island of Qaruh was then captured without loss from its Iraqi garrison.



The mass of craters in and around the fertiliser factory at Al Qaim provides telling evidence of the efforts launched by the coalition air forces to destroy key elements of Iraq's economic infrastructure

In overall terms, the first days of the coalition air offensive were an unmitigated disaster for Iraq, which had suffered enormous physical damage and had all her forces, land, sea and air, devastated by virtually unmolested coalition air power. The coalition air arms were able to operate where and when they wanted without fear of Iraqi air force intervention, for its had become more than clear that such Iraqi warplanes as survived were not prepared to venture into the air even where an intact runway was still available. Even so, some in the coalition camp still expressed a fear that the Iraqi air force was not so much beaten as biding its time, with its air-defence radars switched off and its main strength hidden in well concealed bunkers awaiting the decisive moment, when it would be unleashed against the coalition's ground offensive with chemical weapons.

Even the information that many aircraft had flown to Iran was not greeted with unalloyed joy, for while many saw this as tacit evidence of the Iraqi air force's concession of defeat in the air war, others saw in its an Iraqi ploy to preserve at least some of their air strength for future use at the decisive moment. Evidence for this latter fear was found in the belief that Iran's professed neutrality might be a sham, for the religious leadership of Iran was known to be at least partially in favour of putting aside the legacy of the two countries' animosity in the 1980-88 war in favour of collaborative action in a jihad (holy war) against the USA and its allies, in particular Israel.

By 27 January the coalition's air forces had lost no aircraft in air combat, while the Iraqi air force had suffered the loss of 22 aircraft in the air and 23 more on the ground, the latter figure including three Tu-16 'Badger' medium bombers as they were preparing to take-off on a mission from Qayyarah West during 23 January. Another highly satisfactory factor for the coalition was that the Iraqi air force's most capable fighter, the MiG-29 'Fulcrum', had been no threat at all, as at least eight had been

Although the losses of the coalition air forces was remarkably small in overall terms, many of their aircraft were damaged, more or less severely, by the vast quantity of missiles and anti-aircraft artillery projectiles the Iraqis lofted into the sky over their country. Evidence of the fact is borne out by this McDonnell Douglas F/A-18A Hornet of the VMFA-314 'Black Knights' squadron, a US Marine Corps' unit that had every reason to be glad of the Hornet's very considerable ability to absorb and survive battle damage

shot down without loss to the coalition's own fighters. Iraq had claimed the destruction of more than 200 coalition aircraft by its ground-based air defence forces, but the reality was a mere 17 aircraft including nine American machines. This represented a loss rate of only 0.025 per cent for the figure of more than 22,000 sorties that had been undertaken before the end of the campaign's 11th day.

In overall terms, therefore, the coalition air forces had achieved a very considerable success in the first days of its offensive, and the coalition had every reason to be pleased with progress. The one unfortunate aspect of the war to date has been the rate of Iraqi 'Scud' missile launches. These were not significant in purely military terms, but were a major feature in the public relations war that was in many respects as important as military events in this first war conducted in the glare of real-time television coverage from both sides of the line.

By 28 January, the 12th day of the air offensive, the coalition could justifiably claim not just air superiority but total aerial superiority over Iraq, especially as the Iraqi air force had wherever possible decamped to Iran. By 7 February, the 22nd day of the coalition's offensive, these defections had risen to 137 aircraft including 25 transport machines as well as five MiG-25 'Foxbat', eight MiG-29 'Fulcrum', 24 Mirage F1EQ, all 24 Sukhoi Su-24 'Fencer' and both Adnan AEW machines. Iraq's loss of five examples of the MiG-29, the best fighter available to the country and presumably flown by some of the Iraqi air force's most privileged if not yet best trained pilots, during the first five days of the conflict must have provided a clear pointer of the course of events likely to follow if other pilots made themselves and their aircraft available as targets.

In these circumstances the three primary types of air-superiority fighter available to the coalition (the F-15 flown by the USAF and Royal Saudi Air Force, the Tornado F.Mk 3 operated by the RAF and Royal Saudi Air Force, and the Mirage 2000 manned by the French air force) could be confident that they faced no realistic threat of Iraqi challenge and, with the upper air to themselves, could now move forward to more offensive patrols deeper into southern Iraq. Here their most likely prey, detected by E-3 AWACS aircraft that would control the most economical interceptions, were further Iraqi aircraft trying to make the run to Iran. During

Despite its lack of advanced offensive electronics, the SEPECAT Jaguar GR.Mk 1 proved itself an effective, reliable and rugged warplane in British service. Seen on its way to the target, this machine carries offensive armament in the form of 'Rockeye' anti-tank cluster bombs, defensive armament in the form of AIM-9L Sidewinder short-range AAMs, and defensive electronics in the form of an ALQ-101 jammer pod and a Phimat chaff dispenser pod

the first week of February, though, AWACS aircraft detected only one flight; a week later, the AWACS aircraft had found no more Iraqi aircraft in the air. This was a portent of the continuing shape of the war, and with the exception of a few helicopter flights no Iraqi aircraft took to the air after that day.

This greatly aided the pace and scale of the coalition air effort, for even unarmed aircraft such as the vital inflight-refuelling tankers could be moved north to orbits over the southern part of Iraq, thereby greatly easing the task of mounting attack missions still deeper into Iraq. Such attacks were at first targeted primarily against strategic objectives, but from a time late in February the number of such targets still surviving had declined considerably and there were more pressing tactical targets as the coalition moved toward the start of its land offensive. Thus the emphasis of the air attacks moved south once more to the Iraqis' land links with Kuwait and the Iraqi border with Saudi Arabia, and then to the men and equipment that were becoming increasingly isolated in Kuwait and southern Iraq. Attacks on these targets alone would have allowed the Iraqis to deduce the nature of the forthcoming land war, however, and for this reason a major effort was also made by fixed- and rotary-wing aircraft against Iraq's surviving ships and installations in a largely successful scheme to persuade the Iraqis that the coalition was still planning an amphibious assault on Kuwait, which was therefore not stripped of its considerable garrison.

Despite the heavy weight of attacks on Iraq's front-line formations in southern Iraq and Kuwait, where their capabilities were very seriously degraded, the coalition air forces also continued with their intensive operations against Baghdad and the major concentrations of Republic Guard formations that constituted Iraq's strategic reserve in the south.

The coalition's supposed preparation for an amphibious assault became clearly evident to the Iraqis on 26 January, when Jaguar GR.Mk 1 attack aircraft of the RAF struck as coastal defence missile batteries in Kuwait, and was reinforced in the minds of the Iraqis on 29 January, when Lynx HAS.Mk 3 helicopters of the Fleet Air Arm collaborated with

Even Iraq's hardened aircraft shelters, built from reinforced concrete of considerable thickness, proved vulnerable to laser-guided weapons such as the 907 kg (2,000 lb) GBU-10I with its hardened steel casing

A-6E Intruder fixed-wing aircraft of the US Navy and OH-58D helicopters of the US Army struck at Iraqi patrol craft, sinking five such craft and damaging another 12. The attack was renewed on the following day, this time claiming six more craft. This fascinating little offensive continued to the end of the month, and resulted in the Iraqis' overall loss of 46 craft. This meant that there was no realistic Iraqi naval threat in the northern waters of the Persian Gulf, and as a result even ships as large as the battleship USS Missouri to operate in these waters from 4 February: the Missouri therefore operated off the coast of Kuwait as a floating battery of super-heavy artillery, engaging and destroying land targets with her 406 mm (16 in) main guns.

It is worth recording, though, that it was during this period, when the Lynx helicopters of the Fleet Air Arm seemed rampant in and around the northern end of the Persian Gulf, that the Iraqi forces gained their only tactical success of the entire war. On 29 January an Iraqi force took the town of Khafji, just a few miles into Saudi Arabia, even though intervention by American aircraft (AH-1W SuperCobra and AH-64A Apache helicopters together with AV-8B Harrier and A-10A Thunderbolt II warplanes) severely handled an Iraqi armoured element supporting the infantry thrust. The Iraqis gained a measure of propaganda success from their seizure of Khafji, but no real military advantage especially as the men in and around the Saudi Arabian town suffered heavy losses to the attentions of some AC-130H gunship aircraft of the USAF's 16th Special Operations Squadron, which lost one of its aircraft.

From the last days of January the coalition air forces started a major effort to ensure the total isolation of southern Iraq and Kuwait from the rest of Iraq. This effort concentrated on the destruction of the bridges needed for any significant southward movement of men and, more

The war with Iraq saw comparatively widespread use of American special forces, which were infiltrated and extracted by the Sikorsky MH-60J Pave Hawk, a type making its combat debut with the Special Operations Command. With its armour, armament, special sensors and long-range, the helicopter was also used for combat search-and-rescue missions

importantly, armour and artillery. The key weapon in this effort was the laser-guided bomb, and by 30 January the coalition air forces had hit 33 of the 36 strategic bridges over the Tigris and Euphrates rivers downstream of Baghdad, and also inflicted further damage on the bridges of Baghdad itself. The Iraqi forces attempted to revitalise their links with the south by means of pontoon bridges, but a regular watch was kept on such efforts, which received devastating air attention as soon as they were nearly complete. The overall success of this coalition effort is attested by the fact that movement between Baghdad and Kuwait declined by some 90 per cent.

Airfields were also visited on a regular basis to prevent the Iraqis undertaking repairs, and by the end of January 38 Iraqi airfields had been attacked, eight of them being effectively destroyed and the others rendered inoperable within the immediate future. The aircraft that were most significant in this effort were the F-111 machines of the USAF, and the Tornado interdictors of the British, Italian and Saudi air forces. By a time early in February is had become clear that the Iraqis did not intend to repair the damaged runways, and the coalition changed tack to ensure that no aircraft could be brought back, either from Iran or from concealed

The US Navy's counterpart of the MH-60J, although optimised for combat search and rescue, was the Sikorsky HH-60H that was also used for the support of covert operations

accommodation in Iraq, to operate from these air bases after any lightning repairs once the coalition had started its land campaign. Thus the coalition air forces started the process of destroying every one of the Iraqi air force's almost 600 hardened aircraft shelters: this meant that even if warplanes were brought back onto the airfields, they could not be concealed or sheltered, and would therefore be totally vulnerable to immediate destruction on the ground. By 30 January some 70 hardened aircraft shelters had been hit and destroyed, this figure rising to 345 by 15 February, when the onslaught was seen as largely irrelevant and scaled down.

The primary weapon against hardened aircraft shelters was, yet again as with most point targets, the 'Paveway' series of laser-guided bombs. The USAF used its F-111F aircraft, carrying a centreline 'Pave Tack' laser designation system, to drop 907 kg (2,000 lb) laser-guided bombs, while the RAF concentrated on the use of 454 kg (1,000 lb) laser-guided bombs delivered by Tornado GR.Mk 1 aircraft, each of which generally operated with two or three such weapons. The Tornado GR.Mk 1 lacked any inbuilt laser designation system, so four of the aircraft were used as the platforms for the only two available examples of the new TIALD pod, which offered night as well as day capability, and other designation capability was provided by the 'Pave Spike' day-only pods carried by 12 Buccaneer S.Mk 2B aircraft specially flown in for the task.

In the absence of any Iraqi opposition there was no operational reason for the Tornado warplanes to restrict themselves to nocturnal operations, so the force began day attacks on 2 February. Operating at an altitude of 6,095 m (20,000 ft) or more, the Tornado warplanes were essentially invulnerable to the Iraqis' largest-calibre anti-aircraft artillery, radar-directed 3.94 in (100 mm) weapons whose shells were nearing their apogee at that height and therefore moving so slowly that they could be seen and avoided. Even in these circumstances, with no Iraqi intervention at all likely, the Tornado warplanes were generally supported by American warplanes: even though they were operating from Tabuk on the eastern side of Saudi Arabia, the Tornado machines were often supported and supplemented by F-14A Tomcat fighters and A-6E Intruder attack warplanes from carriers operating in the Red Sea, on the western side of Saudi

The smallest air-to-surface guided missile used by fixed-wing warplanes in the campaign against Iraq was the AGM-65 Maverick, this example under the port wing of a Fairchild Republic A-10A Thunderbolt II anti-tank and battlefield attack warplane being an AGM-65A/B with an optronic guidance system as indicated by the clear window on the nose

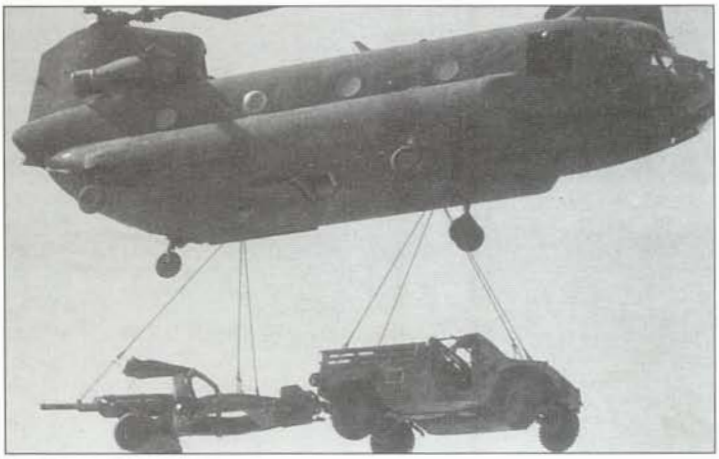
Protected from the harsh sunlight of the region but against little else, the General Dynamics F-16C Fighting Falcon was a workhorse of the American air effort. Here members of the ground crew bring up a Tactical Munitions Dispenser, a weapon that carries a mix of anti-armour and anti-personnel mines

Arabia. The Intruder was also highly capable in the laser-guided bombing role, for it had its own laser designation system in the TRAM (Target Recognition and Attack Multi-sensor) system in a trainable turret under the nose.

The Iraqi anti-aircraft gunners and surface-to-air missile operators were also increasingly loathe to reveal their positions by activating their weapons' radar systems, for this inevitably invited the retaliation of EA-6B Prowler, F/A-18 Hornet and F-4G 'Wild Weasel' defence-suppression aircraft, which could locate and use an AGM-88 HARM (High-speed Anti-Radiation Missile) to destroy a hostile radar well within the time of 30 seconds need for the Iraqi radar to acquire a target and guide a missile onto it.

The coalition air forces stepped up their attacks on Republican Guard formations early in February, the most devastating of the raids being mounted by B-52G Stratofortress heavy bombers operating from comparatively nearby bases in Saudi Arabia and from the island base of Diego Garcia, but also from considerably more distant locations such as Moron AB in Spain and RAF Fairford in England. The Spanish permission for the USAF to mount attacks from Spanish territory was more than a little surprising, and so too was the French authorisation for the USAF to base KC-135 inflight-refuelling tankers at Mont-de-Marsan to top up the tanks of bombers transiting to Iraq after take-off with an offensive load typically comprising 51 340 kg (750 kg) M117 bombs internally and externally. By 9 February aircraft of the coalition air forces had delivered some 80,000 tonnes of bombs onto Iraq.

Even though the coalition air forces were completing about 2,500 sorties per day, by 8 February it was estimated that the air campaign was some eight days behind the schedule originally fixed, this shortfall being the result largely of adverse weather but also to an extent of the need to divert something in the order of 100 to 150 sorties to the difficult task of finding and then attacking the mobile 'Scud' launchers on which Iraq had pinned her faith as a means of breaking up the coalition. The 'Scud' effort required the extensive use of comparatively scarce reconnaissance assets,



As in every campaign involving the US Army and its allies since the early 1970s, the Boeing CH-47 Chinook played an invaluable role as a heavy personnel and logistic transport, in the latter capacity delivering items such as this piece of field artillery and its tractor

and also the mounting of standing patrols of F-15E attack warplanes so that they could respond immediately to any sighting and so prevent the escape of the launcher.

The effort against the 'Scud' launchers also involved ground teams of British and American special forces, who also had a number of other responsibilities. The need to deliver, support and then extract these teams required considerable use of helicopters, such as the MH-53J and MH-60G types supported by the MC-130E 'Combat Talon II' and HC-130N/P versions of the Hercules transport, all of which suffered little in the way of losses as there was by now no Iraqi air threat. Among the tasks undertaken by the special forces teams was the rescue of airmen who had come down in Iraqi territory. The activities of the special forces teams was a constant thorn in the side of the Iraqis, as much for subjectively psychological as objectively military reasons, and further pressure was exerted by the use of psychological warfare aircraft such as the EC-130E(RR) Hercules.

With the date for deploying the coalition's ground forces approaching, it was essential that the extensive minefields laid by the Iraqis in front of their positions should be neutralised. Among the several methods used for this task, one of the most unusual made its debut on 15 February when C-130 aircraft started to drop 6,804 kg (15,000 lb) 'Daisy Cutter' devices, which detonated the mines in a within a large radius of their detonation point with the pressure wave of their blast.

Ground and air probes toward the Iraqi front became more frequent and also more aggressive, and the crumbling of Iraqi morale, especially among the unwilling conscripts who constituted the bulk of Iraq's front-line formations, was revealed on 17 February, when two of the US Army's AH-64A attack helicopters returned from a probing flight shepherding some 20 men who had surrendered to the helicopters. During this period the efforts of the coalition air forces moved steadily closer to the front line. B-52 bombers undertook carpet bombing raids that caused as much psychological as physical damage, while coalition attack aircraft concentrated on the piecemeal destruction of the Iraqis' heavy weapons with attacks on individual tanks and pieces of artillery using precision guided weapons as well as 'dumb' weapons such as bombs (free-fall and retarded), cluster bombs and air-to-surface unguided rockets. So far as the

Carrying multi-tube rockets launchers and AGM-114 Hellfire anti-tank missiles in addition to the 30 mm Chain Gun cannon under the fuselage, the McDonnell Douglas AH-64A Apache proved itself wholly the master of Iraqi armoured formations

'smart' ordnance was concerned, the laser-guided bomb again proved invaluable as its lack of a motor made it a cost-effective weapon, but extensive use was also made of air-to-surface missiles such as the AGM-65D version of the Maverick with imaging infra-red guidance by tactical warplanes including the F-15E, F-16 and F-111. These generally launched their attacks soon after the setting of the sun, when metal was still hot but the surrounding sand had cooled, offering the high level of thermal contrast that ensured the most successful use of the missile. Large numbers of armoured fighting vehicles and artillery pieces fell to this tactical, typical nightly success figures being 200 in clear weather and 100 in cloudy weather.

The land campaign was scheduled to start on 24 February, and by the day before this the coalition air forces claimed the destruction of 1,685 tanks (some 60 per cent of Iraq's strength) together with 925 armoured personnel carriers and 1,485 pieces of artillery. By this time the Iraqi air force and navy had effectively ceased to exist in operational terms. The coalition effort to secure this ideal position in which to start the land offensive had involved the dropping of 60,000 tonnes of bombs (some 150,000 weapons) in 94,000 sorties. A considerable amount of damage had also been inflicted on the Iraqi forces by naval bombardment in the area of Kuwait, and by artillery and the large-calibre rockets fired from MLRS (Multiple-Launch Rocket System) launchers.

The coalition ground forces started their advance at 04.30 on 24 February under the cover of concentrated air power provided by the coalition air forces' massed attack and close support aircraft as well by the ground forces' own armed helicopters. The Iraqi defence was based largely on the belief that the coalition's primary effort would be made by ground and amphibious forces in and around Kuwait, but in fact the main weight of the coalition offensive had been shifted to the west, where major armoured forces plunged though the Iraqi right wing before hooking eastward to cut the Iraqis' lines of communication or, as it soon became clear, lines of retreat.

With the coalition's left flank shielded by French troops and Gazelle anti-tank helicopters against the unlikely event of any Iraqi attempt to take the main thrust in flank, the men and machines of the American ground forces swept forward with some 300 CH-47D Chinook heavy lift and AH-64A Apache battlefield helicopters to secure a forward operating base, codenamed Cobra, at Salman airfield, some 80 km (50 miles) inside Iraq. On 24 February the coalition air forces flew more than 3,000 tactical sorties, including 1,300 against targets in Kuwait and 700 more for close air support.

With his forces outflanked and lacking the matériel and command strengths to provide any kind of counter, Saddam Hussein was faced with the problem of what to do with the surviving elements of his army, round which the coalition's grasp was tightening rapidly as all attempts at movement were instantly checked by the activities of AV-8B Harrier, A-6E Intruder, A-10A Thunderbolt II, AC-130H 'Spectre' and even B-52G warplanes. Saddam proclaimed publicly that his forces had won a great victory but privately ordered all surviving forces to fall back as, when and how they could. The land campaign lasted just 100 hours, and in this time of less than four days the Iraqi army lost about half of the 42 divisions in had deployed to the theatre. The garrison of Kuwait fled north as best it could, often in plundered Kuwaiti vehicles laden with booty, but the coalition air forces made their northward dash a misery of burned-out vehicles and killed men. After public and private expressions of concern about the loss of Iraqi life, especially after reports of absolutely total destruction on a 4.8 km (3 mile) length of the main route north from Kuwait, President Bush decided to cut short the offensive.

Almost the final event of the war was the use over Abu Gharb, near Baghdad, of two 2,132 kg (4,700 lb) 'bunker-buster' laser-guided bombs. Hastily created from sections of 203 mm (8 in) gun barrel to provide a casing able to penetrate deep into the earth and even through concrete before detonating, these weapons were dropped by F-111 warplanes on an Iraqi high-level command bunker, in which many of Iraq's senior officers are believed to have perished.

The coalition's forces ended their offensive on 28 February. By this time the Iraqis had left Kuwait, whose liberation had been the primary objective of the war in which the Iraqi army had suffered an unknown but very large number of casualties as well as the destruction of 3,700 tanks and the capture of 175,000 men. On the other side of the front line, the coalition forces had suffered the loss of only 150 personnel killed while completing a truly phenomenal rout of their opponents. There can be no doubt that the small scale of the coalition losses and totally comprehensive success of their ground offensive were the direct results of the coalition's overwhelming air campaign of more than 110,000 sorties.

Armed with the devastating 30 mm GAU-8/A Avenger rotary cannon in its forward fuselage for tank-killing purposes, the Fairchild Republic A-10A Thunderbolt II is a decisive battlefield warplane with this and underwing weapons that can include the AGM-65 Maverick air-to-surface missile, multi-tube launchers for air-to-surface unguided rockets, and free-fall stores such as these Mk 20 Rockeye II cluster bombs each carrying 247 Mk 119 anti-tank bomblets

When Iraqi dictator Saddam Hussein unwisely invaded neighbouring Kuwait in August 1990 he not only overestimated his own military prowess but also underestimated the determination of the Western coalition to put a stop to his ambitions. Within days, the United States and its European allies had sprung into action, diverting huge air, land and sea forces from all over the globe to Saudi Arabia and the Gulf states. By far the largest numbers of warplanes available to the coalition forces' command for offensive operations into Iraq when hostilities finally broke out in January 1991 were those provided by the USA. Britain and France spearheaded the European contribution. This volume gives a fascinating insight into the impressive logistics involved, and shows just how far weapons technology and air warfare thinking have progressed in recent years.

OSPREY AVIATION

delPrado publishers