



# Special Report

**OPERATIONS DESERT SHIELD  
AND DESERT STORM:**

**THE LOGISTICS PERSPECTIVE**

**ASSOCIATION OF THE UNITED STATES ARMY**

# OPERATIONS DESERT SHIELD AND DESERT STORM: THE LOGISTICS PERSPECTIVE

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## FOREWORD

This special report narrates the broad logistical aspects of Operations Desert Shield and Desert Storm. While it focuses on the U.S. Army, it recognizes that the conduct of military operations in the Persian Gulf region was a combined operation involving allied forces and a U.S. joint effort of the Army, Navy, Air Force and Marine Corps, all backed by the civilian employees of the Department of Defense, U.S. industry and the American people. The success of the war is a tribute to the many active and reserve units and individual soldiers who participated in and supported the operations.

This is intended as a companion piece to the June 1991 Special Report *The U.S. Army in Operation Desert Storm: An Overview*, which describes the conduct of combat operations. It is not intended as a logistics textbook or as a critical analysis of lessons learned. Rather, it is a report designed to give the reader a grasp of the magnitude and complexity of the logistics support involved. It was authored by Colonel James D. Blundell, USA Ret., Assistant Director of the AUSA Institute of Land Warfare.

A handwritten signature in black ink, appearing to read "J. N. Merritt". The signature is stylized with a long horizontal line extending to the right.

JACK N. MERRITT  
General, USA Ret.  
President

September 1991

## **DEDICATION**

This AUSA Special Report on the logistical support of Operations Desert Shield and Desert Storm is dedicated to the memory of the 28 logistics soldiers of the U.S. Army Reserve who made the supreme sacrifice for their country during an Iraqi SCUD missile attack on 25 February 1991.

# **OPERATIONS DESERT SHIELD AND DESERT STORM: THE LOGISTICS PERSPECTIVE**

## **INTRODUCTION**

On August 2, 1990, the military forces of Iraq invaded Kuwait. Within 24 hours Iraqi military forces had gained control of the Emirate and defeated or ejected the Kuwaiti armed forces. By August 6, the Iraqi Army was postured to continue military operations against Saudi Arabia. In light of the imminent threat, the Saudi head of state, King Fahd, requested U.S. military assistance to defend the sovereignty of Saudi Arabia.

On August 6, the president of the United States ordered U.S. military forces to commence deployment to the Persian Gulf region as part of Operation Desert Shield. The first Desert Shield soldiers arrived in Saudi Arabia by airlift on August 8 and the first fast sealift ship carrying Army unit equipment was underway on August 13. This was the beginning of a complex military deployment, at great distances, to an environmentally demanding operational area.

There were four straightforward U.S. national policy objectives in responding to Iraq's aggression:

- immediate, complete and unconditional withdrawal of all Iraqi forces from Kuwait;
- restoration of Kuwait's legitimate government;
- security and stability of Saudi Arabia and the Persian Gulf;
- safety and protection of the lives of American citizens abroad.

To achieve these objectives, the United States would ultimately send over half a million soldiers, sailors, airmen, marines, coast guardsmen and civilians to the Persian Gulf region. Backed by United Nations resolutions, U.S. military forces and the military forces of 38 other nations (see appendix) undertook the task of deterring an Iraqi attack on Saudi Arabia (Operation Desert Shield). When U.N. sanctions proved ineffective and Iraq failed to withdraw from occupied Kuwait, the allied coalition forcibly ejected Iraqi military forces from Kuwait (Operation Desert Storm).

The extensive allied air campaign, launched on January 17, 1991, paralyzed the air, ground and sea capabilities of the Iraqi armed forces. The allied ground campaign, which commenced on February 24, delivered a devastating defeat of the Iraqi Army, thus prompting President Bush to declare a cease-fire on February 28, 1991, only 100 hours into the ground war. For discussion of the conduct of the military campaign see AUSA's Special Report *The U.S. Army in Operation Desert Storm: An Overview*; dated June 1991.

This special report focuses on the logistical aspects of the operation. It is a description of the magnitude and complexity of the logistics effort, to include its successes and problems. The report is a broad overview and is based on material available at the time of preparation. It does not attempt to be all-inclusive. Serious logisticians will note voids, particularly with regard to medical, construction and maintenance activities. While important, proper attention to these technical areas will have to await the assessment of detailed after-action reports still in progress.

## **LOGISTICAL SUPPORT OF MILITARY OPERATIONS**

Logistics encompasses the materiel and services needed to sustain the conduct of military operations aimed at achieving specific objectives. Materiel includes organizational items (e.g., unit equipment, ammunition, spare parts, fuel and lubricants) and individual items, such as food, water, clothing and personal equipment. Services include maintenance and repair of equipment, transportation of people and supplies, medical treatment and evacuation, construction, and provision of individual services such as mail delivery and sanitation facilities.

The logistical support of Operation Desert Shield (aimed at both the deterrence of further Iraqi aggression and the defense of Saudi Arabia) and Operation Desert Storm (aimed at ejecting Iraqi military forces from Kuwait) included these same materiel and service requirements. However, the logistical support requirements and planning were in many ways unique. Long before the crisis, Saudi Arabia had started a program to modernize its armed forces, principally under the U.S. security assistance program. They had constructed a coastal logistics infrastructure of sea- and airports, military bases and a rudimentary inland road system, thus making unnecessary the massive construction effort so often required in a new theater of operations.

The host nation, Saudi Arabia, and other coalition countries provided transportation, water, food, fuel and support personnel, further reducing the demands on U.S. military resources. Time also worked in favor of the allies as limited strategic lift assets were pressed into service. The lack of inland infrastructure in Saudi Arabia, particularly supply bases and extensive roadways, required a measured pace of unit personnel deployments by airlift to coincide with the arrival of unit equipment and supplies by sealift. Still, the logistics challenges were massive in scale and magnified by the complex force structure deploying to the region. Only the United States had the wherewithal to organize the strategic move of personnel and materiel over vast distances to Southwest Asia, and the theater management capabilities and organizations to receive, control and distribute the materiel necessary to support the operation.

For discussion purposes, the logistical support of Army operations in the Persian Gulf region is divided into three parts: strategic, theater and division. The strategic overview involves the movement of personnel, equipment and supplies to the Persian Gulf region to posture them to accomplish their assigned objectives throughout the period of the operation. The theater perspective involves the reception and onward movement of

personnel, equipment and supplies within the theater of operations, configured in a manner to best support the campaign plan. The division level includes the activities of theater, corps and organic divisional support units to sustain the combat divisions.

In combination, these three perspectives illustrate the magnitude and complexity of the present-day logistical capabilities needed by the Army in a contingency operation. Still, each contingency operation is unique; logistical support must be tailored to the particular environment and operation to be conducted. Above all, flexibility and adaptability to meet unusual, unique and unforeseen requirements are essential to success.

## **STRATEGIC PERSPECTIVE**

During the Desert Shield phase (August 8, 1990, to January 16, 1991), the buildup of military forces in the Persian Gulf region established sufficient defensive capability in theater to deter and, if necessary, repel further Iraqi aggression. To accomplish these objectives required the rapid movement to the Persian Gulf region of military units prepared to conduct combat operations if required. In order to ensure the arrival of the greatest possible amount of combat power during the crucial early days of the crisis, the decision was made to defer deployment of logistics forces and give priority of deployment to combat forces.

To undertake the deployment and the massive logistics challenge required the assets of the Total Army—active and reserve components—and Army civilians. To commence and sustain the preparation, movement, reception and distribution of personnel, equipment, supplies and services throughout the Gulf region required the coordinated efforts of literally thousands of individuals and units. While ultimately one-third of the Army was to become directly involved in the Gulf operation, a far greater proportion of the Total Army provided the needed support.

### **Deployment by Air- and Sealift**

The deployments of U.S. Army units to the Persian Gulf were principally made from the United States and Europe through air- and seaports in Saudi Arabia. The initial deployment of one corps-size force (XVIII Airborne Corps) in August was followed by a second corps-size force (VII Corps) in November. The major organizations of the two corps that deployed in whole or part are depicted in table 1.

The two corps that deployed to the theater of operations in the Persian Gulf region were under the operational control of Army Central Command, the land force component of the United States Central Command (USCENTCOM). USCENTCOM, comprising land, sea and air component commands, was composed, at its peak strength, of 539,000 personnel. All the U.S. military services were represented. The Army element totalled 303,500 personnel.

**TABLE 1**  
**ARMY DEPLOYMENTS TO THE**  
**DESERT SHIELD THEATER OF OPERATIONS**

**Phase I**

82d Airborne Division, Fort Bragg, NC  
 24th Infantry Division (Mechanized), Fort Stewart, GA  
 197th Infantry Brigade (Mechanized), Fort Benning, GA  
 HQ, XVIII Airborne Corps, Fort Bragg, NC  
 101st Airborne Division (Air Assault), Fort Campbell, KY  
 3d Armored Cavalry Regiment, Fort Bliss, TX  
 1st Cavalry Division, Fort Hood, TX  
 1st Brigade, 2d Armored Division, Fort Hood, TX  
 11th Air Defense Artillery Brigade, Fort Bliss, TX  
 XVIII Airborne Corps Artillery, Fort Bragg, NC  
 III Corps Artillery (elements), Fort Sill, OK  
 1st Corps Support Command, Fort Bragg, NC  
 13th Corps Support Command, Fort Hood, TX  
 12th Combat Aviation Brigade, Germany  
 3d Armored Division (aviation elements), Germany  
 7th Medical Command, Germany  
 HQ, 3d U.S. Army, Fort McPherson, GA

**Phase II**

1st Infantry Division (Mechanized), Fort Riley, KS  
 1st Armored Division, Ansbach, Germany  
 3d Armored Division, Frankfurt, Germany  
 2d Armored Cavalry Regiment, Nuremburg, Germany  
 2d Corps Support Command, Stuttgart, Germany  
 HQ, VII Corps, Stuttgart, Germany

During the first six months of the buildup, 296,000 soldiers deployed to the region. Approximately 2.3 million short tons (STONS) of Army equipment and supplies were moved. The relative magnitude of the Desert Shield deployments is put into perspective when compared with deployments during the Korean War and the Vietnam War (table 2).

**TABLE 2**  
**HISTORICAL ARMY DEPLOYMENTS (SIX MONTHS)**  
**SEA- AND AIRLIFT COMBINED**

	Passengers	Cargo (STONS)
Korean War	45,800	1,622,200
Vietnam War*	168,400	1,376,400
Saudi Arabia	295,800	2,280,000

\*Figures are for all of 1965.



Almost all soldiers were deployed to Saudi Arabia by air and usually arrived within 48 hours of departure. Approximately 45,800 Army personnel were deployed to Korea by air and 85,600 (for all of 1965) to Vietnam.

The amount of Army equipment and supplies shipped to Saudi Arabia in six months totaled 2,280,000 tons, most of it by sealift. In a similar period 1,622,000 tons were shipped to Korea and 1,376,000 tons were shipped to Vietnam.

The magnitude of the tonnage and speed of lift to Saudi Arabia reflect advances in sealift and airlift capabilities and the advance planning and preparations by the military services. The relative contributions of airlift and sealift to the transport of personnel and cargo to Saudi Arabia in the initial six months are summarized in table 3.

	<b>Personnel</b>	<b>Percent</b>	<b>Cargo (STONS)</b>	<b>Percent</b>
Airlift	293,000	99.05	175,000	7.68
Sealift	2,800	.95	2,105,000	92.32
<b>TOTAL</b>	<b>295,800</b>	<b>100.00</b>	<b>2,280,000</b>	<b>100.00</b>

To undertake the deployment of the personnel and equipment of the units listed in table 1 required the strategic lift capabilities of the Air Force and Navy, the reserve capabilities of the Civil Reserve Air Fleet (CRAF), Ready Reserve Force (RRF) ships and prepositioned ships. Contract air carriers and U.S.- and foreign-flag ships were also used in significant quantities to supplement the lift capabilities of the military services, i.e., Military Airlift Command (MAC) and Military Sealift Command (MSC).

### **Civil Reserve Air Fleet**

The Civil Reserve Air Fleet (CRAF) is a program in which commercial airlines agree to make aircraft available for military deployments in exchange for peacetime military business. On August 18, 1990, the Military Airlift Command activated stage one of the CRAF because the lift requirements for Desert Shield exceeded the capabilities of military airlift assets and those of civil air carrier volunteers. Stage one involved 38 long-range passenger and cargo aircraft, to be available 24 hours after activation.

On January 17, 1991, the Secretary of Defense exercised his authority to activate stage two of CRAF, making available an additional 187 aircraft. Eventually, 79 stage two aircraft were under contract to the Military Airlift Command. The combination of CRAF and

military aircraft in support of Desert Shield provided the capability to airlift 5,000 passengers per day.

Over 15,400 flights were flown by military and civil aircraft under control of the Military Airlift Command throughout Operations Desert Shield and Desert Storm deployments. The flights carried more than 484,000 passengers and more than 524,000 tons of cargo. From the east coast of the United States, aircraft flew 6,000 nautical miles to Saudi airfields; from the west coast, the air route is 8,200 nautical miles.

For perspective, consider that by the sixth week of Operation Desert Shield the combined efforts of military and civil aircraft had flown the equivalent cargo of the entire Berlin airlift, which took 65 weeks. In just 16 weeks the combined military and civil airlift assets had carried the same cargo tonnage as two and one-half Berlin airlifts.

During a December 3, 1990, hearing before the Senate Armed Services Committee, General Colin L. Powell, chairman of the Joint Chiefs of Staff, summarized the extent of the airlift up to that point:

The Desert Shield deployment is one of the largest and most successful deployment operations in our nation's history. The United States has airlifted over 200,000 personnel and some 210,000 short tons of equipment. Over 90 percent of the Military Airlift Command is committed and over 6,400 missions have been flown. This is comparable to moving the entire city of Richmond, Virginia, 8,000 miles to the Saudi desert.

CRAF and volunteer air carriers delivered 22 percent of the air cargo and 69 percent of the air passengers, while MAC aircraft delivered the remainder.

### **Contract, Prepositioned and Ready Reserve Force Ships**

More than eight division-equivalents of equipment were shipped to the Persian Gulf region, principally to seaports and airfields located in Saudi Arabia. In excess of 86 percent of cargo tonnage totalling two million tons went by sealift and involved more than 500 ships. Transoceanic crossing distance by sealift from the east coast of the United States to Saudi Arabia is 8,450 nautical miles; from the west coast the distance is 11,200 nautical miles. The distances involved are far greater than the transoceanic supply routes of World War II (where the distance from the east coast of the United States to Normandy was 4,000 nautical miles) and the Vietnam War (where the distance from the west coast to Vietnam was 6,000 nautical miles).

Chartered commercial ships carried 37 percent of all unit equipment (U.S.-flag ships carried 15 percent while foreign-flag ships carried the remaining 22 percent). The lack of roll-on/roll-off (RO/RO) ships in the U.S. merchant marine required chartering foreign-flag RO/RO vessels. RO/RO ships are particularly advantageous because they have large capacity and require less time to load and unload.

In addition to contract U.S.- and foreign-flag ships, fast sealift, prepositioned and Ready Reserve Fleet (RRF) ships were available. The fast sealift ships (FSS), which have both container and RO/RO capabilities, were particularly valuable because they could steam at more than 30 knots and arrive at Saudi ports in 12-15 days; most other ships, making 15-18 knots, arrived in three weeks. Eight FSS ships were initially available to provide a versatile means of transport for unit equipment. Seven FSS ships (one had a major breakdown) delivered over 13 percent of Army cargo. By comparison, 116 World War II Liberty ships would have been required to move the same tonnage.

The strategic reserve sealift system that had been put into place to support military contingencies was activated according to the following timetable: President Bush ordered the deployment of military forces to Saudi Arabia on August 6, 1990; the first prepositioned ship departed for the region on August 7; the first 18 ships of the RRF were activated on August 10; the first ship loaded with equipment of the 24th Infantry Division departed for Saudi Arabia on August 13; and the first prepositioned ship arrived at a Saudi Arabia port on August 17. A total of 38 RRF ships had been activated by August 20.

The arrival, only 10 days after alert, of the first prepositioned ship with essential materials for Army units reflects the important role this asset can play in a major contingency operation. The Army maintained four prepositioned ships for contingency purposes. One ship sent to the Persian Gulf region, the *American Cormorant* (figure 1), contained landing craft, container handling equipment, barges, tugboats, cranes, forklifts and other equipment needed to conduct port operations; the ship also carried a supply of spare parts for the watercraft and materials handling equipment.

The other three prepositioned ships for the Army contained critical supplies needed to sustain soldiers until supply lines could be established. They carried equipment to support ground operations. The items on board included rations, packaged products, concertina wire, barbed wire, pickets, conventional ammunition and medical supplies. Additional prepositioning ships provided supply support to the other services. For example, 13 maritime prepositioning ships preloaded with equipment and supplies to support Marine expeditionary forces for 30 days were deployed to the Gulf region.

Strategic sealift assets are available in times of crisis from the National Defense Reserve Fleet. The most significant are the 96 ships of the Ready Reserve Fleet. These include the FSS ships discussed above, break-bulk cargo ships and barge carriers that are supposed to be maintained in a state of readiness for alert in five, 10 or 20 days. A total of 79 ships of the RRF supplemented the cargo-carrying capacity of available U.S. Navy and U.S.- and foreign-flag commercial carriers.

There were delays in activation of certain RRF vessels because some ships had deteriorated as a result of prior-year cuts in maintenance and exercise funding and qualified manpower availability was strained. Consequently, the median activation time was 11 days. However, once brought up to operating condition, RRF ships had a 93 percent reliability rate and carried 28 percent of the cargo for U.S. forces.



**Fig. 1. The Army Prepositioned Ship *American Cormorant* deployed to the Persian Gulf.**

### **Industry Support**

The surge of operations by the Army and other services would quickly consume the various supplies on hand for peace-time training. To sustain the Persian Gulf deployment and operations required the support of U.S. industry to respond to new and increased demands. To ensure the availability of adequate supplies in the Gulf region, the Defense Logistics Agency (DLA) and the Army Materiel Command (AMC) undertook massive contracting efforts for increased production of consumable items.

DLA processed more than 40,000 contracting actions with over 1,000 contractors in support of all the services. The estimated value of the contracts was over \$4.6 billion for the accelerated production and delivery of desert uniforms, chemical defense clothing, desert boots, rations, repair parts, equipment, weapons and fuel. By way of illustration, \$175 million in contracts were let for the production of 5.2 million desert uniforms and \$63.1 million for the manufacture of 1.4 million pairs of desert boots.

AMC processed over 4,000 contracts with 1,500 contractors at an estimated value well over \$2 billion. The contracts were for accelerated production and delivery of such items as munitions, water systems, repair parts, chemical and environmental systems, generators and maintenance and support systems.

U.S. industry suppliers not only increased production to meet the greatly increased demands for supplies, but also undertook numerous measures to overcome special equipment needs and problems created by the desert environment. Some examples are equipment shackles to secure tanks for overseas movement, greatly increased demand for engine filters and propeller shafts for heavy transport vehicles.

### Reserve Components

The Total Army was involved in the full range of military operations. But nowhere was the role of the reserve components (RC)—Army National Guard and Army Reserve—more evident than in logistical support. Over 70 percent of the required combat service support capability of the Army is in the RC; 85 percent of the support for units above corps level is also in the RC.

As shown in table 4, more than 1,000 Army RC units of all types were called to active duty. A total of 139,500 RC personnel served in units or as individuals worldwide, 74,000 in Southwest Asia. Over two-thirds of those in Southwest Asia were involved in combat service support activities.

<b>Location</b>	<b>RC Units</b>	<b>Personnel</b>
Southwest Asia		
Combat	8	2,900
Combat Support	175	19,900
Combat Service Support	509	51,900
Other	16	1,000
Europe	41	9,500
United States	284	39,300
Individuals		14,900
<b>TOTALS</b>	<b>1,033</b>	<b>139,400</b>

The Army, in its deployment to and operations in the Gulf region, could not have functioned effectively without sustainment support from RC units. The functions of the combat service support units that were deployed to Southwest Asia included adjutant general, finance, judge advocate, military history, public affairs, civil affairs, medical, transportation, ordnance, maintenance, quartermaster, petroleum, port operations and supply units.

In addition, close to 300 Army RC units performed duties in the United States, in many cases to backfill the support functions normally performed by active units, but also

to assist units in the process of deploying overseas. RC units were involved in installation support, port operations, depot support functions and medical, transportation and maintenance activities.

## **THEATER PERSPECTIVE**

The strategic aspects of logistical support for Desert Shield and Desert Storm entailed the preparation and movement to Saudi Arabia of personnel and materiel from the United States, Europe and other bases worldwide. The specific mission of the Desert Shield theater logistics command was to prepare for and receive the mass of personnel and equipment required and to sustain the forces in the region.

### **Theater-level Logistical Support**

The principal theater-level logistics mission involved the reception, onward movement and sustainment of U.S. forces in the Southwest Asia theater of operations. The theater of operations for Desert Shield was Saudi Arabia, a country of 250,000 square miles (about one-third the size of the continental United States), most of it uninhabited desert. The extremes of the desert environment are inhospitable to personnel and equipment, thus compounding the support required to sustain major military operations. Saudi Arabia, its central position in the Persian Gulf region and the major ports through which U.S. personnel and supplies would disembark are depicted in figure 2. The primary seaports of debarkation were Dammam, Jubail and in neighboring Bahrain. The primary airports of debarkation were Dhahran, Riyadh and King Khalid Military City (KKMC).

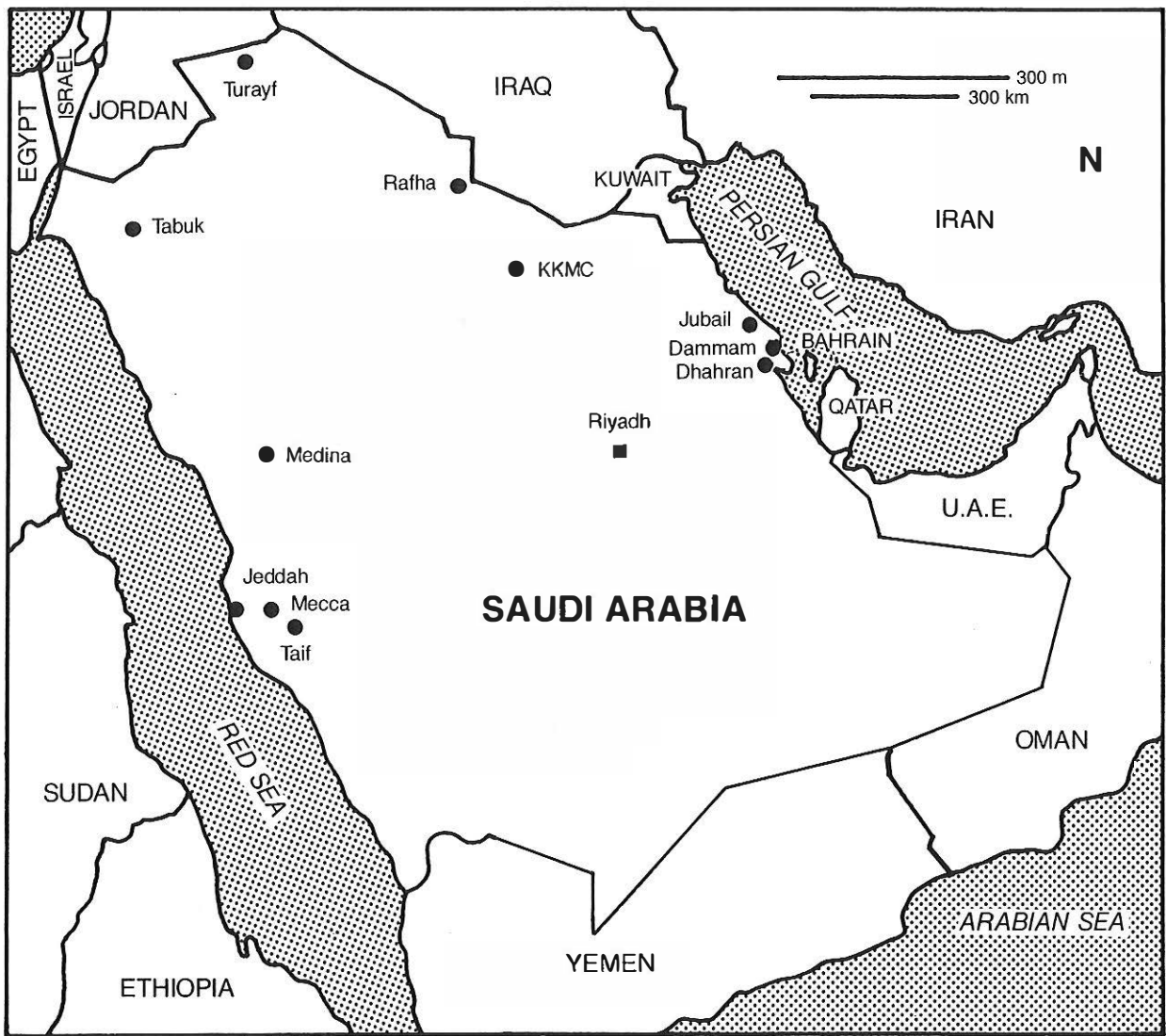
Though Saudi Arabia had modern seaports, airports and a limited number of modern roadways capable of receiving the deploying forces, there was no logistical infrastructure to feed, shelter and supply a force of the size being assembled. The rapid and early movement of combat forces to the theater meant the responsible theater logistical command had to simultaneously coordinate the reception and support of incoming units while building logistical bases beyond the ports of entry.

A provisional theater support command headquarters (later designated 22d Support Command) was established on August 10, 1990, to coordinate the arrival of the first units and the logistical support to be provided by the allies and the host nation, Saudi Arabia. The airfield at Dhahran was made the primary aerial port of debarkation and the ports at Dammam and Jubail were designated as the primary sea ports of debarkation.

The provisional headquarters had two missions:

- first, to develop an Army-level support command using arriving U.S. units and host nation elements;
- second, to provide theater-wide logistics support for reception, onward movement and sustainment of U.S. and combined forces.

By the end of August, the mechanisms were in place for the immediate provision of basic necessities for arriving troops, i.e., shelter, food, water, sanitation and postal service.



**Fig. 2. Saudi Arabia**

A key element in providing this support and establishing bases and lines of communications was the close coordination and cooperation between the support command and the Saudi Arabian government. The coordination of logistics matters, including in-country contractor support, was carried out by a cell in the theater logistics operations center of the 22d Support Command. Here, arrangements were made for the provision of fresh food and bottled water and for the allocation of temporary camps for arriving units.

To supplement the support available at the air- and seaports of debarkation, major logistical bases were established to support the arrival of the first corps-size force (XVIII Airborne Corps). Provisional area support units (at Dhahran, Riyadh and other locations) were also organized to coordinate support for echelons above corps. By the end of September, 72,000 personnel of the XVIII Airborne Corps were being supported. By October 30, most elements of that corps had arrived, raising the total number of troops supported to 97,000.

On November 8, 1990, the president ordered a second corps to the theater to prepare for possible offensive operations to free Kuwait. The VII Corps from Europe and units from the United States (table 1) deployed to the region over the next two months. The extent of support from U.S. European allies in the movement of VII Corps units to ports of embarkation must be appreciated. The movement required 465 trains, 312 barges and 119 ships. A total of 578 aircraft and 140 ships were required for the move to Saudi Arabia. Heavy equipment and vehicles arrived through the seaports of Dammam and Jubail. The VII Corps troops were initially billeted in a complex near the Dharan International Airport.

### **Logistical Preparations for the Ground Campaign**

To provide support for deployed units of XVIII Airborne Corps and VII Corps during Operation Desert Shield and to be prepared to logistically support future combat operations—what would become the Desert Storm ground campaign—the theater support command established additional logistical support bases to store and distribute supplies. To accomplish this, the allocation of transport and priority for use of highways and lesser roadways had to be closely coordinated.

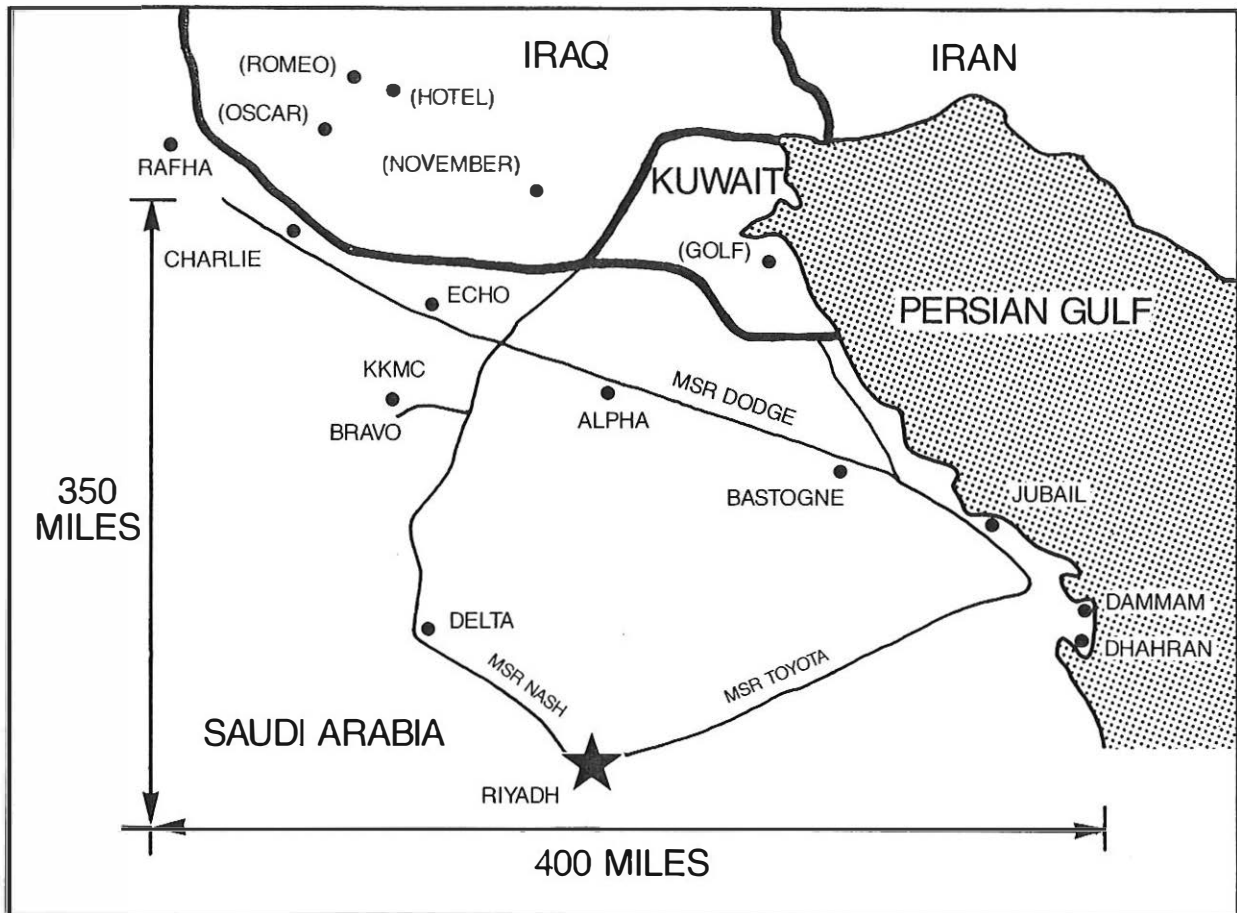
The system of major support bases provided a continuous supply of water, rations, fuel, ammunition and other essential supplies to the deployed corps. This required the repositioning of stocks and supplies from the vicinity of Dhahran and Jubail to new logistical bases north along the main roadway—designated as Main Supply Route (MSR) Dodge—and along the north-south roadway (MSR Nash) adjacent to King Khalid Military City (KKMC).

The series of logistical bases were designated Alpha, Bravo, Charlie, Delta and Echo. These bases were stocked with all classes of supply to support the two corps: Class I (food and water), Class II (clothing), Class III (fuel), Class IV (barrier materials, such as barbed wire and sandbags), Class V (ammunition), Class VII (major items, such as M1A1 tanks, to replace losses), Class VIII (medical) and Class IX (repair parts). Figure 3 shows the major logistical bases and MSR in Saudi Arabia, as well as the support bases that would be established later in support of the ground campaign.

Logistical planning for offensive combat operations was initiated in November upon the decision of the president to deploy a second corps to the region. The theater-level support of Operation Desert Storm—which would commence January 17, 1991, with the start of the air campaign—began in late November 1990. The initial phase involved the repositioning of 22d Support Command units and supplies to the new logistical bases while also supporting the reception and movement of VII Corps.

The next phase involved the movement of the two corps to their attack positions prior to initiation of the ground war. Theater logistics support involved coordination of heavy transportation and the completion of the major forward logistical base for each corps (Charlie for XVIII Airborne Corps and Echo for VII Corps).





**Fig. 3. Desert Shield: Major Supply Routes and Logistical Bases**

The two corps commenced their move to attack positions on January 20; by February 3, both corps had closed in their attack positions. During this movement, theater-level support involved control of the 2,750 miles of main supply routes (MSRs), which carried many thousands of vehicles. The VII Corps alone had over 7,000 tracked vehicles and more than 40,000 wheeled vehicles. Movement control was coordinated by the 318th Movement Control Agency, which allocated blocks of time for each corps to move on the designated MSRs. During the peak period of the move, 18 vehicles per minute passed a single point on the northern route alone. The movement of the units of the two corps, from 300 to 500 miles, continued 24 hours a day for 21 days. Seven convoy support centers were established to provide food and rest for drivers and fuel and maintenance services.

In addition to the vehicles of the two corps, the theater support command provided 1,400 U.S. Army trucks and 2,100 host-nation vehicles to move equipment, particularly armored and mechanized vehicles. Many of the heavy equipment transporters (HETs) that were so critical to the movement of the two corps, were furnished by Saudi Arabia, Egypt and other allied countries; most of the drivers (many of Pakistani, Bangladeshi or other third-world origins) were obtained on contract. These trucks hauled supplies along the 2,750 miles of roadway connecting the series of logistical bases.

## Logistical Support of the Ground Campaign

By February 20, 1991, XVIII Airborne Corps and VII Corps had moved into their attack positions. The ground war began on February 24, 1991.

The continuous buildup of the theater logistics bases proved to be more than adequate to support the forward bases that were established as the ground operations progressed. Theater-level support of the two attacking corps envisioned the throughput of supplies from logistical bases Echo and Charlie to provisional supply bases established in Iraq to sustain the offensive. Because the ground war went so deep into Iraq at such a rapid pace and was of such short duration (100 hours), these provisional logistical bases were not fully established. Instead, many became trailer transfer points where theater trailers were dropped off for corps units to move forward. Figure 4 illustrates the forward movement of supplies to the main corps logistical bases (Charlie and Echo) and the onward movement to provisional bases within each corps area (Oscar, Romeo, Hotel and November).

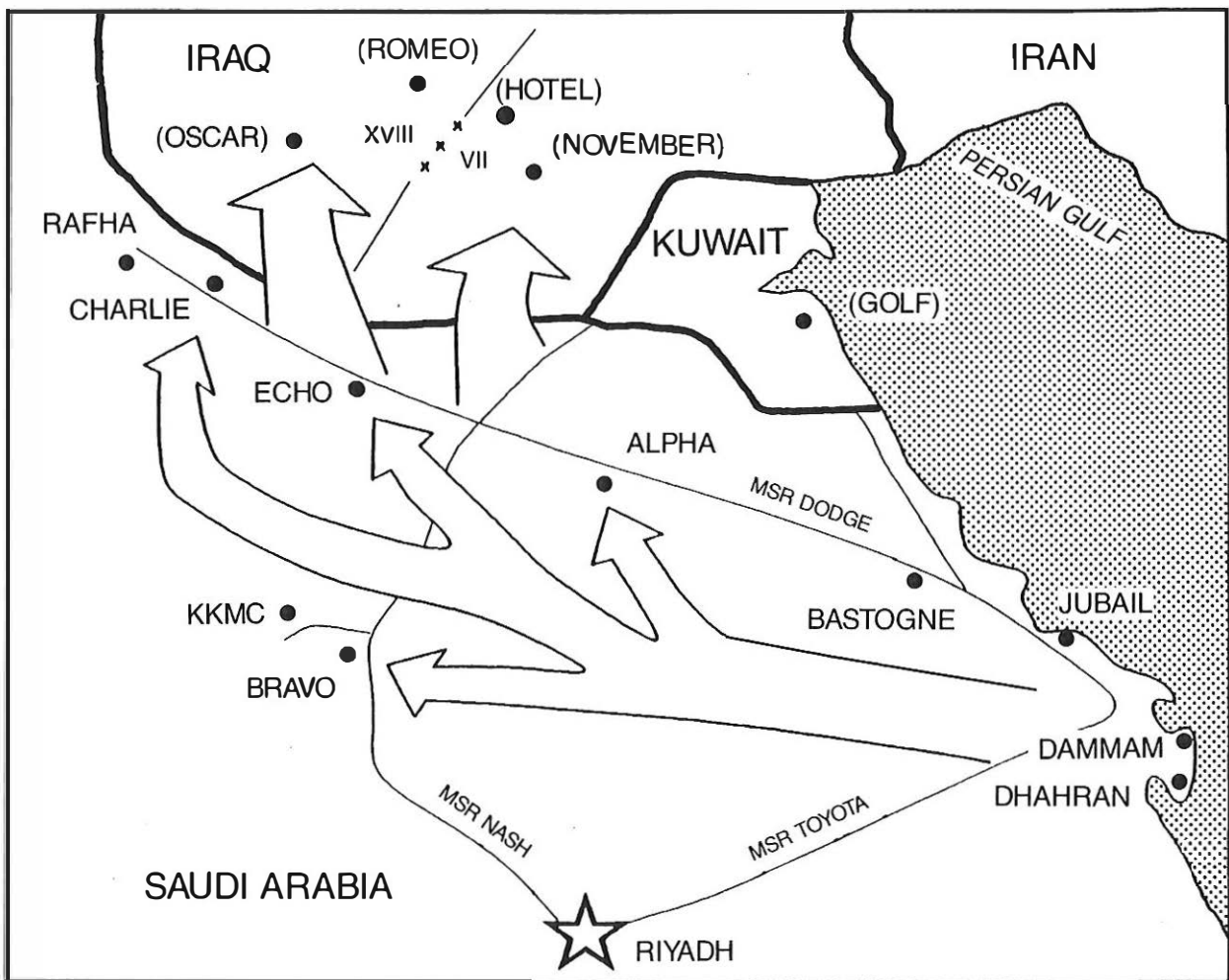


Fig. 4. Operation Desert Storm: Provisional Bases

In addition to food and water, the most critical warfighting supplies required during the conduct of the attack were fuel and ammunition. The daily planned support requirements for the attacking corps are depicted in table 5.

	<b>Ammunition (STONS)</b>	<b>Fuel (Mil Gal)</b>
VII Corps	9,000	2.4
XVIII Corps	5,000	2.1
<b>TOTAL</b>	<b>14,000</b>	<b>4.5</b>

Theater transportation to resupply fuel to the two corps involved almost 900 truck-loads of fuel each day. Ten petroleum, oil and lubricants (POL) companies from the 22d Support Command provided the support. The theater transportation assets needed to support the daily ammunition requirements involved an additional 11 truck companies.

Stockage of supplies at theater logistics bases was critical to the conduct of the offensive, and would have become more critical had the operation been prolonged. By G-Day, the initiation of the ground war, stockages of supplies at theater logistical bases were as indicated in table 6.

	<b>Days of Supply (DOS)</b>
Class I (Food and Water)	29.0
Class III (Fuel)	5.2
Class V (Ammunition)	45.0*

\*By February 28, the stockage level was 60 DOS.

It was realized that the sustainment of these levels of supply for a prolonged period was not possible because the forward bases could not be resupplied fast enough from the now distant ports of entry in Saudi Arabia. However, plans were developed in advance to address this situation, to include the construction by U.S. Army engineers of roads behind the two attacking corps and the use of ports in Kuwait. The shortness of the ground war negated the need to implement these plans.

## **Redeployment and Restoration of Kuwait**

The abrupt ending of the ground war after 100 hours shifted the logistical focus to the sustainment of combat forces in the field who were charged with clearing the enemy from Kuwait and the redeployment of units. With the exception of ammunition, heavy demand continued for other classes of supply.

The focus of redeployment was the preparation of equipment for shipment. Wash sites to remove contaminants from equipment were established at Dammam, Dhahran, Jubail and the King Khalid Military City (KKMC). Redeployment assembly areas were established to prepare equipment for shipment home. At these same sites, morale, welfare and recreation items were provided for redeploying personnel to the extent time and resources would allow.

Redeployments officially began on R-Day, March 10, 1991. By the end of May, virtually all personnel of the two fighting corps had redeployed, while about half of all deployed noncorps units, particularly reserve components, were still in the theater of operations.

Simultaneous with consolidation in the field and the start of redeployments, efforts to restore services in liberated Kuwait began. Large quantities of food, clothing, tents, blankets and medical supplies were transported to Kuwait. Humanitarian relief efforts continued to expand, encompassing refugee camps operated by U.S. units in southern Iraq and in support of the Kurds in northern Iraq. This support effort included 70,000 enemy prisoners of war in four camps who were processed to Saudi control.

## **Overall Logistical Impact**

The success of the theater logistical effort was the result of teamwork on both a joint and combined basis. In addition to the support of Army forces, vital support was also provided throughout the operation to other U.S. military services and to some coalition forces in Saudi Arabia. Support included inland surface transportation, construction support, rations, fuel distribution, medical supplies, mortuary services, barrier materials, spare parts and common munitions.

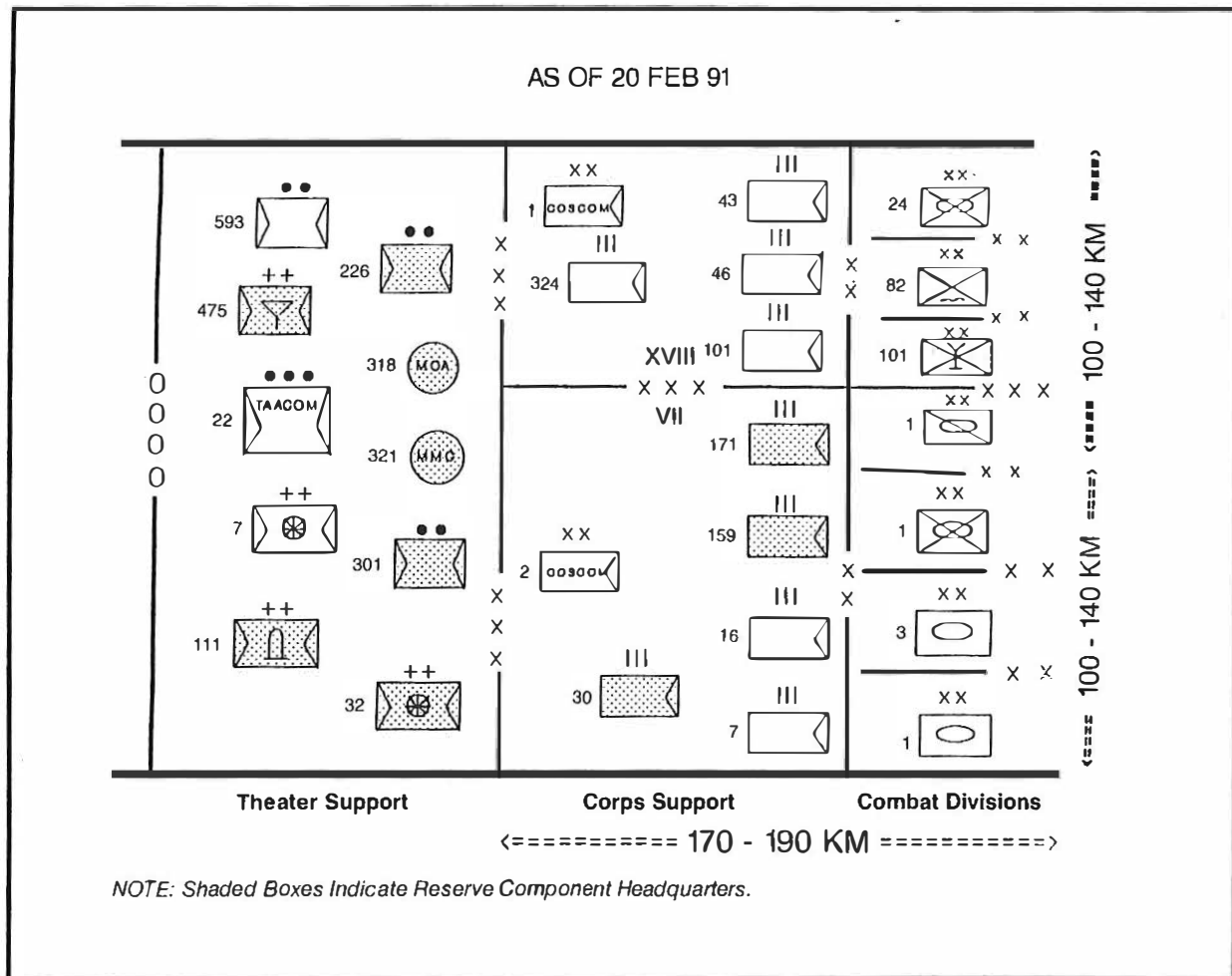
The overall logistical role of the theater-level support units and the critical role they played in the reception of personnel and equipment are illustrated by the following statistics:

- 9,000 aircraft received and discharged;
- 350,000 personnel processed;
- 500 ships received and discharged
  - 2.2 million short tons of cargo
  - 33,000 containers
  - 12,400 tracked vehicles
  - 117,000 wheeled vehicles
  - 1,800 helicopters;
- 94 million meals served;
- 1 billion gallons of fuel pumped;
- 31,000 short tons of mail received;
- 13,000 short tons of mail shipped;
- 35 million road miles driven.

## DIVISION PERSPECTIVE

The logistical perspective of this level of warfare is that of the maneuver elements supported by organic combat service support units and a logistical infrastructure involving the division, corps and theater units. Figure 5 reflects the organizational structure that existed to support the conduct of ground operations.

Each of the seven combat divisions possessed its own support commands to meet short-term supply, maintenance and medical needs. The corps-level logistical support structure included a corps support command (COSCOM) which provided a corps support group in direct support of each division. Each corps support group was composed of a maintenance battalion, supply and service battalion and transportation battalion. Additionally, each corps was supported by a rear corps support group. Division and corps logisticians were in turn supported by theater-level area support groups and functional organizations, to include ammunition, fuel, spare parts and transportation. The role played by the reserve components in providing major support units is evident in figure 5.



**Fig. 5. Logistical Support Structure**

Theater and corps logistical support involved stocking sufficient supplies (particularly water, food, fuel and ammunition) and providing services (to include transportation, maintenance and supply distribution) to ensure that combat operations of the divisions could be sustained for whatever period was required to defeat the Iraqi Army. The logistical support of VII Corps alone involved the provision of supplies to support 1,400 tanks and 1,200 fighting vehicles—the largest armor corps in history.

### **Logistics at the Division Level**

The division is the lowest organizational level at which military operations can be conducted and self-supported for an extended period of time. Seven U.S. Army divisions deployed to Saudi Arabia to carry out assigned missions in Operations Desert Shield and Desert Storm. Rather than presenting a picture of division logistics in the aggregate or attempting to summarize the logistics of each division, this section will describe the logistical operations of one heavy division—the 24th Infantry Division (Mechanized). Then, for comparative purposes, logistics in support of a light division—the 82d Airborne Division—is briefly reviewed. While not all-inclusive, this approach will provide a sensing of the logistical challenges and problems faced by the other divisions.

Each type of division involved in the operation—airborne, air assault, armored and mechanized—had unique capabilities and requirements and, therefore, unique logistical problems. The 24th Infantry Division, like the other divisions, faced logistical challenges that required flexibility and creative solutions. An overview of the division's logistical operations—from deployment to redeployment—follows.

### **Division Deployments**

The 24th Infantry Division (Mechanized), home based at Fort Stewart, Georgia, was alerted for deployment at 0300 hours, August 7, 1990. The division's mission upon arrival in Saudi Arabia was to deter Iraqi attack on Saudi Arabia, to counterattack if required to reestablish the Saudi Arabian border and to be prepared to continue operations to complete destruction of Iraqi offensive capability.

The deployment of the division involved 18,000 soldiers, 1,575 tracked vehicles, 3,500 wheeled vehicles, 90 helicopters and the division's supporting equipment and supplies. The sea deployment of the division's heavy equipment required seven fast sealift ships (FSS) and three roll on/roll off (RO/RO) ships. The first ship departed for Saudi Arabia on August 13, 1990, less than six and one-half days after the division was alerted; the last ship arrived in Saudi Arabia on September 20, 45 days after division alert.

The air deployment of the division's personnel required a total of 57 aircraft—two C-5As and six C-141s from the Military Airlift Command (MAC) and 49 commercial aircraft from the Civil Reserve Air Fleet (CRAF). The first plane departed from Savannah, Georgia, on August 20; the last aircraft landed in Saudi Arabia on September 6. All 18,000 soldiers had arrived in the theater of operations within 17 days of alert.



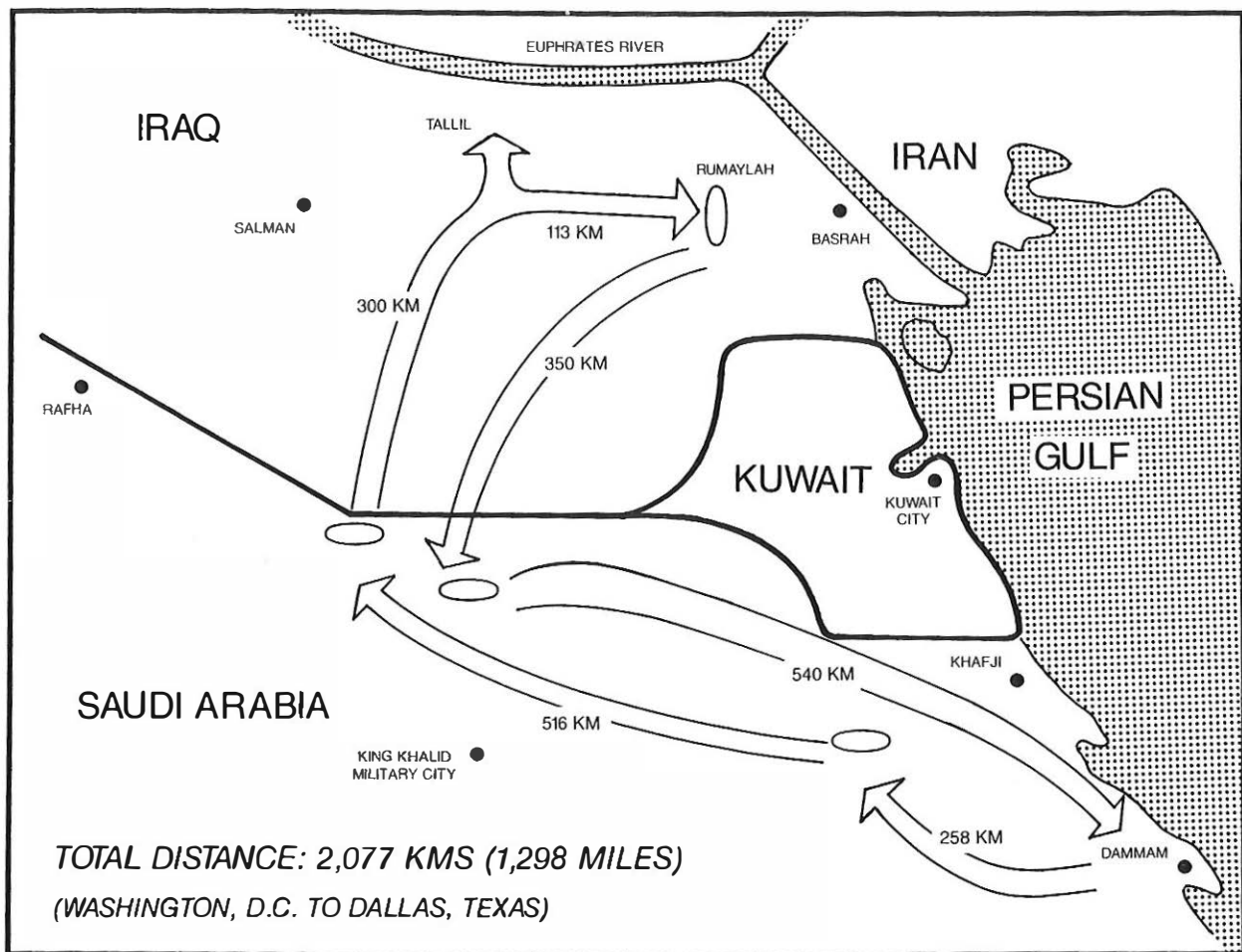
**Fig. 6. Soldiers of the 24th Infantry Division load M1A1 tanks onto heavy equipment transporters upon arrival in Saudi Arabia.**

The division moved from the aerial port of debarkation at Dammam to its initial combat staging areas 77 miles to the west. The 24th Division then moved on to its assigned defensive sector an additional 84 miles to the northwest, where the division was assigned a defensive sector 62.5 miles wide by 75 miles deep and 94 miles from the Iraqi border. As part of the repositioning of the XVIII Airborne Corps to its attack sector in Operation Desert Storm, the 24th Infantry Division moved to its preattack positions, 320 miles west. Figure 7 shows the division's movements during this and subsequent phases.

### **Logistics Buildup for the Ground War**

During the period of Desert Shield when activities included defensive missions, training and maintenance of equipment, the division required 345,000 gallons of diesel fuel, 50,000 gallons of aviation fuel, 213,000 gallons of water, 2,400 tons of ammunition and 208 40-foot tractor-trailers of other supplies each day.

Particularly noteworthy was the procedure established during this period to requisition spare parts. While the theater-level stockage was being established, a system was set up so that the division's spare parts requisitions could be reported directly back to the



**Fig. 7. 24th Infantry Division Movements**

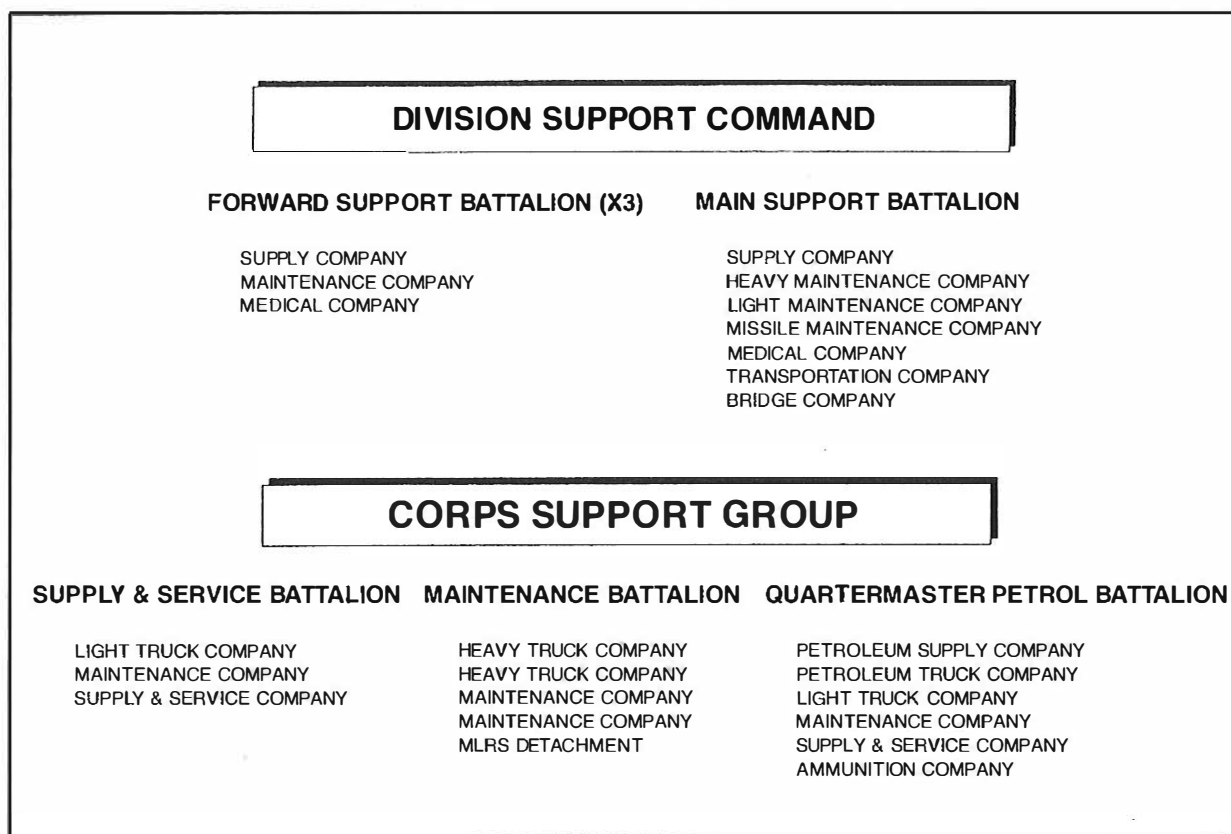
United States each night. Air delivery was made to Dhahran—often within 24 hours for high priority needs—and delivered directly to the division by host nation trucks. The division averaged 70 aircraft pallet loads of spare parts daily.

The division received additional combat support and combat service support units, growing into a combined arms team of 34 battalions and 25,000 soldiers. The number of wheeled vehicles increased from 3,500 to 6,600 and tracked vehicles from 1,575 to 1,790. When the move was made to preattack positions in January, it took 10 days, moving in 67 serials of 150 vehicles each; units were fully loaded with ammunition and were prepared to fight.

The logistics task force in direct support of the division included units from the division's support command, the corps support group and other supporting units. Figure 8 lists the types of units.

Planning for the logistical support of the ground attack envisioned the division support command and corps support group operating from a series of forward operating bases and division support areas. During the attack, supplies would be *leap-frogged* forward to the





**Fig. 8. 24th Infantry Division Logistics Task Force**

support bases. Units would carry sufficient supplies to remain self-sustaining for the first two days of the ground attack (G + 2). Afterward, units were to be supplied by corps throughput of food, fuel, engineer supplies, ammunition and repair parts.

The ultimate purpose of the forward operating bases was to provide the division the capability to distribute supplies, perform equipment repairs and treat wounded as far forward as possible. Mobile fuel stocks (in 5,000-gallon tankers) and ammunition in combat-configured loads (CCL) were pushed forward. To simplify and enhance resupply, ammunition was organized into CCL sets which included specific quantities of each type of munition needed for a major weapon system. A CCL for an M1A1 tank, for example, would include rounds for the 120mm gun, .50 caliber machine gun and 7.62mm machine gun, as well as smoke grenades.

Priority of resupply was fuel, ammunition, spare parts and then water production, storage and distribution. To reduce demand on the distribution system during the upcoming attack, supplies were prepositioned in brigade areas and wells were dug to support water consumption requirements at the preattack positions. The mileage put on tracked and wheeled vehicles was controlled to reduce fuel consumption and repair parts usage. Immediately prior to the ground attack, virtually all of the division's major weapon systems were operational. Only six of 241 M1A1 tanks, six of 221 M2/M3 armored fighting vehicles and one of 72 M109 howitzers were inoperable. All nine Multiple Launch Rocket Systems (MLRS) were operational.

## **Logistical Support of the Division Attack**

When the Desert Storm ground attack commenced on February 24, 1991, the western flank of the XVIII Airborne Corps was secured by the French 6th Armored Division and a brigade of the 82d Airborne Division. The 24th Infantry Division commenced its attack at 1500 hours toward a series of phase lines and specific objectives. Within the 24th Infantry Division zone of attack there were elements of seven Iraqi divisions totalling 138,000 personnel.

The division seized its initial objectives, Tallil and Jallibah Air Bases, by the afternoon of February 27 and then attacked east toward Basrah. The Iraqi theater logistics base was located within the division's attack zone, and 1,300 bunkers containing artillery, air and other munitions were captured. These early successes of the ground and air campaigns had destroyed the Iraqi will to fight, resulting in declaration of a cease-fire by the allies effective at 8 a.m., February 28. By then, the 24th Infantry Division was 30 miles west of Basrah. However, on March 2, a large enemy column of wheeled and tracked vehicles approached the division's security zone. The division successfully engaged the enemy force with a combination of armor, mechanized infantry, attack helicopters and artillery.

The logistical support of the ground war involved the priority resupply of war-fighting materiel to the division. The concept for refueling units in the attack involved use of forward operating bases (FOBs). To support the initial attack, for example, a base was established by a corps support battalion with 60 fuel tankers having a total capacity of 300,000 gallons. Additionally, the division's aviation brigade established a forward area refueling point. The corps support battalion had additional storage capability for 300,000 gallons of fuel. The division's forward support battalions supporting the attacking brigades drew fuel from the FOBs and in turn resupplied the attacking units. In the attack phase, the division consumed 2.4 million gallons of fuel, transported on 475 5,000-gallon tankers.

The distribution of ammunition was accomplished through the supply of combat configured loads (CCL), as described earlier. When a unit ordered ammunition, it was not ordered in terms of a specific quantity of, for example, so many rounds of 155mm high explosive ammunition; rather, the predetermined configuration of munitions was requested. Corps delivered preconfigured CCLs to a division support area and to the forward support battalions of the division. In the attack, the division was supplied with 16,740 tons of ammunition, transported on 700 40-foot tractor-trailers.

At the beginning of the ground war, each unit of the division had three days' supply of water. A day's supply of water was 3.8 gallons per soldier. Three days' supply of water for the division, excluding bulk hauling assets, was almost 300,000 gallons. The bulk water hauling assets within the division area exceeded 500,000 gallons, using water trailers, blivets, tankers and fabric water tanks mounted on trailers. In later phases of the ground attack, water was drawn from several sources, including reverse osmosis water purification units (ROWPUs), tested wells, corps support group and built-up storage capacity within the division support areas. Water consumption exceeded 375,000 gallons during the ground campaign, requiring 75 5,000-gallon water tankers.

## **Post-Combat Operations and Redeployment**

Post-cease-fire operations for the 24th Infantry Division took place between March 2 and March 12, 1991. Though the military focus was on force protection and destruction of captured enemy equipment and supplies, the care of thousands of displaced civilians became a second mission. The division provided more than 120,000 meals, 2,500 gallons of potable water, 550 cases of bottled water and 1,000 blankets to the refugees.

The 24th Infantry Division began its redeployment on March 8, 1991. The initial withdrawal was almost 220 miles to a marshalling area south of the Iraqi-Saudi Arabian border. From this assembly area, the division's tracked vehicles were moved 325 miles by heavy equipment transporters to the port at Dammam for embarkation to the United States. Since arrival in Saudi Arabia, the division had moved a total of 1,300 miles within the theater of operations. The redeployment by sea required 14 ships (three fast sealift ships and 11 RO/RO ships) to return the division's equipment to Savannah Port from April 7 to May 15. The redeployment of personnel required 54 aircraft to return the 18,000 soldiers home.

## **Logistical Support of a Light Division**

As a light division, the 82d Airborne Division is mainly equipped with tactical wheeled-vehicles, whereas a mechanized division like the 24th Infantry Division is equipped with both wheeled-vehicles and tracked-vehicles. The 82d Airborne Division had about 3,200 wheeled-vehicles in Saudi Arabia and the 24th Division had about 3,500. However, the 24th Division also had 1,600 tracked-vehicles, which adds considerably to fuel, spare parts, transport and maintenance requirements. The lighter division is equipped for more rapid airlift to a crisis area. The mechanized division is less rapidly deployable and more dependent on sealift.

With its continuing mission of rapid deployment, the 82d Airborne Division airlifted an initial ready force of 2,300 personnel and their equipment from Fort Bragg, North Carolina, to Dhahran, Saudi Arabia, on August 8-9, 1990. The balance of the division's personnel arrived by air during the first week of September. A total of 12,500 personnel and 1,900 major items of equipment were airlifted using 640 C-141 aircraft-equivalent lifts.

The balance of the division's equipment (1,500 major items) and supplies were deployed from seaports in Wilmington, North Carolina, Charleston, South Carolina, and Jacksonville, Florida. A total of 26 ships of various types, most of which carried other military cargo, were involved in the sealift. The division's equipment arrived in Dammam, Saudi Arabia, by the middle of September. Along with other U.S. Army combat units committed to Operation Desert Shield, the division undertook the mission of defending Saudi Arabia and improving their overall combat readiness.

As part of the massive move to western Saudi Arabia that commenced in late January in preparation for the ground war, the division moved 750 miles from its defensive assembly

areas to the far flank of the XVIII Airborne Corps. The move took 18 days utilizing 722 C-130 aircraft sorties to lift 1,400 High Mobility Multipurpose Wheeled Vehicles (HMMWVs), 56 M551 Sheridan tanks and 9,200 personnel. Land transportation involved the use of 250 tractor-trailers to move the balance of the division's equipment and other wheeled-vehicles to move the personnel. In total, the move involved a shift into western Saudi Arabia of 16,300 personnel, 111 aircraft, over 3,000 pieces of equipment and 84 tracked vehicles.

Host nation transportation support included 20 tractor-trailers, 20 lowboys and 35 busses. Additionally, four reserve component truck companies, consisting of 50 five-ton cargo trucks and 10 five-ton tractors each, were attached to the division during Desert Storm. The division also received additional two-and-one-half-ton and five-ton trucks, which were manned by division personnel.

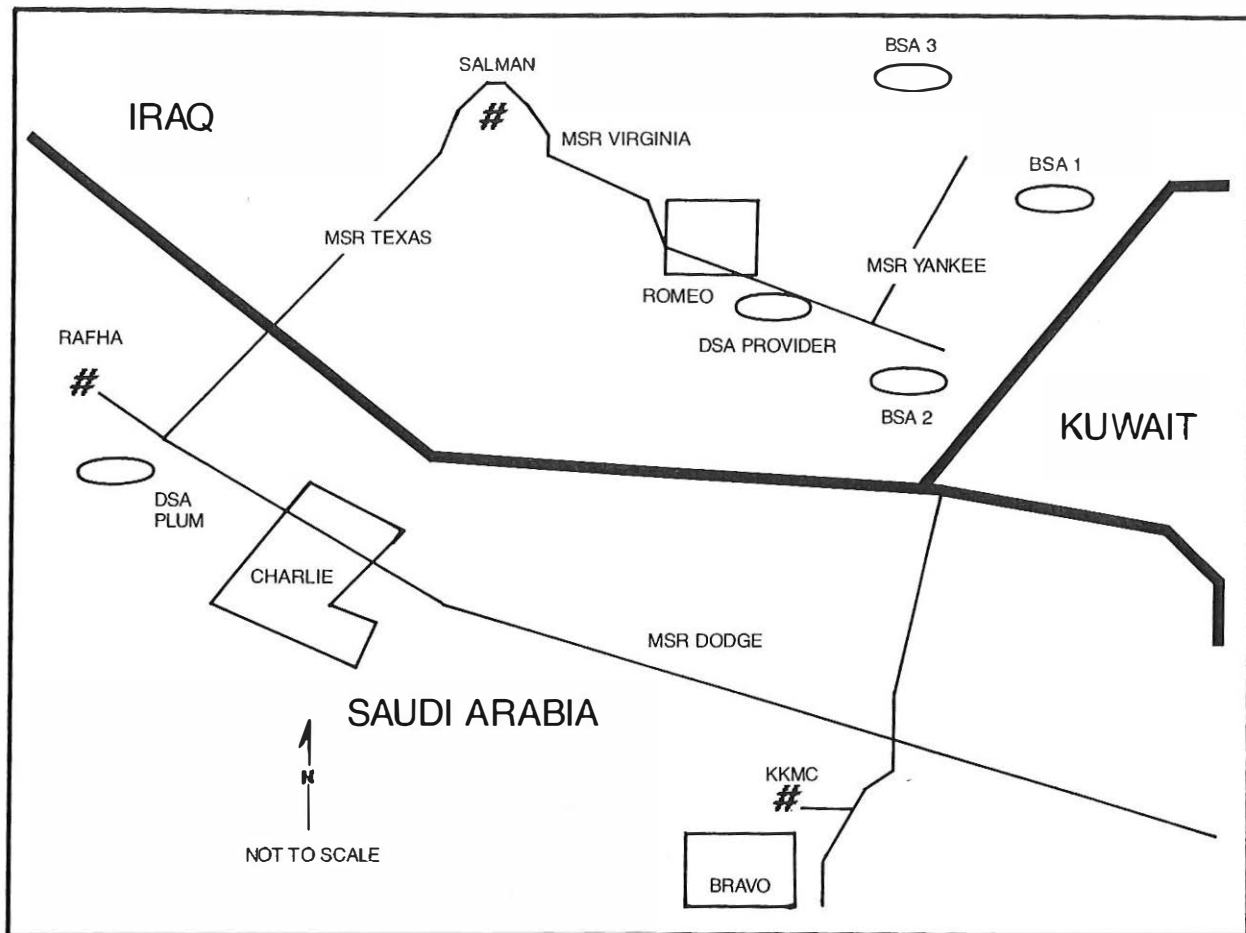
Logistical bases were established to support the division. Initially, a base was established in the vicinity of King Khalid Military City (Logistics Base Bravo). Here, stores were established for three days' supply of water (18,000 gallons), five days' supply of food (160 tons), barrier materials and ammunition (1,300 tons).

To support the division, as well as other divisions in the XVIII Airborne Corps, Logistics Base Charlie was established by the 1st Corps Support Command. In this vicinity, the 82d Airborne Division support command established a division support area (DSA Plum). Supplies at the DSA were configured to meet the needs of the particular types of units in each of the division's three combat brigades. The supplies remained loaded on vehicles to facilitate a rapid push of supplies to attacking units once the ground war began. Figure 9 provides an overview of the main supply routes and logistics bases, to include those that would support the ground attack.

Combat service support within the division included its own division support command, comprised of a medical battalion, supply and transportation battalion, maintenance battalion and aviation maintenance company, and four attached light truck companies. The 46th Corps Support Group in direct support of the division included a supply and service battalion and maintenance support battalion.

The ground campaign began on the morning of February 24, 1991, when the French 6th Armored Division and a brigade of the 82d Airborne Division attacked 90 miles into Iraq to seize the airfield at Salman and to establish a security screen for the corps western flank. The balance of the 82d Airborne Division conducted operations to secure supply routes and forward logistics bases. The division moved 50 miles to secure initial objectives in the vicinity of Salman and an additional 150 miles to secure objectives in the Euphrates Valley.

During the conduct of ground operations by the combat elements of the division, logistical support was to be uninterrupted. Once MSR Texas and Virginia were operational, a mobile logistics task force organized by the division support command moved forward and established division support area (DSA) Provider. The 46th Corps Support



**Fig. 9. 82d Airborne Division Logistical Support**

Group established Logistics Base Romeo to supply forward elements. The ground MSRs were supplemented by airlift of supplies using UH-60 and CH-47 helicopters and C-130 aircraft. Corps-level support was provided by pushing supplies initially to the DSA and throughput to each brigade support area (BSA).

Water was distributed by corps support units to the DSA and to the BSAs by semi-trailer-mounted fabric tanks. Three 40,000-gallon storage and distribution systems were maintained at the DSA; each BSA had a single 40,000-gallon storage system. Water was distributed to soldiers using water trailers, 600-gallon drums, 55-gallon drums and five-gallon cans.

Fuel was distributed by corps support units to the DSA and BSAs by 5,000-gallon tankers. The DSA and BSAs had fuel system supply points, HEMTT fuelers, and tank and pump units mounted on five-ton trucks; fuel was distributed to units using 500-gallon drums.

Subsequent to the declaration of the cease-fire on February 28, the division undertook the mission of destroying Iraqi supply bases and clearing mines. Redeployment to Saudi Arabia commenced on 15 March to final assembly areas in the vicinity of Dhahran and



**Fig. 10. Heavy Expanded Mobility Tactical Truck (HEMTT) tanker was a primary means of fuel distribution for the 82d Airborne Division.**

Dammam to prepare equipment for further redeployment to Fort Bragg. In its redeployment to the United States, almost all of the division's 3,400 pieces of major equipment and 200 containers went by sealift involving 12 dedicated ships (which included 9 RO/RO ships). A total of 73 aircraft (including C-5As, C-141s and commercial 747s) were required to move 14,000 personnel back to Fort Bragg. The redeployment was completed by April 12.

During their deployment to the region, the 82d Airborne Division consumed 8,100 tons of food, purified 8 million gallons of water, issued 1.7 million gallons of fuel and 3,700 tons of ammunition and drove more than one million miles.

In general, the theater, corps and division support for the two divisions was similar in terms of supply, services and maintenance needs. The major difference was in the significantly greater mechanized division requirements for such items as transport, ammunition, fuel and spare parts. As pointed out above, the 82d Airborne Division consumed 1.7 million gallons of fuel and issued 3,700 tons of ammunition; however, the 24th Infantry Division consumed 4.8 million gallons of fuel and issued 16,700 tons of ammunition. As telling as these statistics are, only the detailed review of unit after action reports will generate the many lessons learned that are not readily apparent from the data used in this report. AUSA is also anxious to see the results of these analyses.

## OBSERVATIONS

The U.S. strategic reserve of sea- and airlift was activated to reinforce contract and military lift resources. The dependence on modern foreign-flag ships and less flexible CRAF aircraft to move significant amounts of cargo and personnel suggests a continuing need to modernize and expand U.S. military lift capabilities. The need for more flexible and immediately available air- and sealift to move forces to any distant crisis area has to be resolved.

U.S. industry was called upon to increase the production of items essential to the sustainment of U.S. forces in the Persian Gulf region. Stories of around-the-clock manufacturing abound. Additionally, U.S. manufacturers provided the necessary technical support personnel in the United States, Europe and the Persian Gulf to maintain and repair military equipment. Industry was also responsive in meeting special requirements for solutions to equipment problems unique to the Saudi desert. However, industry could not meet all requirements to the extent desired. Looking to the future, the ability of industry to meet demands for spare parts, replacement equipment and other sustainment items in a more lengthy contingency operation requires special attention. Additionally, there is a continuing requirement to balance war reserve, depot production and industrial base capabilities.

The Total Force Policy worked well for the logistics and combat service support of Operations Desert Shield and Desert Storm. The reserve components were essential. At one point, 70 percent of the units assigned to the theater's 22d Support Command were RC. In planning for future contingencies, the relative balance of logistical support capabilities in the active and reserve components should be carefully weighed, especially in light of required response times and the availability of sustainment support in potential areas of operation.

Forward-deployed forces in Europe were committed to the operation when it was recognized that Iraqi military forces would have to be forcibly ejected from Kuwait. Their high state of readiness, proximity to the crisis area and allied support of their deployment all point to the continuing strategic value of overseas basing of U.S. military forces. Forward-deployed forces, prepositioned equipment and supplies on land and at sea, and host nation and allied support confirm the interdependence of U.S. and allied capabilities in crisis situations. Advance combined planning to accommodate these elements of a military response to a crisis is more important than ever before.

During the ground attack phase, logistics elements displaced forward with the combat elements as they advanced to their objectives. The pace was rapid, due to the speed and cross-country mobility of the modern armored and mechanized weapon systems (i.e., M1A1 tanks and M2/M3 fighting vehicles). Maneuver forces, such as the 24th Infantry Division, moved over 200 miles in the 100-hour war. Some support vehicles accompanying the maneuver units, including the M35A2 truck, M113 personnel carrier and M88A1 tank recovery vehicle, could not move as quickly or function as effectively in the desert environment as the M1A1 tank. Also, the M88A1 did not have sufficient power to evacuate M1A1

tanks any distance in the desert. The M-9 Armored Combat Engineer (ACE) vehicles, deployed in limited quantities, possessed the mobility that older engineer equipment lacked. A review of the mobility capabilities and hauling capacity of logistical units, as well as maintenance and engineer vehicles, is clearly in order.

Logistical command and control in a highly mobile environment involving extended lines of communications is challenging. Broad-based and theater-wide communications to inform supporting units of the priorities of resupply, allocation of transportation assets and use of main supply routes are essential components of an effective logistical system. This was stressed during Desert Shield and Desert Storm and sometimes found wanting. It is time to reassess the communications available to logisticians.

The United States and the coalition enjoyed some significant advantages, to include: time, host nation and allied support, modern sea- and airport facilities, enforced economic sanctions, air and sea supremacy, failure of the Iraqis to press the attack and incompetent Iraqi leadership. We cannot expect many of these factors to exist in a future contingency of this nature. Resulting assessments should ensure that the Army is given the strategic support necessary to rapidly deploy a sustainable combat force in the future.

We must expect that future contingencies will not always provide the same port and base facilities as found in Saudi Arabia and that essential logistical support facilities, to include air- and seaports and roadways, will have to be put in place concurrent with the maneuver forces engaging in combat. These forces will have to be moved to the operational area with sufficient combat power and logistical support to secure theater logistical support areas and allow the buildup of adequate support units and supplies to sustain follow-on combat operations.

The logistical support of Operations Desert Shield and Desert Storm was a total team effort. It started with the deployment of a small cell of logisticians from U.S. Army Forces Command to lay the groundwork for the reception, onward movement and sustainment of deploying forces. The effort quickly involved many other actors, to include the staff of the Army Deputy Chief of Staff for Logistics, Army Materiel Command, Defense Logistics Agency, major subordinate logistics commands, Army depots, the staff of U.S. Army Europe, Military Traffic Management Command, Military Airlift Command, Military Sealift Command and additional Army, joint and other service commands.

Ingenuity, flexibility and aggressiveness of smart, creative soldiers overcame many obstacles that could not be anticipated. As the major commanders of U.S. Army logistical units have stated, it was the commitment and teamwork of individual soldiers that made the logistical support of Desert Shield and Desert Storm a major success. General H. Norman Schwarzkopf, Commander-in-Chief, United States Central Command, during an appearance before the House Appropriations Committee, summed up the logistical effort: ***The task faced by the logisticians can only be described as daunting and their success can only be described as spectacular.***



## Appendix

### COALITION COUNTRIES PROVIDING FORCES OR COMBAT SUPPORT FORCES

Afghanistan	300 Mujahidin
Argentina	2 frigates, 450 troops
Australia	1 guided missile frigate, 1 destroyer, 1 supply ship
Bahrain	3,500 troops
Bangladesh	2,000 troops
Belgium	2 minesweepers, 1 fighter squadron (to Turkey)
Canada	2 destroyers, CF-18 squadron (30 fighter/transport aircraft), 1,700 troops
Czechoslovakia	200-man chemical defense unit, 150 medical personnel
Denmark	1 corvette
Egypt	40,000 troops, 358 tanks, 4th Armored Div, 3rd Mech Infantry Div
France	20,000 troops, 18 ships, 1 CV, more than 60 aircraft, 350 tanks, 6th Armored Div
Germany	1 fighter squadron (to Turkey)
Greece	1 frigate (in Red Sea)
Hungary	40-man medical team
Honduras	150 troops (offered, not used)
Italy	4 ships, 8 Tornado fighters, 1 fighter squadron (to Turkey)
Kuwait	7,000 troops (remnants of Kuwaiti armed forces), 35 combat aircraft
Morocco	2,000 troops
Netherlands	1 squadron of 18 F-16 fighters (to Turkey), 2 frigates
Niger	480 troops guarding shrines in Mecca and Medina
Norway	1 cutter, 1 military supply ship
New Zealand	2 C-130 aircraft
Oman	25,500-man armed forces, 12 patrol ships, 75 tanks, 50 combat aircraft
Pakistan	10,000 troops
Poland	2 ships, medical team
Portugal	1 support ship helping British forces
Qatar	7,000-man armed forces, 24 tanks, 9 coastal vessels, 19 combat aircraft
Republic of Korea	C-130 aircraft, medical team
Saudi Arabia	60,600 personnel, 267 main battle tanks, 216 combat aircraft, 15 combat-ant ships
Senegal	500 troops
Sierra Leone	27-man medical team
Singapore	30-man medical team
Spain	2 corvettes and 1 destroyer patrolling near Ba al Mandeb
Sweden	40-man medical team for UK casualty support
Syria	14,300 personnel in 9th Armored Div and Special Forces
Turkey	2 frigates in the Gulf, 120,000 troops on border with Iraq (no commitment to involvement except if attacked), U.S. F-16 & F-111 squadrons at Incirlik
UAE	40,000-man army, 1,500 in air force, 1,500 in navy, 14 main battle tanks, 78 combat aircraft
United Kingdom	42,000 personnel, 22 ships, 85 aircraft, 1st Armored Div HQ, 7th Armored Bde, 4th Armored Bde

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