

Al Jubail – an aeromedical staging facility during the Gulf conflict: discussion paper

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Summary

During the latter half of 1990 the Royal Air Force established a medical evacuation chain in support of the British First Armoured Division during Operation Granby (known as Operation Desert Storm in the USA). Medical contingency plans, formulated prior to embarkation from the UK, foresaw the need for five aeromedical staging facilities sub-deployed throughout the east of the Arabian Peninsula. The early days of the deployment found personnel busy with the construction of tented and hardened facilities and with the establishment of local operating procedures. Many problems were initially encountered, especially with supply, communications and in co-ordinating with collaborating coalition and host nation units. Nevertheless, progress was rapid and non-combatant operations were started within days of arrival. As the ground offensive became more imminent, training took on a sense of urgency. Advanced first aid techniques were taught to all non-medical staff, whereas doctors, nurses and paramedical personnel were taught ACLS and ATLS skills. All studied field hygiene, the hazards of nuclear, chemical and biological warfare, casualty handling, battle psychology and the intricacies of loading and unloading various types of aircraft. By the start of the ground phase of the war the British evacuation chain was fully operational and capable of treating and transferring hundreds of casualties per day. In the event, only about 850 patients were transported down the evacuation chain during the conflict, and less than 10% of these were battle casualties. This paper presents an overview of the British aeromedical evacuation system and discusses, in more detail, the establishment and operation of the busiest aeromedical staging facility at Al Jubail in the Eastern Province of Saudi Arabia.

Introduction

After the Iraqi invasion of Kuwait on 2 August 1990 the United Nations applied pressure on the Iraqi government to withdraw from the occupied territory. When diplomacy and economic sanctions failed, the coalition forces, under the leadership of the United States of America, retaliated with military might in an effort to drive the invaders from Kuwait. From the outset, the Royal Air Force (RAF) was involved. Squadrons of strike aircraft, their tankers, transports and support services, were deployed early in the conflict and were first into action, alongside their

American allies, on the 16 January, when the air phase of the war started.

Medical contingency plans for a full scale conflict had already been drawn up and it was clear that an aeromedical evacuation capability would be required. In modern warfare, the time taken to move casualties to definitive medical care is extremely short, thanks to the rapid evacuation made possible by the use of both road and air transport, not least helicopters. At the start of the conflict, the RAF possessed one Aeromedical Evacuation Squadron (1 AES), with a second squadron of reserve personnel on standby (4626 AES Royal Auxiliary Air Force). In the event, 1 AES was deployed to the Gulf in November 1990, whereas 4626 AES were not called up until the ground phase of the war became almost inevitable. The embodiment of this reserve medical unit was planned over the Christmas period, and was the first such mobilization since 1940.

The concept of operations

The aeromedical detachment at Al Jubail was situated at the hub of an evacuation chain which started at the battlefield and ended in the UK (Figure 1). Other British aeromedical facilities were located in Bahrain, Dhahran, Riyadh and Al Qaysumah in the Gulf, and at Akrotiri in Cyprus. The plan was to evacuate casualties from the front line dressing stations to field hospitals near the forward air head at Al Qaysumah, some 75 km south

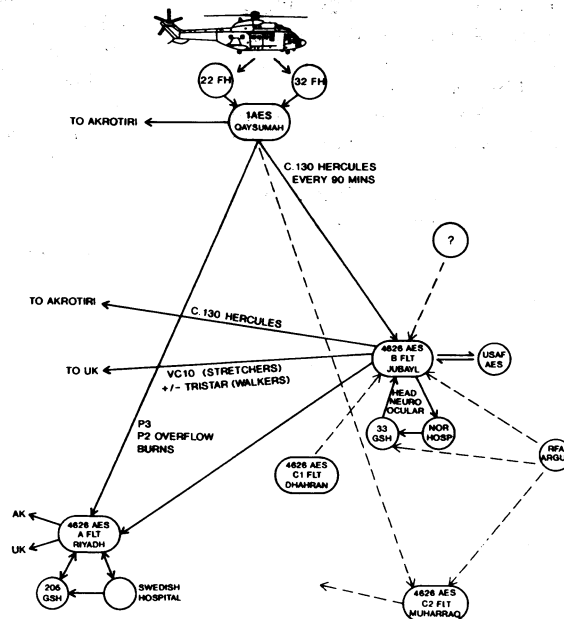


Figure 1. Aeromedical evacuation – the overall scheme

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of the Iraq/Saudi border. From there they were flown either direct to Riyadh or to Al Jubail where they would receive further treatment, if urgently needed, before transfer to a surgical unit.

The Jubail detachment owed its location to the siting of the Royal Army Medical Corps 33rd General Surgical Hospital (33 GSH) in the nearby industrial town of Al Jubail. 33 GSH was a 650 bed tented hospital which specialized in the treatment of head, neck, ophthalmic and neurological injuries, but which had the capability of dealing with any general surgical condition. Although some burns patients were accepted, most were transferred to the major referral centre, 205 GSH, in Riyadh. Co-located in the town of Jubail was a 40 bed Norwegian Field Surgical Hospital which dealt with general surgical and orthopaedic admissions.

Evacuation from the Front

It was anticipated that battle casualties from two forward field hospitals (22 and 32 FH) would be sorted into evacuation priorities by 1 AES at the forward air base in Al Qaysumah. Of the general and orthopaedic patients, only P2 (those whose treatment could be delayed by up to 12 hours) and stabilized P1 (urgent) patients were sent to Al Jubail. In addition, all patients with head, neck, ophthalmic or neurological trauma were also evacuated to Jubail, regardless of their triage category.

C.130 Hercules aircraft were used for the evacuation flights, initially from Al Qaysumah, but later from Kuwait itself. They were fitted for 30 stretchers and 42 seated casualties and inbound flights were expected as frequently as one every 90 min.

Resuscitation

The flight time from Al Qaysumah to Jubail is approximately one hour and aircraft often flew at low level when operational reasons dictated. The possibility of deterioration of some P2 patients was ever present and there was also the inevitability of missed diagnoses being responsible for rapid deterioration of some patients who appeared to be stable before boarding the aircraft. The in-flight medical teams, although well trained, were hampered by their limited equipment, confined working space and the vagaries of motion in 3 planes. It was therefore essential for a comprehensive resuscitation capability to be available at the Jubail air head. This was even more important since casualties faced a minimum 40 min onward road journey before arrival at their destination hospital.

Holding at Jubail Air Head

Delayed flights and insufficient numbers of ambulances may have necessitated holding some patients at the airfield pending the completion of their journey. The holding requirement demanded sufficient ward space and the need for all basic nursing procedures, along with such facilities as toilets, catering, security (for enemy prisoners of war) and a comprehensive selection of medical stores.

Evacuation from 33 GSH

To keep the maximum number of beds open for new admissions, patients were evacuated from 33 GSH as soon as they were considered fit for transfer. Evacuation was direct to the UK via VC10 aircraft (Figure 2), although plans were made to use TriStar aircraft for

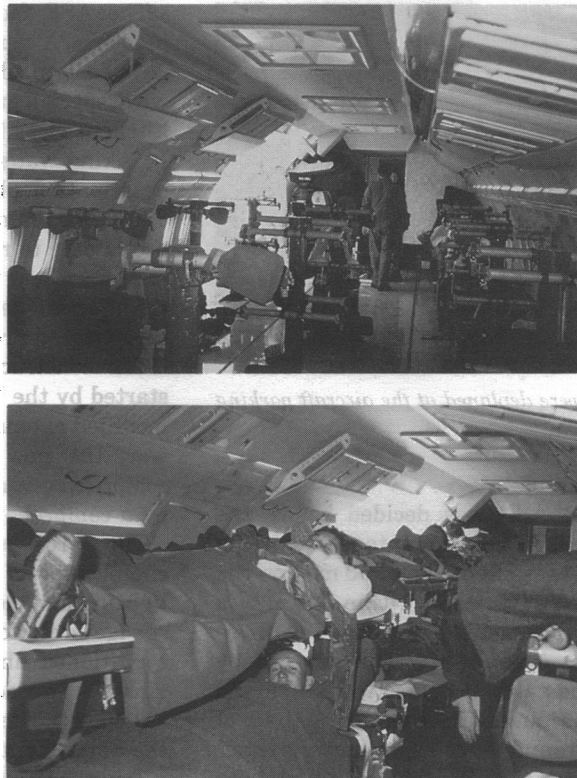


Figure 2. (a) Inside the cabin of a VC10 aircraft before casualties were embarked; (b) stretcher patients in the VC10, awaiting repatriation

large numbers of seated patients and C.130 Hercules aircraft for shorter flights to Akrotiri.

Other inbound casualties

Personnel were constantly vigilant to the possibility of local casualties who would, of course, also have needed triage and treatment at the aeromedical staging facility (ASF) before onward transfer to 33 GSH. It was also anticipated that patients evacuated from the hospital ship RFA Argus may, on occasions, have been flown direct to Al Jubail air head. Furthermore, if all the northern hospitals had become inundated, the RAF War Hospital at Muharraq in Bahrain would have been utilized. It was planned that evacuation aircraft would then fly direct from Al Qaysumah to Bahrain, thus overflying the Jubail facilities.

Personnel

During the ground war phase of Operation Granby/Desert Storm, aeromedical personnel at Al Jubail were drawn from regular and auxiliary RAF medical personnel (1 AES and 4626 AES), RAF musicians (as stretcher bearers) and RAF supporting staff (drivers, caterers, suppliers, technicians, etc). In addition, British and Norwegian Army ambulance drivers and paramedics were co-opted.

The expanded squadron-sized detachment was organized into three shifts, each commanded by a Medical Officer and administered by a paramedical Senior Non-Commissioned Officer. Each shift was fully integrated, with regular and auxiliary personnel working alongside each other. Personnel from each shift had nominated tasks, dependent on their background, skills and training. Morale was high when the workforce was trained, organized and informed, and no major personnel problems presented during the duration of the deployment.



Figure 3. Casualties were deplaned at the aircraft parking ramp

Facilities at Al Jubail

The location of the ASF was decided before the detachment's arrival. To take advantage of existing tentage, the facility was sited about 250 m from the western edge of the runway and within 500 m of a very busy helipad. The noise pollution from these neighbouring areas was a problem for tannoy communications, and patients held at the ASF found difficulty sleeping because of the constant activity of both aircraft and ground vehicles around the site.

It soon became clear that the level of air activity on the airfield would cause queueing of all aircraft waiting to off-load, including those carrying casualties (consequently delaying their definitive medical care). This problem was resolved by the construction of a 100 m x 100 m aircraft parking ramp (Figure 3), located between the runway and the ASF, intended exclusively for the purpose of deplaning casualties. It was laid in less than 36 hours and was the only such structure to be assembled solely by medical and musical personnel.

The ASF faced few environmental health (EH) problems. A capable but small team of EH technicians gave general advice on the layout of the encampment, with special emphasis placed on the siting of the kitchen, mess tent, latrines and washing facilities. Drinking water was provided by a reverse osmosis desalination plant and fresh foods were collected daily. The team also conducted frequent pest control procedures to reduce numbers of insects (especially mosquitos and flies), reptiles and rodents. Although the effects of heat were monitored daily, no temperature related problems were encountered.

The construction of the tented facility, so ably started by the US Marine Corps, was extended and modified extensively and, by the start of the ground war, the new resuscitation and holding facility comprised seven wards (Figure 4) and was surrounded by a comprehensive domestic site.

The wards were timber-framed and protected with chemical-proof covering. All were supplied with lighting and electricity supply outlets and some had refrigerators for storage of medicines. All were air conditioned and contained heaters for night use. However, wooden flooring, shelving and seating were amongst the items that needed to be fabricated to fill the empty tentage.

Triage was undertaken on the aircraft or ambulance as casualties were off-loaded, there being no separate triage facility in the tentage. Initial resuscitation procedures were possible at this stage since the duty Aeromedical Evacuation Co-ordination Officer (AECO) carried the resuscitation officer's 'snatch bag' to all inbound aircraft transporting casualties. Further equipment or assistance, if needed, was requested via an Aeromed Control vehicle parked next to the aircraft. The ASF contained all necessary equipment, drugs and medicines to cater for any

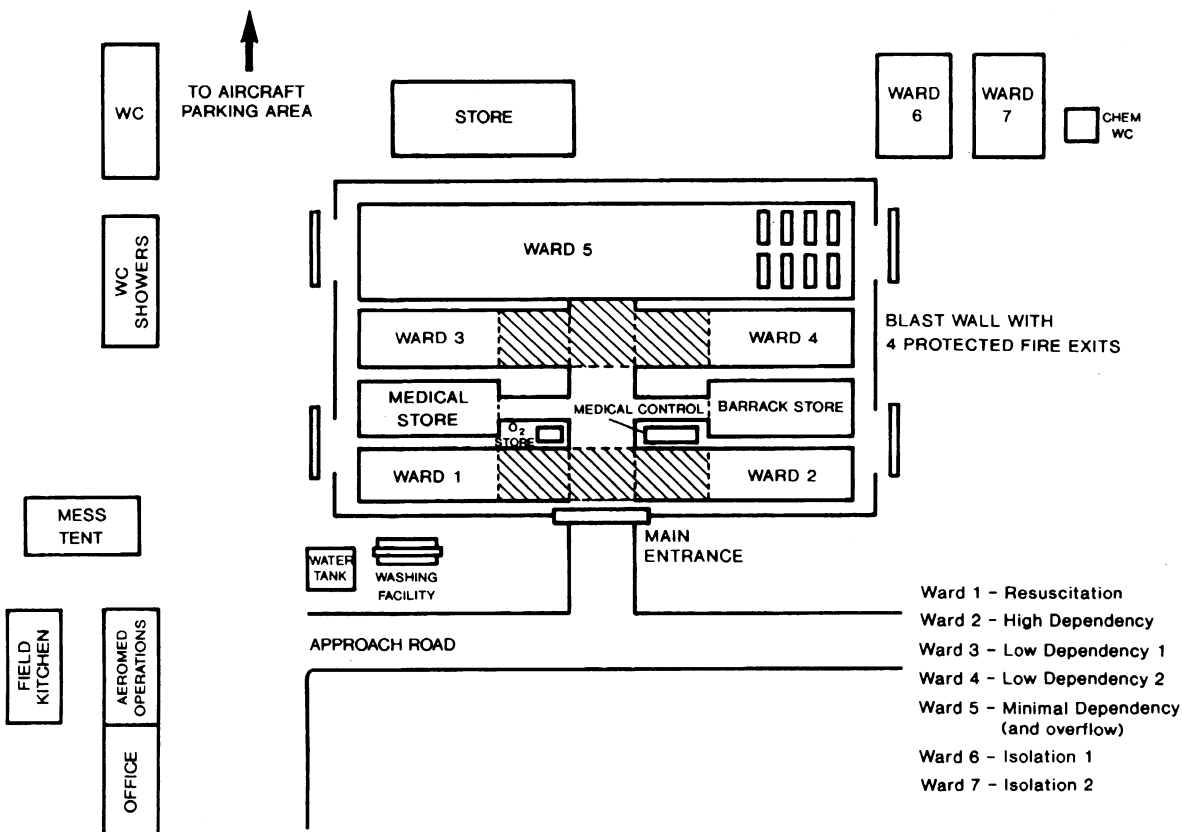


Figure 4. ASF resuscitation and holding facility

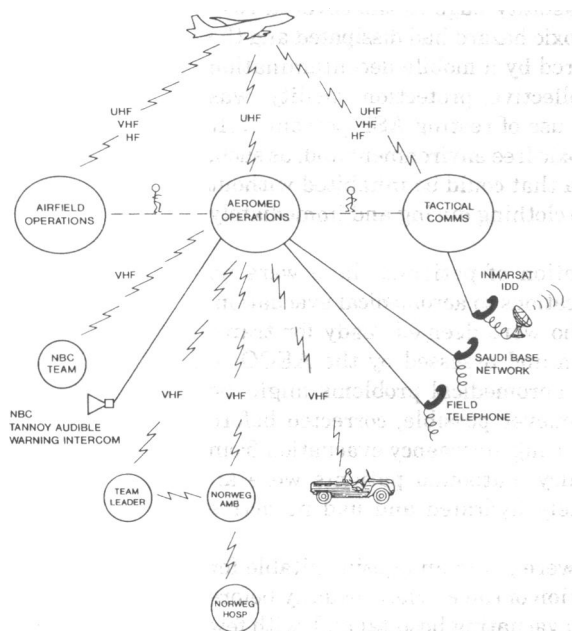


Figure 5. Aeromed operations communications network

procedure recommended in the advanced trauma life support and advanced cardiac life support training protocols. A maximum of six casualties at any one time could be treated in the resuscitation area. In addition, the ASF had the capacity to hold a maximum of 100 non-ambulant stretcher patients and 120 walking wounded. In the event of a mass casualty situation, the ASF accommodation and dining tents were also allocated as overflow treatment and holding areas.

Communications and co-operation

The aeromedical team was a RAF unit operating on behalf of British Forces Middle East on a Saudi owned but USA controlled Air Base. To operate effectively necessitated liaison and co-operation with a large number of collaborating organizations, including numerous British, American and other allied medical units. Without doubt, the essence of smooth and efficient aeromedical operations is good teamwork and communications. The latter may be by radio, telephone, fax, signal (telex) or by word of mouth but, whatever the means, they all require discipline and correct procedures to avoid confusion and the possible transmission of incorrect information. The operational requirement of Al Jubail was for both air-to-ground and ground-to-ground communications. A schematic diagram of the systems utilized is illustrated in Figure 5.

To facilitate the co-ordinated functioning of the ASF, each shift had a nominated Operations Controller who was responsible for communications. He relayed inbound signals and messages to the Commander or other shift officers, and ensured that outbound messages were quickly passed on to the relevant destination authority. He also maintained an accurate and current operations status board, co-ordinated communications between Aeromed Operations and inbound aircraft, airfield and hospital personnel, and was responsible for monitoring the air attack alert warning radio.

Training

With the expectation of hundreds of battle casualties per day, it was assumed that Al Jubail would see very

Table 1. Al Jubail ASF teaching programme prior to the ground war

All Personnel

Aeromedical evacuation in Operation Granby
Jubail operating procedures
The roles of 33 GSH and the Norwegian Field Hospital
Harnesses and stretchers
Stretcher carrying
Loading C.130 and VC10 aircraft
Unloading C.130 aircraft
Casualty flow in the ASF
Basic cardiac life support
Climatic extremes - heat stress
Prevention of infection
Bites and stings
Battle shock
Post traumatic stress disorder in carers
Death and dying
Chemical warfare
Biological warfare
Nuclear warfare

Medical Assistants and Nurses

Advanced first aid techniques
Orthopaedic care
Intravenous cannulation
Care of IVs
Fluid balance
Lifting and turning patients
Pain
Medical equipment
Patient care in an NBC environment
Tubes and drains

Non-medical Personnel

First aid - Haemorrhage
First aid - Shock
First aid - Burns
First aid - Fractures
Lifting and turning patients
Pain
Medical equipment
Patient care in an NBC environment

Nursing and Medical Officers

Handling casualties with multiple injuries
Triage
Airway control, airway adjuncts
Oxygen equipment
Head injuries
Ocular injuries
Maxillo-facial injuries
Shock and fluids
Burns
Abdominal and pelvic injuries
Cardiothoracic injuries
Limb injuries
Spinal injuries
Gunshot wounds and blast
Revision of priorities
Dysrhythmias
Treatment of pulseless VT and VF
Treatment of asystole
Safe use of a defibrillator
Putting advanced primary care skills together
Clinical considerations in aeromedical evacuation

large numbers of patients being evacuated through the air head. Many of these patients could be expected to have deteriorated during the flight from Al Qaysumah, and many would have been unfit for the continuing road journey from Jubail airfield to 33 GSH. It therefore became essential to ensure that all ASF personnel were thoroughly familiar with the casualty handling operating procedures at Jubail airfield and that all non-medical personnel were competently trained in basic and advanced first aid skills. Additionally, all medical assistants were taught basic nursing procedures, and all medical and nursing staff were trained in both advanced cardiac and trauma life support skills. It was vital, also, that medical and nursing staff were competent and confident in all aspects of the clinical care of patients before and during air transportation. Finally, all personnel needed to be well informed on self-protective measures, including operating in a nuclear/biological/chemical (NBC) environment, working in hot climates, prevention of infection, prevention of venomous bites and stings and post-traumatic stress disorder in carers (Table 1). To meet these requirements, a training officer was nominated and two initial one-week training programmes were organized. These included practical procedures and realistic exercises. In addition, advantage was taken of every opportunity to practice casualty handling and flow in the ASF and on C.130 aircraft as they became available.

Operational activity

After notification of an inbound aircraft carrying casualties three immediate response vehicles met the aircraft as it parked. The AECO and team leader then received a handover from the in-flight medical team and those patients who were in urgent need of treatment (tagged with a red peg) were identified for immediate disembarkation and rapidly triaged before transfer to the resuscitation facility.

The remaining patients were unloaded in the order - most seriously injured stretcher patients, less seriously injured stretcher patients and, finally, the ambulant minor injuries. As patients passed the team leader at the rear of the aircraft, he documented names from the most available source (uniform, identity tags or papers) in order that their destinations could be annotated on the manifest.

Good communication between the resuscitation facility, ambulance control and the disembarkation team leader was of the utmost importance. Time was always of the essence, yet not at the cost of undue discomfort to the patients. A smooth transition between loading and unloading was achieved by accurate and timely positioning of the ambulances and by frequent practice of the teamwork and co-operation required to unload large numbers of stretchers. The end result was minimal inconvenience to patients and rapid turnaround of aircraft.

Ambulances arriving at the ASF facility were met by a reception team who unloaded the P1 casualties into the resuscitation area. The shift medical officer then assessed and, if necessary, resuscitated the casualties, assisted by the AECO and nursing and paramedical personnel.

In the event of the site becoming contaminated with chemical or biological weapons, casualties were to be

held in chemical casualty bags in the covered ASF complex until any toxic hazard had dissipated and the area had been cleared by a mobile decontamination team. A small collective protection facility was constructed for the use of resting ASF personnel. It was designed as a toxic-free environment and, as such, it was the only area that could be inhabited without full NBC protective clothing during and immediately after an attack.

In the transportation of patients, there were no absolute contraindications to aeromedical evacuation, but all patients who were deemed ready for transportation were seen and assessed by the AECO so that any potential aeromedical problems might be identified and, whenever possible, corrected before flight. Other than during emergency evacuation from the location of injury, outbound patients were all stabilized, adequately hydrated and had no active haemorrhage.

Patients in pain were given analgesia suitable for the mode and duration of the journey, usually before departure from the evacuating hospital and, with few exceptions, movement of postoperative patients was delayed for at least 24 h after surgery.

The decision to evacuate any patient by air was made with the best interests of the patient in mind. A clear understanding of the physical and physiological stresses of flight was essential, and decisions took account of the latest information on flight times, delays, flight duration, stop-overs and the level of medical care available at each stage in the evacuation chain.

For the duration of the conflict a total of 848 casualties were transported down the RAF evacuation chain. Of these, over 75% were transported through the ASF at Al Jubail yet, fortuitously, less than 50 were battle casualties. The remainder were patients who had been involved in other forms of trauma (falls, RTAs, accidental discharge of weapons, etc) or who were suffering from any one of the normal range of surgical or medical conditions that might be expected in a catchment of 40 000 patients.

Conclusions

Despite intensive preparations in terms of construction, supply, training and planning, the incredible speed of the allied victory resulted in few battle casualties and a serendipitous under-utilization of the evacuation chain. Nevertheless, the size of the operation, its complexity and the need for co-operation between services and countries has taught us many valuable lessons, not least in the areas of communications and organization. For the first time in its history, the RAF was required to operate a number of resuscitation-equipped aeromedical staging facilities within a war zone. The knowledge and experience gained by both regular and auxiliary personnel in terms of both their personal and medical skills can only prove beneficial as they return to their peace-time occupations.

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