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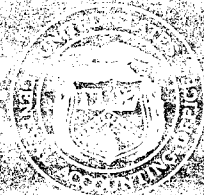
Report to the Chairman, Subcommittee

Management Committee on  
Governmental Affairs, U.S. Senate

December 1991

# OPERATION DESERT STORM

## Transportation and Distribution of Equipment and Supplies in Southwest Asia



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United States  
General Accounting Office  
Washington, D.C. 20548

National Security and  
International Affairs Division

B-246015

December 26, 1991

The Honorable Carl Levin  
Chairman, Subcommittee on Oversight  
of Government Management  
Committee on Governmental Affairs  
United States Senate

Dear Mr. Chairman:

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As you requested, we reviewed the Defense Department's capabilities to distribute equipment and supplies during Operation Desert Storm.<sup>1</sup> Specifically, we reviewed the Army's, Marine Corps', and Air Force's capability to (1) unload equipment and supplies at seaport and airport facilities, (2) store and retrieve assets, (3) transport supplies and equipment to forward-deployed logistic bases and units, and (4) provide security at ports of entry, in warehouses, and during the surface transportation of assets.

## Background

On August 2, 1990, Iraqi military forces launched a surprise attack against Kuwait. On August 7, 1990, the U.S. military began deploying equipment, supplies, and personnel to strategic seaports and airports in Saudi Arabia.

The U.S. Central Command (CENTCOM) was responsible for overall in-theater logistics management. It developed policy and monitored and coordinated transportation and distribution operations. CENTCOM delegated specific theaterwide functions to the Army, Marine Corps, and Air Force. For example, while all three services stored and provided security over equipment and supplies, the Army was responsible for seaport and airport operations as well. It also managed the surface transportation and distributed common items such as food, clothing, lubricants, and munitions.

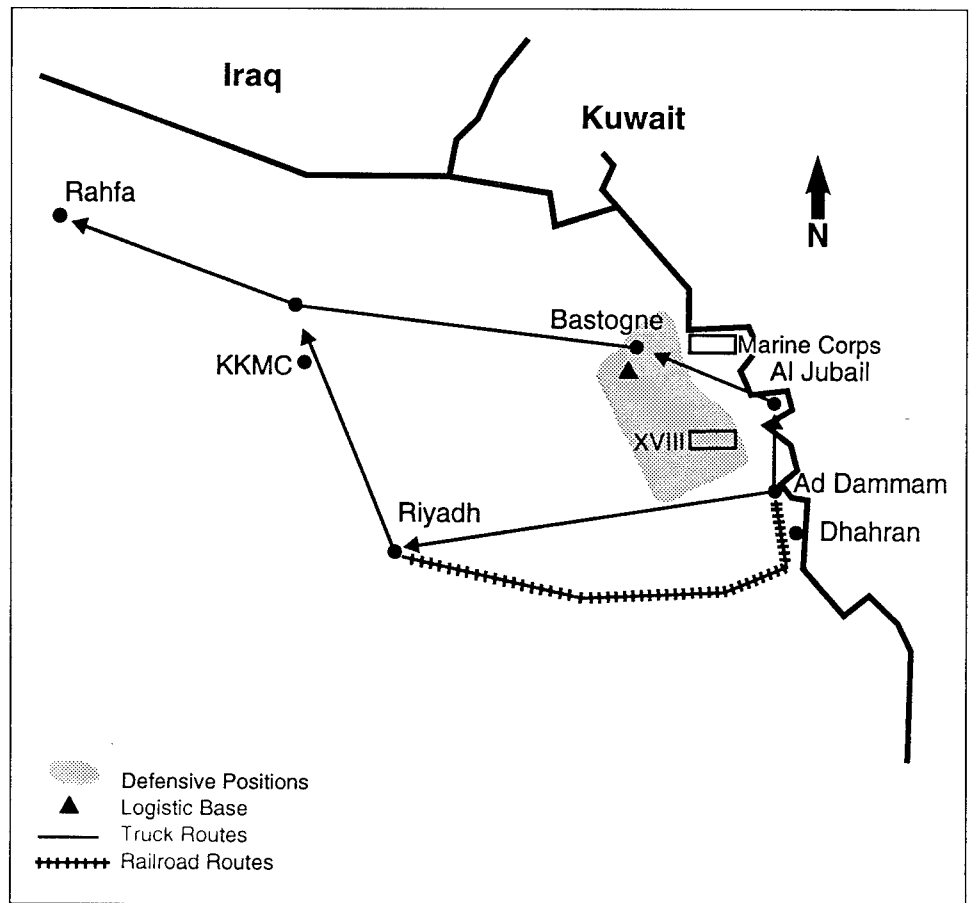
Once equipment and supplies arrived in Saudi Arabia, Army, Marine Corps, or Air Force personnel unloaded and transferred them directly to the units and to supply personnel at staging areas.

<sup>1</sup>"Operation Desert Storm" refers to the entire period of the Gulf war—from its buildup to its completion.

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The main ground elements to be supported were the Army's VII and XVIII Corps and two Marine divisions. The XVIII Corps was deployed in August; by November most of its elements had arrived in Saudi Arabia and moved to their assigned defensive position west of Ad Dammam and Al Jubail. The Marine Corps was in its staging area north of Al Jubail (see fig. 1).

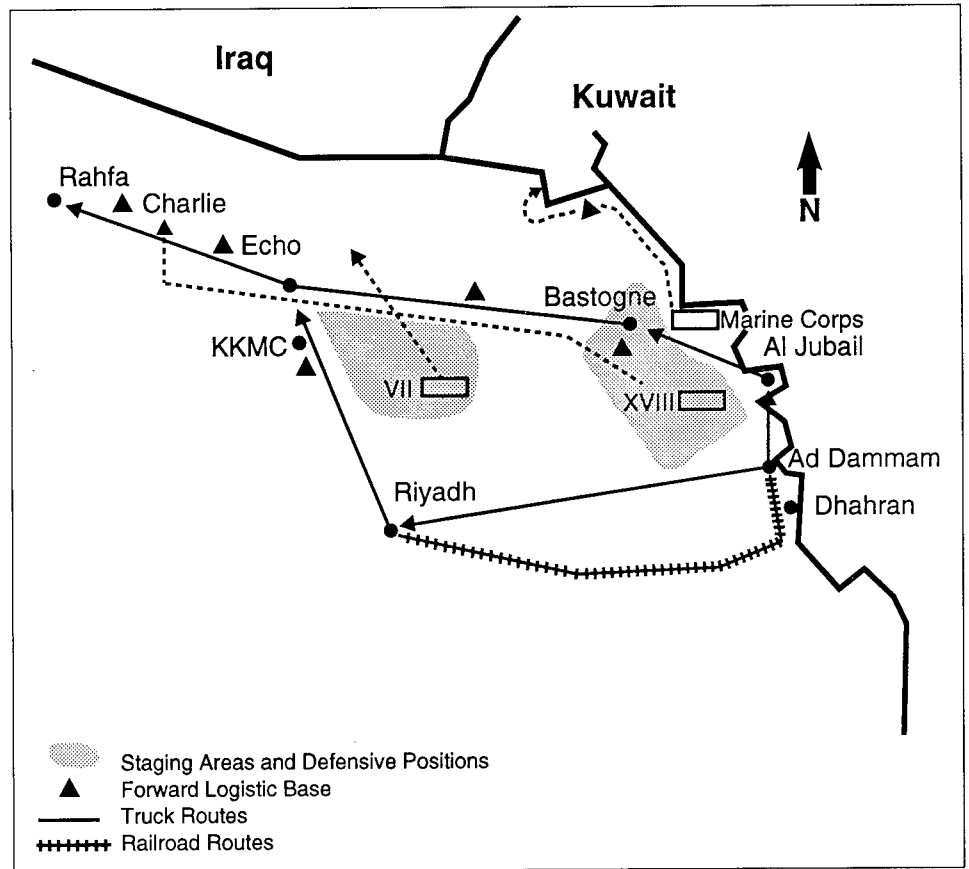
Figure 1: Army and Marine Corps Initial Defensive Positions



In November, the U.S. objective changed to expelling Iraq from Kuwait, and the President ordered a second corps to the theater. The VII Corps from Europe and units from the U.S. deployed to the region over several months. The staging area for the VII Corps was primarily west of Al Jubail between Bastogne and King Khalid Military City (KKMC). Logistic bases were established to support the deployed corps.

The two corps commenced their move to attack positions around the start of the air campaign on January 17, 1991. By February, two major forward logistic bases were established for each corps (Charlie for XVIII Airborne Corps and Echo for VII Corps). Thus, about 1 month into the air campaign, ground units were positioned to carry out U.S. objectives. The ground war began on February 24, 1991 (see fig. 2).

Figure 2: Movement of the Two Corps and Marine Divisions



### Results in Brief

During Operation Desert Storm the military moved enormous quantities of equipment and supplies. The accessibility of excellent Saudi Arabian seaport and airport facilities (far greater than the Saudi Arabian needs) eased the unloading and movement of these assets. During the initial deployment period, the availability of U.S. prepositioned assets proved important. These assets included material-handling and transportation equipment stored aboard U.S. ships and at land sites in the Middle East. As the quantity of incoming equipment and supplies increased, U.S.

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forces depended upon host nation and coalition support to sustain port operations.

The Army and Marine Corps had limited capability to store and retrieve equipment and supplies during the initial stages of Operation Desert Storm. The military's decisions to "push" enormous amounts of equipment and supplies into the theater, and deploy combat units before support units in the first 3 months of the campaign contributed to the problem.<sup>2</sup> During this period, the Army and Marine Corps were unable to maintain visibility over the equipment and supplies. Once logistical support units began to arrive in the theater and the supply system graduated from a "push" to a sustainment mode, the supply units began to get some visibility over the supplies and equipment being stored at the ports.

The Air Force's in-theater air transportation system met the U.S. forces' airlift requirements. However, the Army's shortages of surface transportation assets, including heavy-equipment transports, tractor trailers, and material-handling equipment limited the services' ability to transport equipment and supplies. Although the Army was the designated theater manager for surface transportation, it could not fulfill that role because it lacked the transportation assets to meet its own requirements. For example, it had only 112 heavy-equipment transports to move tanks and personnel carriers to forward locations. Consequently, the services relied on host nation support and coalition-donated assets. U.S. forces used third-country nationals as drivers and obtained or contracted for over 3,800 heavy-equipment transports and tractor trailers. The services also relied extensively on contracted and donated material-handling equipment—especially forklifts—to load and unload equipment and supplies at forward locations.

A major factor in the successful buildup of U.S. forces was that Iraq's defensive military tactics allowed the United States to (1) dictate when the war would commence and (2) prosecute the war on U.S. terms. The U.S. forces were able to take the time they needed to transport personnel and equipment to Saudi Arabia and distribute these assets within Saudi Arabia. The United States used several months to prepare and was able to accomplish the buildup because there were no hostilities. U.S. officials maintained that there were no notable instances of theft or

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<sup>2</sup>"Push" refers to equipment and supplies' being sent into the theater without a request from a specific unit. Logisticians calculated the amount of equipment and supplies a corps or division would require for buildup and sustainment and then made plans to get them into theater in the quickest manner possible.

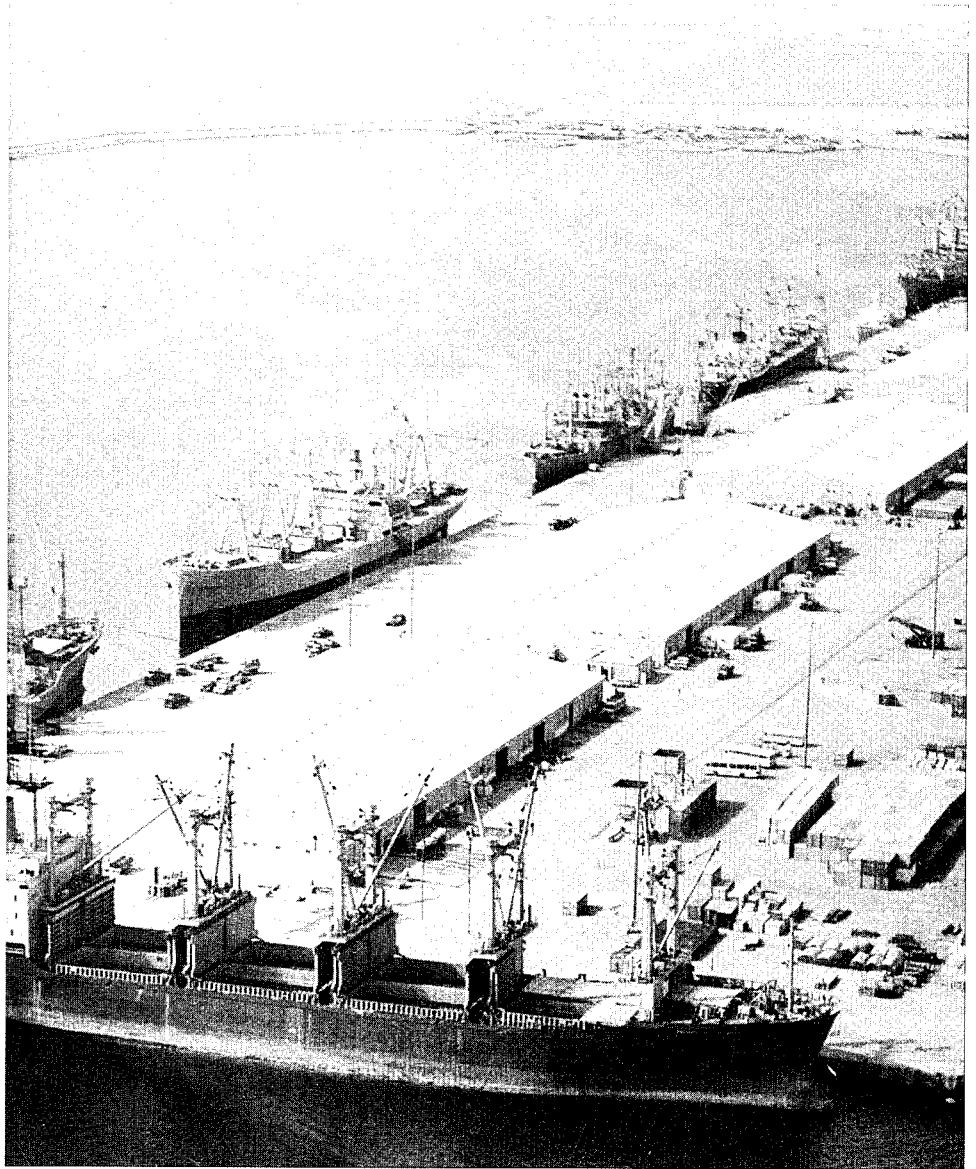
diversion at ports of entry, in warehouses, or during the surface transportation of assets.

## Modern Facilities Were Key to Port Operations

Military officials said that access to excellent Saudi Arabian port facilities allowed the U.S. military to unload large amounts of equipment and supplies without delay. Also, in the initial deployment period, August through October 1990, the U.S. military's prepositioned material-handling and transportation equipment proved important to the unloading of equipment and supplies. The Army had assets stored on four prepositioned ships at Diego Garcia in the Indian Ocean. The Marine Corps used assets from its 13 prepositioned ships in Europe and Southeast and Southwest Asia. The Air Force used assets prepositioned at air bases in the Middle East.

Between August 1990 and March 1991, U.S. personnel unloaded 576 ships and 10,002 aircraft, handling approximately 4 million short tons of equipment and supplies and 7 million gallons of fuel.<sup>3</sup> Army and Marine Corps personnel processed most of these assets through three locations: the Ad Dammam and Al Jubail seaports and the Dhahran airport. (Fig. 3 shows part of the Ad Dammam seaport.)

<sup>3</sup>One short ton is equivalent to 2,000 pounds.

**Figure 3: Ad Dammam Port**

During that period, the Army unloaded 427 ships at Ad Dammam, 68 at Al Jubail, and 5 at other seaports in the region. Marine Corps personnel unloaded the remaining 76 ships at Al Jubail. Military officials said that while there were shortages of material-handling equipment, the lack of trained personnel to operate material-handling equipment became the main restraining factor at the seaports. To overcome this problem, the Army and Marine Corps employed third-country nationals and cross-trained U.S. military personnel to operate the equipment.

The Dhahran airport was the major point of entry for assets arriving via air. Army personnel unloaded approximately 7,800 aircraft and processed 354,900 personnel through this airport. Army officials said their capability to unload aircraft was initially limited by a shortage of material-handling equipment. For example, logistics personnel arriving at the Dhahran airport in August 1990 brought only five forklifts. The Army obtained additional forklifts from Saudi Arabia and coalition partners. By January 1991 Army personnel were unloading an average of 1,600 pallets per day. Marine Corps personnel unloaded approximately 1,165 aircraft at Al Jubail airport.

Logisticians stated that they were unable to maintain visibility over equipment and supplies arriving in theater during the initial deployment phase. Army and Marine Corps officials at the Ad Dammam and Al Jubail seaports stated that they generally knew when a ship was to arrive but had only a general idea about what type of cargo it was carrying. For example, they might know that a ship was loaded with rations, but would be uncertain of the type of rations it carried. Also, it was not uncommon for a ship to have incomplete manifests, mislabeled containers, or generic cargo descriptions.

Officials at the Dhahran airport said that they usually did not know the contents of incoming shipments until the unloading was complete. Air shipments also suffered from inaccurate manifests and mislabeled pallets. Another problem involved material arriving before the units. According to Dhahran officials, some units that were being deployed from the United States and Europe had ordered supplies. These units changed the supplies' shipping address to Saudi Arabia. As a result, the supplies began arriving in Saudi Arabia before the units did. Because officials at Dhahran did not have knowledge of the units' arrival nor where they would be located, a backlog of supplies developed at the airport. Dhahran officials told us that once these units began arriving in theater, they were able to eliminate the backlog.

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## Storage and Retrieval Capability Was Limited at First but Later Improved

The Army and Marine Corps had limited capability to store and retrieve equipment and supplies during the initial deployment phase. U.S. officials cited two major reasons for this problem. First, the military "pushed" enormous amounts of equipment and supplies through the Ad Dammam and Al Jubail seaports and the Dhahran airport. At the same time, CENTCOM, to deter a possible Iraqi attack against Saudi Arabia, decided to deploy combat units (the Army's XVIII Airborne Corps and the Marine Corps' 1st Division) before support units. Thus, a small cadre

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of logisticians had to receive incoming equipment, supplies, and personnel; support the combat units that were deployed; and build a logistical infrastructure in an austere environment. Building this infrastructure was a demanding job for the small cadre. It included establishing mechanisms for acquiring necessities such as shelter, food, water, sanitation, and postal services; setting up a system to acquire host nation assets; and making physical improvements, especially to unpaved staging areas.

The magnitude of items arriving in theater during this time overwhelmed the supply personnel at staging areas and warehouses in and around the ports of entry. Receiving, storing, locating, and retrieving equipment and supplies was difficult. Also, during this period support units were unable to maintain accurate inventory records. According to supply officials, some combat units arriving in theater and preparing to deploy to forward-operating locations obtained equipment and supplies and departed before logistics personnel could record their receipt of the assets into the supply system.

The storage and retrieval capabilities of the supply units at the ports began to improve when the logistical system graduated from a "push" to a sustainment phase in early November 1990. Logistical support units began arriving with the personnel needed to handle the incoming equipment and supplies. Also, by this time, the services had set up their logistical infrastructure. The sustainment phase also coincided with the President's order directing the Army's VII Corps to deploy from Germany to Saudi Arabia. U.S. officials said that the deployment of the heavily armored corps (about 65,000 soldiers, including tanks, personnel carriers, artillery, and other support equipment) strained the logistical system. However, the logisticians managed the deployment and simultaneously sustained the forces already deployed.

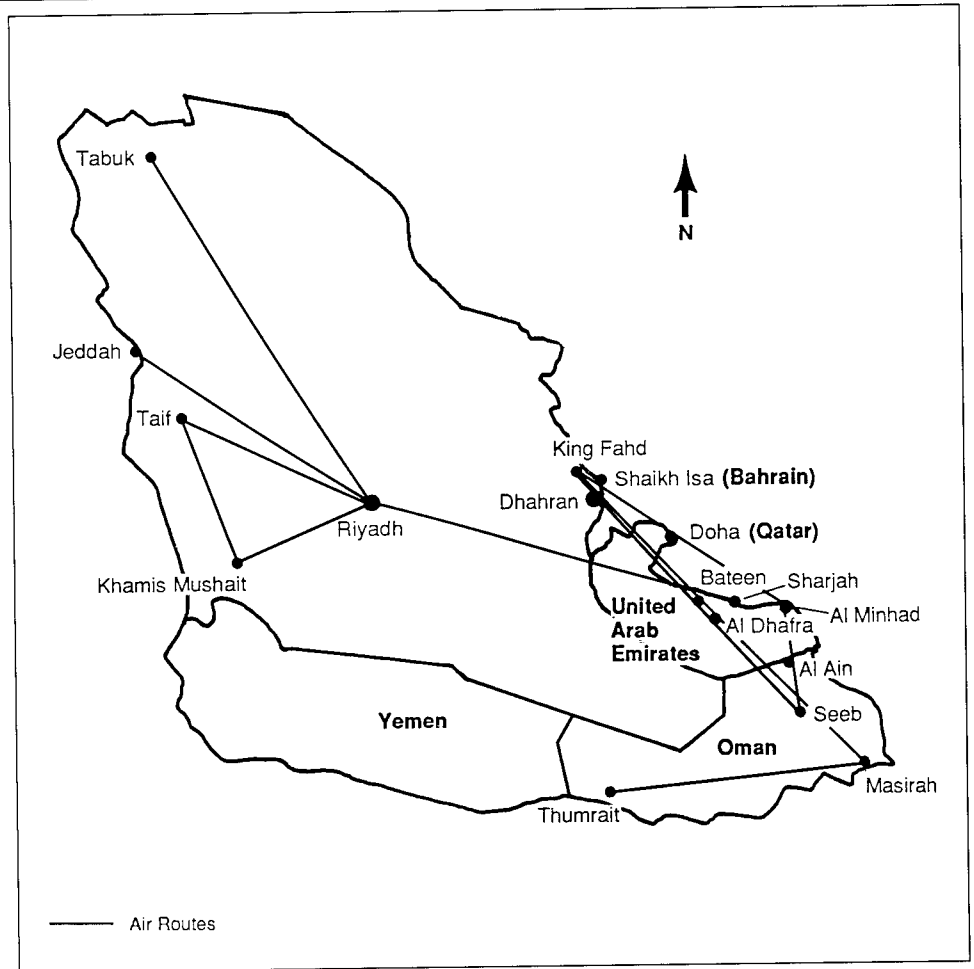
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## Adequate Airlift Was Available, but Surface Transportation Was a Problem

The Air Force established and implemented an in-theater air transportation system to meet the U.S. forces' airlift requirements. Tasked by CENTCOM to support Army, Marine Corps, and Air Force combat units, the Air Force used C-130 cargo planes to perform two flight operations known as Star and Camel missions. Using the Dhahran and Riyadh airports as hubs, Star missions transported passengers and some cargo. Camel missions used the same hubs but carried essentially cargo (fig. 4 shows typical Camel routes). According to Air Force officials, most of these air bases contained runways long enough to accommodate most

aircraft. In addition, they often contained hardened shelters, maintenance shops, and other support facilities.

Figure 4: C-130 Camel Route



Note: Dhahran supported air bases in the eastern area, and Riyadh supported air bases in the western and northern areas.

The Air Force also supported some unique transportation requirements. Its transport of the Army's XVIII Airborne Corps' move from eastern to western Saudi Arabia in preparation for the ground war is an example of this support. The move involved approximately 16,000 soldiers, 2,700 vehicles, and 100 pallets of equipment and supplies. The Air Forces' C-130 in-theater airlift, as of April 1, 1991, included 45,666 sorties, 158,811 short tons of supplies and equipment, and 184,049 passengers.

The Army was the designated theater manager for surface transportation, but it could not fulfill that role because it lacked the transportation assets to meet its own requirements and those of the other services. Thus, the Marine Corps and the Air Force had to establish their own surface transportation operations.

Transportation of material within the theater presented problems not considered when the services designed their transportation units. Under military doctrine, the Army and Marine Corps are equipped to operate up to 90 and 30 miles respectively from their main supply bases. During Operation Desert Storm, the Army supported military and logistic bases over 600 miles from its main supply bases at the Ad Dammam and Al Jubail seaports. Marine Corps supply lines stretched 250 miles from its main supply base, also at the Al Jubail seaport. Figures 5 and 6 show the Army and Marine Corps main logistic routes and bases.

Figure 5: Main Army Logistic Routes and Bases as of February 1991

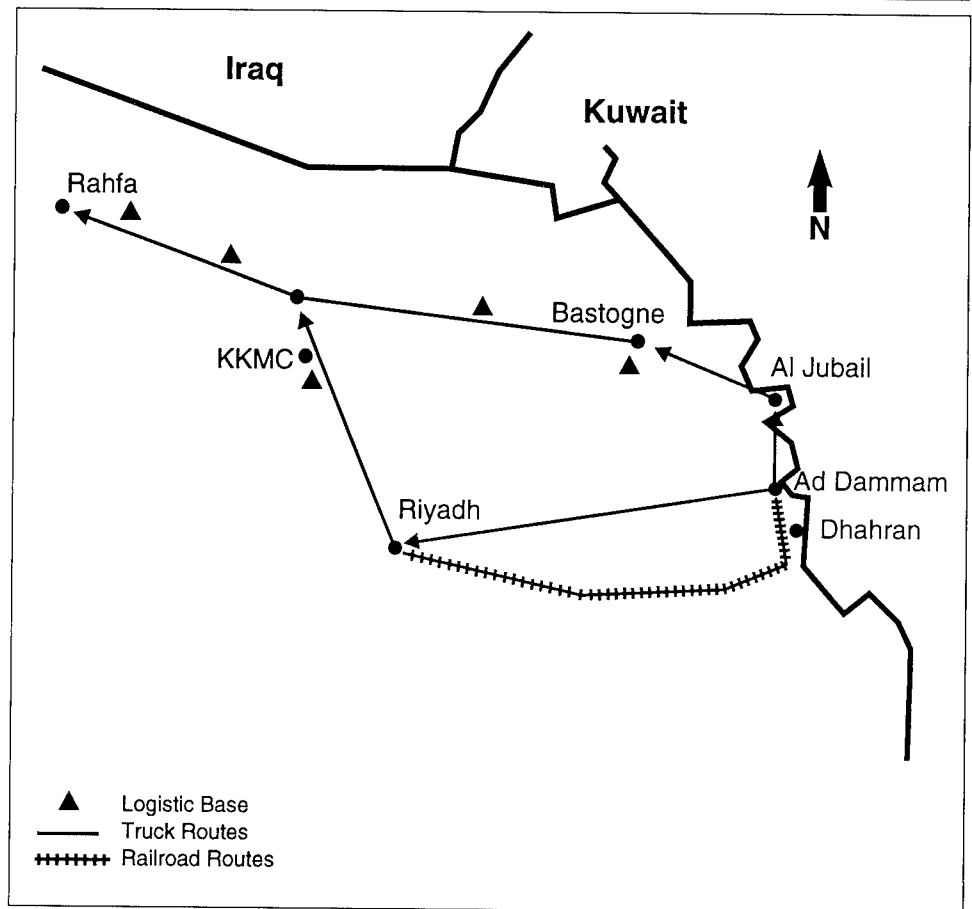
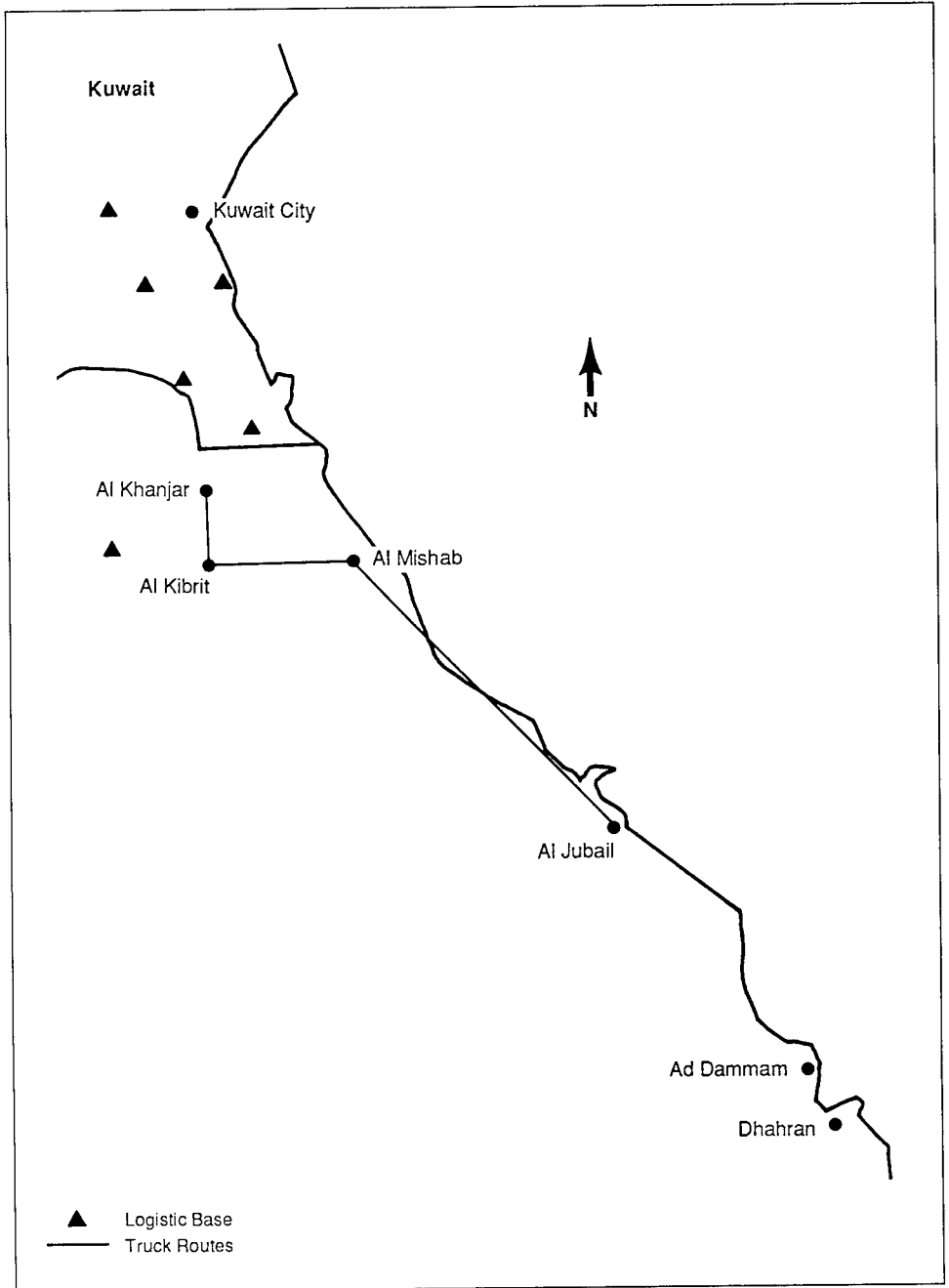


Figure 6: Main Marine Corps Logistic Routes and Bases as of February 1991



These distances also created communications problems within the logistical system. According to Army officials, they had difficulty communicating over the long distances with their organic equipment because the

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equipment was designed for much shorter ranges. They contracted with and acquired equipment from the local economy in an attempt to address these problems.

Additionally, the Army's and Marine Corps' tactical movements further strained the transportation assets. These movements entailed the transfer of large quantities of equipment and supplies from various logistic bases and ammunition supply points. For example, at the beginning of the air war, the Army's XVIII and VII Corps relocated from their defensive positions and staging areas to their attack positions in preparation for the ground war. The movement of the two corps, averaging 360 and 140 miles respectively to their new positions, continued 24 hours a day for 21 days. Also, in preparation for the ground war, the Marine Corps' transportation units operated around the clock carrying cargo to northern ammunition storage points.

Heavy equipment transports are essential for the rapid and efficient movement of heavy equipment, especially tracked vehicles. Without these transports, Army and Marine Corps personnel would have had to drive tanks, personnel carriers, and other heavy equipment to the forward-operating locations. This alternative would have increased fuel consumption and required additional maintenance. Also, because tanks and personnel carriers are tracked vehicles, they would have damaged the paved highways making other surface transportation difficult, if not impossible.

The Army and Marine Corps had only 112 and 34 heavy equipment transporters, respectively, far short of total requirements. As a result, the services relied extensively on host nation and coalition support (such as that provided by Germany, Japan, and Egypt). For example, the Army obtained or contracted for approximately 1,200 heavy equipment transports, and another 1,400 tractor trailers from Saudi Arabia and other coalition partners. The Marine Corps borrowed 26 Army heavy-equipment transports, and contracted for over 1,200 heavy-equipment transports and tractor trailers. The Air Force, which had only 104 tractor trailers, also relied on commercial carriers to fulfill the bulk of its surface transportation requirements. Figure 7 shows some of the contracted tractor trailers.

Figure 7: Contracted Tractor Trailers



The services relied heavily on third-country nationals to drive the tractor trailers. As the war approached, these drivers became less inclined to deliver equipment and supplies to the northern logistics bases. Military officials told us that a large number of drivers disappeared when the war began. As a result, special measures were taken by the services to encourage the drivers to return to work. These measures included incentive pay, mess hall and exchange service privileges, and the issuance of gas masks. The services also cross trained some soldiers as tractor trailer drivers.

The services relied extensively on both host-nation-contracted and their own material-handling equipment to load and unload equipment and supplies at forward locations. The handling of ammunition especially depended on the availability of material-handling equipment. Without contracted forklifts at forward locations, according to Army and Air Force officials, the movement of equipment and supplies would have been curtailed.

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## Security Measures Were Taken to Protect Assets

CENTCOM officials told us that there were no notable instances of theft or diversion at ports of entry, in warehouses, or during the surface transportation of equipment, and supplies during Operation Desert Storm. When the buildup began, the services implemented security procedures at ports of entry, storage areas, and for surface transportation. During our tour of the Ad Dammam and Al Jubail seaports, we observed several security measures: security fences, electronic monitoring cameras, and U.S. security personnel who patrolled facilities. The physical location of the seaports helped to provide security because it restricted vehicular access, and U.S. officials told us that the U.S. Navy and Coast Guard provided security around the waterfront perimeters. The Dhahran airport, the main point of entry for air supply operations, is located on a secured Saudi Arabian Air Force base. This location contributed to the security of equipment and supplies arriving via airlift. During the surface movement of munitions and other critical assets, the services provided armed escorts for convoys or placed U.S. soldiers in vehicles driven by third-country nationals.

In addition to these security measures, military officials believe the following may have reduced opportunities for theft and diversion: (1) the eastern and northern provinces of Saudi Arabia are sparsely populated, (2) most military activities were far from indigenous population centers, and (3) the campaign—from buildup, to war, to redeployment—moved quickly.

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## Agency Comments

The Department of Defense reviewed a draft of this report and concurred with our findings (see app. I).

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## Scope and Methodology

In undertaking our review, we held discussions with and obtained documents from officials at CENTCOM and the Army, Air Force, and Marine Corps. Between March 30 and April 11, 1991, we observed port operations and toured equipment and supply storage areas at the Ad Dammam and Al Jubail seaports, and the Al Jubail, Dhahran, and Riyadh airports. Each of these ports is located in Saudi Arabia.

We confined our review to the port areas; our review did not include the transportation and distribution of supplies and equipment at forward locations because at the time of our visit the Marine Corps 1st Division had already redeployed from Saudi Arabia, and the Army's XVIII Airborne Corps and most of the Marine Corps 2nd Division were completing their withdrawal from forward-operating locations. Our audit work was

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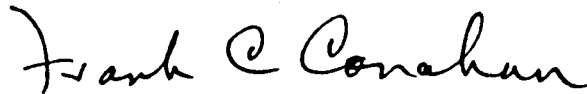
conducted from March through June 1991 in accordance with generally accepted government auditing standards.

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We are sending copies of this report to appropriate congressional committees; the Secretaries of Defense, the Army, and the Air Force; the Commandant of the Marine Corps; the Commander, U.S. Central Command; and the Director, Office of Management and Budget. We will also make copies available to others upon request.

This report was prepared under the direction of Donna M. Heivilin, Director, Logistics Issues (202) 275-8412. Other major contributors are listed in appendix II.

Sincerely yours,



Frank C. Conahan  
Assistant Comptroller General

# Comments From the Department of Defense



ASSISTANT SECRETARY OF DEFENSE  
WASHINGTON, D.C. 20301-8000

PRODUCTION AND  
LOGISTICS

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**OCT 22 1991**

Mr. Frank C. Conahan  
Assistant Comptroller General  
National Security and  
International Affairs Division  
U.S. General Accounting Office  
Washington, DC 20548

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the August 13, 1991, General Accounting Office (GAO) Draft Report, "(U) OPERATION DESERT STORM: Transportation and Distribution of Equipment and Supplies in Southwest Asia," (GAO Code 398072) OSD Case 8779-X.

The DoD has reviewed the report and concurs without further comment. There were no technical changes noted. The DoD appreciates the opportunity to review the report in draft form.

Sincerely,

A handwritten signature in cursive script that reads "David J. Berteau".

**DAVID J BERTEAU  
PRINCIPAL DEPUTY ASD(P&L)**

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# Major Contributors to This Report

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