

September 1990

BURDEN SHARING

Allied Protection of Ships in the Persian Gulf in 1987 and 1988



142164

496

RELEASED

~~RESTRICTED~~ Not to be released outside the General Accounting Office unless specifically approved by the Office of Congressional Relations.

544350

**National Security and
International Affairs Division**

B-240294

September 6, 1990

The Honorable Pat Schroeder
Chairwoman, Subcommittee on Military
Installations and Facilities
Committee on Armed Services
House of Representatives

The Honorable Andy Ireland
House of Representatives

This report is the unclassified version of our classified report. It summarizes and updates the information provided to your staffs during our April 5, 1990, briefing on the major activities of the allies and Persian Gulf states to sustain open navigation in the Persian Gulf between March 1987 and August 1988. Specifically, our objectives were to (1) identify the countries involved in sustaining open navigation and the role each played, (2) analyze the value of the contributions provided by those countries, and (3) assess the potential economic impact of the disruption of Gulf oil imports on Gulf states and industrialized countries.

In late 1986, Iran began attacking ships in the Persian Gulf. In the spring of 1987, the President announced that the United States would reflag and escort Kuwaiti ships. In May 1987, he extended U.S. protection to neutral ships on a case-by-case basis, under an operation called Earnest Will. The United States also called upon its allies to protect shipping in the Gulf. Section 1 of this report provides a historic perspective of non-Gulf countries' presence in the region.

Results in Brief

Belgium, France, Italy, the Netherlands, the United Kingdom, and the United States escorted and monitored their flagged ships and helped keep the Persian Gulf shipping lanes clear of mines. Only three of these countries provided GAO estimates of the incremental costs they incurred in these naval operations. These cost estimates ranged from \$100 million to \$240 million.

Because some of the participating countries did not report cost estimates for their naval operations in the Gulf, we assigned a daily cost—based on U.S. operating costs—to each type of ship supporting operation Earnest Will and derived a relative value of the contribution of each of the non-Gulf countries. Based on our analysis of the types and duration of naval assets provided, we believe the United States accounted for about

40 percent of the assets, followed by France (34 percent), the United Kingdom (10 percent), Italy (7 percent), and the joint Belgium/Netherlands operation (9 percent). Three other non-Gulf countries provided indirect assistance. West Germany interpreted its constitution as prohibiting it from providing a naval presence in the Gulf. Alternatively, it fulfilled a U.S. commitment to NATO to provide naval forces in the Mediterranean, thereby freeing U.S. ships for the Gulf operation. In calculating its contribution, Japan claimed credit for \$500 million in loans to Oman and Jordan. Japan also paid \$9 million for a precision navigation system installed in the Gulf. Luxembourg, which has no Navy, provided \$400,000 for the upkeep of other countries' forces during the operation.

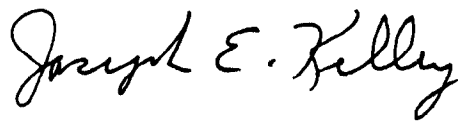
The Gulf states provided vital access to their ports, bases, and facilities as well as other assistance, including fuel for U.S. ships and aircraft. Section 2 provides details on countries' contributions to keeping the Persian Gulf open to navigation, and section 3 provides a burden sharing analysis of these contributions.

One objective of operation Earnest Will was to maintain the free flow of oil from the Persian Gulf area. During the conflict, oil disruptions did not occur, and Persian Gulf oil production actually increased slightly. Section 4 provides an overview of oil prices and production during the conflict. The Department of Energy disruption impact simulator projected that if a disruption had occurred, crude oil prices would have more than doubled. Moreover, the oil market would have distributed price changes to both imported and domestically produced oil, thereby affecting all industrialized countries dependent upon oil or its products.

The allied countries involved in maintaining open navigation in the Gulf and 12 other countries belong to the International Energy Agency (IEA). During an oil disruption, these countries agree to share their oil reserves. This agreement is designed to spread the short-term impact of an oil disruption to all member oil-consuming countries. In addition, countries that are less dependent on Persian Gulf imports, like the United States, will lose some of their imports from other market sources, such as Mexico, as other oil-dependent countries compete for available resources. Section 5 provides a detailed analysis of the economic implications of an oil disruption on oil prices and consuming countries.

Our objectives, scope, and methodology are in appendix I.

As arranged with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from its issue date. At that time, we will send copies to the Secretaries of Defense and State and to other interested congressional committees. Major contributors to this briefing report are listed in appendix II. If you have any questions, you may reach me at (202) 275-4128.



Joseph E. Kelley
Director, Security and International
Relations Issues

Contents

Letter		1
<hr/>		
Section 1		6
Allied Commitment to the Gulf Region	Summary	6
	Several Countries Have Maintained a Lengthy Presence in the Region	6
	U.S. Objective Is to Ensure Regional Security and Maintain Oil Flow	6
	U.S. Forces Vary as Threat Increases and Subsidies Operation Earnest Will Begins	7
<hr/>		
Section 2		8
Overview of Country Involvement	Summary	8
	Nine Non-Gulf Countries Provided Support	8
	Six Gulf States Supported the Effort	9
<hr/>		
Section 3		10
Assessment of Burden Sharing	Summary	10
	Cost of Contributions Is Difficult to Measure	10
	Not All Countries Provided Cost Data	10
	Non-Gulf Countries Assessed in Relation to Naval Assets Provided	12
<hr/>		
Section 4		14
Overview of Oil Prices and Production During the Conflict	Summary	14
	Non-Gulf Countries' Presence Demonstrated the Importance of Gulf Oil	14
	Operation Facilitated the Continued Free Flow of Oil	14
	Little Increase in Worldwide Oil Prices Resulted	15
<hr/>		
Section 5		17
Analysis of Potential Impact of a Persian Gulf Oil Disruption	Summary	17
	IEA Members Did Not Have to Share Reserves	17
	Potential Impact of a Disruption on Oil-Dependent Economies	18
	Impact of a One-Quarter Oil Disruption on the United States	21
	Potential Impact of a Disruption on Gulf Oil-Producing Nations	22

Appendixes

Appendix I: Objectives, Scope, and Methodology	24
Appendix II: Major Contributors to This Report	25

Tables

Table 3.1: U.S. Incremental Costs of Persian Gulf Operations	11
Table 3.2: Relative Value of the Contributions of the Six Countries With Ships Operating in the Persian Gulf (Between October 1987 and August 1988)	13
Table 5.1: 1987 OECD Oil Statistics	18
Table 5.2: Estimated Losses From a Total Disruption in Persian Gulf Oil Supplies	20
Table 5.3: Estimated Losses Due to a Disruption in the Strait of Hormuz	21
Table 5.4: The Potential Effect of a Disruption of Petroleum Shipments Through the Strait of Hormuz	22
Table 5.5: Gulf States Oil Statistics (1987)	23

Figures

Figure 4.1: Oil Production 1986-89 (First Quarter 1987 Through Third Quarter 1988 Covers Operation Earnest Will)	15
Figure 4.2: Quarterly Oil Prices (March 1987 Through September 1988)	16

Abbreviations

AWACS	Airborne Warning and Control System
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GNP	Gross National Product
IEA	International Energy Agency
IEP	International Energy Program
mbd	millions of barrels a day
OECD	Organization for Economic Cooperation and Development
OPEC	Organization of Petroleum Exporting Countries

Allied Commitment to the Gulf Region

Summary

- Several Countries Have Maintained a Lengthy Presence in the Region
- U.S. Objective Is to Ensure Regional Security and Maintain Oil Flow
- U.S. Forces Vary as Threat Increases and Subsides
- Operation Earnest Will Begins

Several Countries Have Maintained a Lengthy Presence in the Region

The United States has maintained a naval presence in the Persian Gulf region¹ since 1949. France and the United Kingdom have also maintained a lengthy naval presence in the Gulf. The United Kingdom, for example, has maintained ships in the region since 1980. The rationale for this presence is the importance of Gulf oil to industrialized nations.

U.S. Objective Is to Ensure Regional Security and Maintain Oil Flow

The economies of the United States and its European and Pacific allies are dependent on the uninterrupted flow of Persian Gulf oil. In the short term, a disruption in the flow of oil from the Gulf may not pose an immediate problem because oil may be available from other producers. However, a mid- or long-term disruption would, no doubt, result in price increases, thereby threatening the economies of all net oil-importing nations.

The greatest threat to allied interests in the area is the spillover of a regional conflict that could interrupt the flow of oil. Historically, relations in the Gulf region have been volatile. U.S. strategy has been to demonstrate a commitment to the region that is firm, credible, and durable in the face of conflicts that could affect established U.S. commitments. The United States is therefore committed to ensuring stability and security with the friendly regional states.

U.S. Forces Vary as Threat Increases and Subsides

In the last 41 years of U.S. naval presence in the Gulf, forces have varied depending on instability in the region. There was little threat to U.S. interests between 1949 and 1978. Although the 1973 Arab oil embargo was not the result of a military conflict in the Gulf, it created an energy crisis that brought to the fore both the need for and risks of overdependence on imported Gulf oil.

After 1978, the U.S. naval presence fluctuated as the threat increased and decreased. The fall of the Shah of Iran, the Iranian hostage crisis, and the Soviet invasion of Afghanistan in 1979 emphasized the need for

¹The Persian Gulf region includes the Persian Gulf, North Arabian Sea, and parts of the Indian Ocean.

a U.S. strategy in an area now vital to U.S. interests. Between 1979 and 1986, the United States increased its naval presence in the region from three to six ships.

Operation Earnest Will Begins

In 1986, Iran boarded a U.S. tanker, the SS President Taylor, and attacked Kuwaiti tankers. The Soviets responded by offering to transport and escort Kuwaiti-flagged Soviet tankers. In March 1987, the President announced the U.S. intention to reflag and escort Kuwaiti tankers in the Gulf, adding three more Navy ships to the region.

About this time, the United States called upon its allies to protect shipping in the Gulf. The U.S. ship protection program became known as operation Earnest Will. In May 1987, the United States extended its protection to neutral ships on a case-by-case basis. U.S. naval forces were increased to 18 ships during the conflict, which ended when Iran and Iraq declared a cease-fire in August 1988.

Overview of Country Involvement

Summary

- Nine Non-Gulf Countries Provided Support
- Six Gulf States Supported the Effort

Nine Non-Gulf Countries Provided Support

Six non-Gulf countries provided direct naval support during operation Earnest Will. Belgium, France, Italy, the Netherlands, the United Kingdom, and the United States cleared mines from navigational routes. All these countries escorted and monitored their flagged ships in a defined channel and patrolled international waters. The United States formally extended its protection to neutral shipping on a case-by-case basis.

The remaining three countries, Japan, Luxembourg, and West Germany, provided indirect support. In reporting its contribution, Japan included credit for a \$300 million loan made to Oman and a \$200 million loan to Jordan, which is not a Gulf state. These concessional loans provide favorable terms and low-interest rates.¹

Japan also agreed to install a precision navigation system in the Gulf. Beacons are almost completely installed along the friendly states' coastlines and, by cross-fixing signals, will enable accurate ship location. This system will not only aid in navigation but will also enhance mine-clearing capabilities should other conflicts arise in the future.

Japan has negotiated individually with each Gulf state for the installation of the navigation system. Negotiations have been completed with all the Gulf states except the United Arab Emirates. Negotiated terms include maintenance and training agreements. The navigation system is operational in all the friendly Gulf states except for Oman and the United Arab Emirates. The system's cost, thus far, is \$9 million.

Luxembourg, which has no navy, provided \$400,000 for the upkeep of forces.

West Germany interpreted its constitution as prohibiting it from providing a naval presence. It fulfilled a U.S.-NATO commitment to provide naval forces in the Mediterranean, thereby freeing other naval forces for relocation to the Gulf.

¹Oman's loan is for 23 years, with an 8-year grace period, at a 4.4 percent interest rate. Jordan's loan includes a \$132 million, 30-year loan at 2.9 percent interest for agricultural and road projects. At the time of our review, negotiations for the remainder of the Jordan loan were ongoing.

**Six Gulf States
Supported the Effort**

The Gulf States, which profited from the continued oil flow, also supported the effort. They provided vital access to their ports, bases, and facilities as well as other assistance—including fuel for both U.S. ships and aircraft.

Assessment of Burden Sharing

Summary

- Cost of Contributions Is Difficult to Measure
- Not All Countries Provided Cost Data
- Non-Gulf Countries Assessed in Relation to Naval Assets Provided

Cost of Contributions Is Difficult to Measure

Establishing a common measure of the cost of naval operations was difficult because some countries, such as France, the United Kingdom, and the United States, maintained a regional presence and had ships in the area. Other countries, such as Belgium, Italy, and the Netherlands, have smaller naval fleets and had to transit to the Persian Gulf region. Naval operating costs differ due to ship sizes, crew complements, and personnel costs (which may or may not be included in naval operating costs). Additionally, incremental costs (costs additional to normal naval operation costs) are difficult to separate, largely because naval ships would be operating elsewhere.

Not All Countries Provided Cost Data

For the reasons noted, some countries did not provide cost estimates for their naval operations in the Persian Gulf during the conflict. The Department of Defense provided U.S. incremental cost data for operation Earnest Will. These costs totaled about \$240 million (see table 3.1).

Section 3
Assessment of Burden Sharing

Table 3.1: U.S. Incremental Costs of Persian Gulf Operations

Dollars in thousands				
	Fiscal year			
	1987 ^a	1988	Through Jan. 1989	1990
Service operating costs				
Navy				
Aircraft operations	\$7,322	\$24,914	\$19,877	\$211
Ship operations	26,681	68,418	23,517	392
Imminent danger pay	1,266	9,690	3,335	•
Other ^b	31,627	47,835	23,706	3,206
Total Navy	\$66,896	\$150,857	\$70,435	\$3,809
Air Force				
Travel/TAD ^c	239	1,574	1,030	49
Other	5,540	1,940	245	0
Total Air Force	\$5,779	\$3,514	\$1,275	\$49
Army				
Travel/TAD	325	3,520	2,093	1,078
SAAM lift	571	382	130	0
Supplies/ contracts	45	2,496	1,573	157
Other	0	146	23	8
Total Army	\$941	\$6,544	\$3,819	\$1,243
Total service operation costs	\$73,716	\$160,915	\$75,529	\$5,101
Other costs and credits				
Host nation fuel support	0	(57,138)	(73,179)	(24,392)
USS Roberts Repair	0	15,907	40,922	0
Procurement (Army)	7,545	14,416	469	0
Total	\$81,261	\$134,100	\$(43,741)	(19,291)

^aThe fiscal year 1987 time period is July through September 1987.

^bIncludes travel and Naval Air Systems Command, Naval Sea Systems Command, and Naval Supply Systems Command support costs.

^cTemporary additional duty.

Source: Department of Defense.

It is difficult to establish a correlation between the number and type of naval assets provided by the countries (see table 3.2) and incremental costs identified. For example, Italy provided six combat vessels, about half of the naval force France had in the Gulf. While Italy's cost estimate is nearly half of France's estimated costs, the estimate appears disproportionate considering that the French force included a costly-to-

operate aircraft carrier. Furthermore, countries' calculations of incremental costs may differ. The United States, for example, does not include personnel costs in its calculations except for hazardous duty pay.

Non-Gulf Countries Assessed in Relation to Naval Assets Provided

When considering the non-Gulf countries' contributions in burden sharing, we focused on the naval assets provided by the countries. Because not all countries provided cost estimates for naval operations, we assigned a value to ships supporting operation Earnest Will. Involvement began in October 1987, when all the countries' ships had arrived in the Gulf region, and ended with the cease-fire in August 1988. We used U.S. operating costs for various types of ships: the highest daily cost was \$74,000 for aircraft carriers; the lowest daily cost was \$1,500 for minesweepers. The values were then computed by days the ships were deployed in the Gulf.

Table 3.2 identifies the naval assets, time frames, and values assigned. Under this methodology, the allied contribution is about 60 percent and the U.S. contribution about 40 percent. The United Kingdom, which had a large number of ships in the region, suffers under this methodology because it did not assign an aircraft carrier to the Gulf.

Section 3
Assessment of Burden Sharing

Table 3.2: Relative Value of the Contributions of the Six Countries With Ships Operating in the Persian Gulf
(Between October 1987 and August 1988)

Country and ships	Estimated arrival/ departure dates	Estimated months deployed	Relative value of contribution (Percent) ^a
Belgium/Netherlands^b			9
1 Minesweeper	10/87-03/88	6	
1 Minesweeper	10/87-07/88	10	
2 Minesweepers	10/87-08/88	11	
1 Support ship ^c			
France^d			34
1 Aircraft carrier	10/87-08/88	11	
7 Combatants	10/87-08/88	11	
3 Minesweepers	10/87-08/88	11	
4 Support ships ^c			
Italy			7
3 Combatants			
1 Combatant	10/87-12/87	3	
2 Combatants	10/87-08/88	11	
3 Minesweepers	10/87-08/88	11	
2 Support ships ^c			
United Kingdom^d			10
3 Combatants	10/87-08/88	11	
3 Minesweepers	10/87-08/88	11	
1 Command ship	10/87-08/88	11	
2 Support ships ^c			
United States^d			40
1 Aircraft carrier	10/87-08/88	11	
9 Combatants			
8 Combatants	10/87-08/88	11	
1 Combatant	05/88-08/88	4	
6 Minesweepers	10/87-08/88	11	
1 Command ship	10/87-08/88	11	
4 Amphibious ships ^e			
2 Other ships			
10 Support ships ^c			

^aValues are based on daily U.S. operating cost estimates, excluding manpower and maintenance costs as follows: Carrier, \$74,000; Cruiser, \$18,000; Destroyer, \$16,000; Frigate, \$9,000; Minesweeper \$1,500, Command ship, \$14,000. It should be recognized that ship size, complements, and maintenance costs differ among countries. Transiting costs and administrative costs are not included.

^bBelgium and the Netherlands combined forces.

^cOperating costs for support ships unavailable.

^dThese countries had a presence in the Gulf region prior to 1987.

^eCosts unavailable for amphibious ships.

^fData not readily available.

Overview of Oil Prices and Production During the Conflict

Summary

- Non-Gulf Countries' Presence Demonstrated the Importance of Gulf Oil
- Operation Facilitated the Continued Free Flow of Oil
- Little Increase in Worldwide Oil Prices Resulted

Non-Gulf Countries' Presence Demonstrated the Importance of Gulf Oil

According to Defense Department officials, Earnest Will has done much to further U.S. relations with the Gulf states. Through the operation, the United States has demonstrated its resolve and willingness to respond to the legitimate defense needs of friendly states in the region.

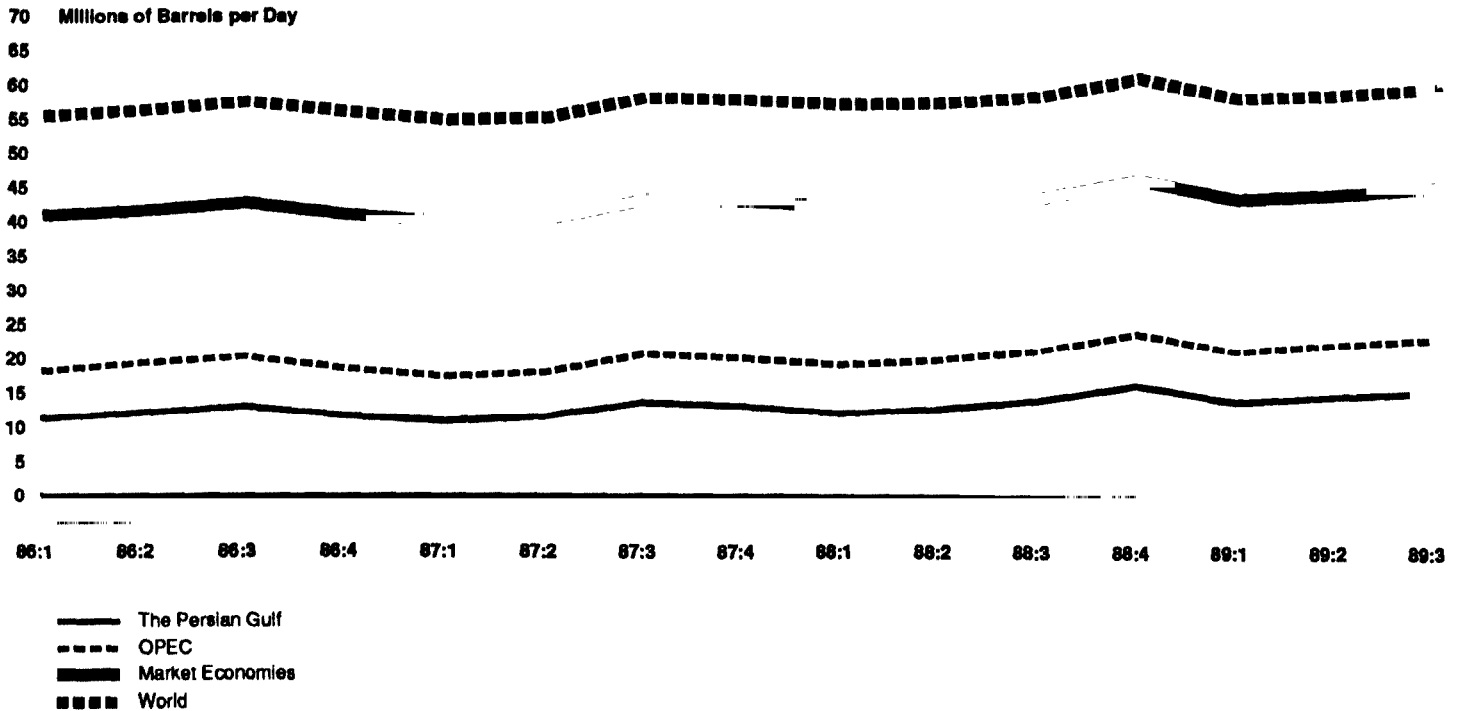
An informal allied presence in the region prior to the Iran-Iraq cease-fire indicated the importance of Gulf oil to Western European and Pacific nations. As long as oil remains a primary source of energy for the industrial world, the Persian Gulf region will remain vital to the security of the United States, its allies, and friends.

Operation Facilitated the Continued Free Flow of Oil

One of the objectives of operation Earnest Will was to maintain the free flow of oil from the Persian Gulf area. As shown in figure 4.1, the operation was successful. Oil disruptions did not occur, and Persian Gulf oil production actually increased slightly. In the first quarter of 1987, when the President announced the reflagging and protection of Kuwaiti tankers, Gulf oil production was at about 10 million barrels a day. By the third quarter of 1987, Gulf oil production had increased to about 12 million barrels a day. This increased production was also reflected in a slight increase in global production as well.

**Section 4
Overview of Oil Prices and Production During
the Conflict**

Figure 4.1: Oil Production 1986-89 (First Quarter 1987 Through Third Quarter 1988 Covers Operation Earnest Will)



**Little Increase in
Worldwide Oil Prices
Resulted**

Oil supply disruptions harm all net oil-importing nations regardless of their dependence on a particular regional supply. An oil loss from a particular region would, in the absence of an oil production surge in undisturbed regions and accompanying oil austerity programs, create global competition for reduced supplies. The demand for reduced oil supplies would result in higher oil prices for all.

International Energy Agency (IEA)¹ countries have a common interest in keeping Gulf oil flowing because they have agreed to share their reserves and an oil disruption would result in price increases. For oil-consuming nations, dramatic price increases adversely affect their economies. Fortunately, the Iran-Iraq war had little effect on oil prices.

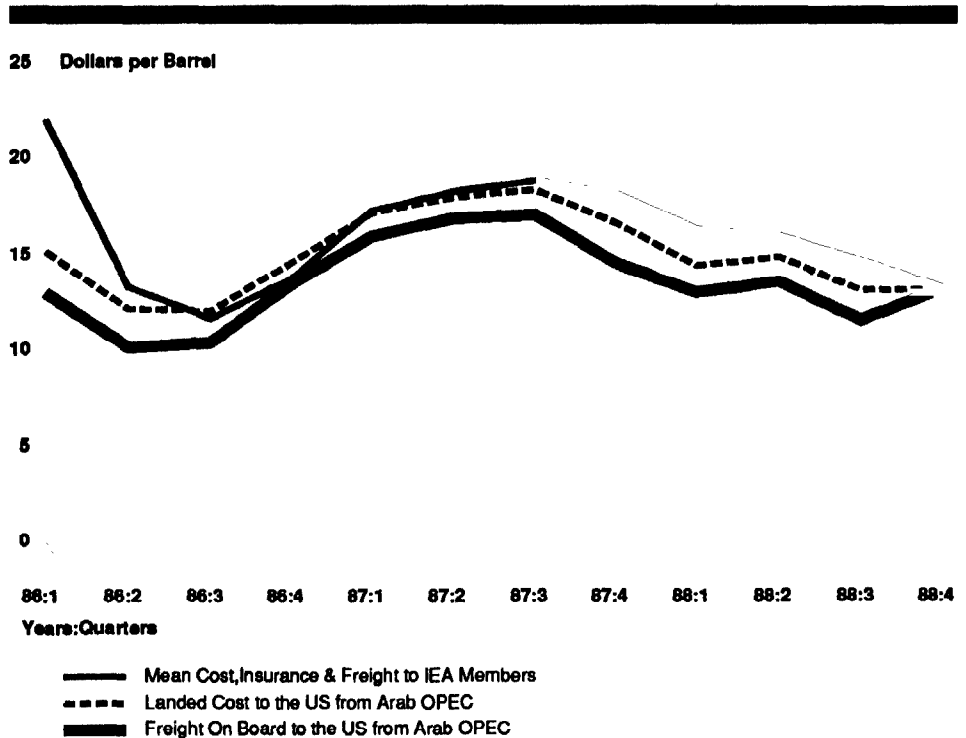
¹The IEA was established to facilitate responses to short-term energy disruptions and long-term supply problems. IEA members are Australia, Austria, Belgium, Canada, Denmark, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States, and West Germany.

**Section 4
Overview of Oil Prices and Production During
the Conflict**

Figure 4.2 presents three indicators of the cost to obtain a barrel of oil during the operation. The first indicator is the weighted average cost of a barrel of oil, including insurance and freight, for members of the IEA agreement. The line shows that oil prices declined steadily until the third quarter of 1986 and rose slightly until the announcement of U.S. operations. These prices ranged from around \$14 to \$18 a barrel for the duration of the operation.

The second price indicator is the landed, or final, cost of a barrel of oil that is shipped from the Persian Gulf to U.S. ports. The third indicator is the cost of a barrel of oil at Persian Gulf ports. This is the price of oil on board vessels destined for the United States, excluding transportation and insurance costs. Figure 4.2 indicates that the difference between the second and third indicators did not significantly change. This suggests that the risk—real or imagined—from 1986 to the third quarter of 1989 also did not change.

Figure 4.2: Quarterly Oil Prices (March 1987 Through September 1988)



Freight On Board (FOB) prices Exclude costs related to insurance and transportation to the United States

Analysis of Potential Impact of a Persian Gulf Oil Disruption

Summary

- IEA Members Did Not Have to Share Reserves
- Potential Impact of a Disruption on Oil-Dependent Economies
- Impact of a One-Quarter Oil Disruption on the United States
- Potential Impact of a Disruption on Gulf Oil-Producing Nations

IEA Members Did Not Have to Share Reserves

Under IEA's International Energy Program (IEP), member countries voluntarily agree to share oil reserves. This emergency sharing system is the Agency's mechanism for reducing the adverse effects of a serious oil supply disruption.¹ Under the system, member countries agree to

- maintain emergency reserves equal to 90 days of net oil imports,
- establish measures to reduce demand by 7 to 10 percent during a serious oil disruption, and
- subject their oil supplies to an international allocation system, using a predetermined formula to share with or receive oil from each other if disruptions exceed 7 percent of their imports. Outside the system, members also have agreed to cooperate in disruptions that are smaller than 7 percent. The system guarantees members access to essential volumes of oil, but not necessarily at the same prices.

Oil from the Persian Gulf accounts for 42 percent of the total net oil imports of all Organization of Economic Cooperation and Development (OECD) countries.² Table 5.1 shows, among other things, the Gulf oil imports of the countries that contributed to open navigation in the Persian Gulf. It also shows that Japan, the United States, and the smaller European nations that did not participate in operation Earnest Will were the main importers of Persian Gulf oil during this period. Measuring dependence on the Persian Gulf as the ratio of imports from the Gulf to daily consumption, the Netherlands and Japan were most dependent on oil from the Gulf. The Netherlands and Japan depended on the Persian Gulf for 74 percent and 58 percent of their daily oil consumption, respectively. In contrast, the U.S. dependence on the Persian Gulf oil was only 7 percent. In daily consumption, imports from the Gulf represented 27 percent of the total for OECD countries.

¹For further information on the Emergency Sharing System, see GAO report Status of U.S. Participation in the International Energy Agency's Emergency Sharing System (GAO/NSIAD-85-99, June 13, 1985).

²OECD members are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States, and West Germany.

**Section 5
Analysis of Potential Impact of a Persian
Gulf Oil Disruption**

Table 5.1: 1987 OECD Oil Statistics

Country	1987 Daily net oil imports ^b			Average daily consumption (thousands/barrels)	1987 GDP ^a in U.S. (dollars in billions)
	OPEC	Gulf	Total ^c		
Belgium	257	162	456	452	\$142
France	684	459	1,742	1,789	873
West Germany	679	187	2,281	2,424	1,118
Italy	1,307	782	1,718	1,855	749
Japan	3,198	2,637	4,418	4,454	2,376
United Kingdom ^d	164	277	-1015	1,603	576
United States	3,053	1,072	5,914	16,665	4,497
Luxembourg	^e	^e	27	27	^e
Netherlands	773	516	562	686	214
Others	3,120	2,036	2,725	^e	^e
Total	13,235	8,128	18,828	29,955	e

^aGross domestic product.

^bBased on daily averages reported quarterly.

^cGulf imports are extracted from OPEC totals. Differences between OPEC totals and total country imports indicate additional sources of oil imported or produced by countries.

^dNet exporter.

^eNot applicable.

Potential Impact of a Disruption on Oil-Dependent Economies

If a disruption had occurred, the near-term impact on oil-consuming economies would have been serious. Dramatic increases in oil prices have historically affected the economies that rely on oil or its products. For example, following the 1973-74 embargo, crude oil prices nearly tripled. This increase contributed to a 1.1-percent decrease in the real gross national product of the United States in 1975. Further, in the year following the 1979 Iranian shutdown, oil prices nearly doubled, contributing to a 13.5-percent inflation rate and a 7.1-percent unemployment rate in 1980 in the United States.

Generally, oil supply disruptions immediately increase the spot market price of oil. Lags in market response to the change in market conditions and increased inventory buildup may create a period of rising prices even after the disruption. The size of the disruption, market tightness, and the availability of emergency reserves would, however, ultimately determine the severity of the macroeconomic consequences of inflation, unemployment, and economic stagnation. Ultimately, oil supply disruptions harm all net oil-importing nations regardless of their dependence on supplies from a disrupted area.

The potential impact of disruption of oil imports from the Gulf on selected OECD oil-consuming countries is shown in tables 5.2 and 5.3. The generated estimates are derived using the assumptions in the Department of Energy's Disruption Impact Simulator and petroleum statistics from the period. Table 5.2 presents the most severe impact that could have occurred at the outset of a disruption in the first quarter of 1987 through the launch of operation Earnest Will at the beginning of the second quarter of 1987. Table 5.2 shows the potential impact resulting from a disruption to oil transshipped through the Strait of Hormuz as well as oil shipped through existing regional pipelines, which were operating at 24 percent of capacity.

These tables show for the United States an initial oil import loss from a disruption, an increased oil import loss resulting from competition for available oil in the free market, and a slightly reduced loss resulting from IEP members' sharing of reserves or member-produced oil. A total disruption of petroleum from the Persian Gulf in the first quarter of 1987 would have meant a loss of 6.63 million barrels a day (mbd) of worldwide supplies, of which 5.63 mbd would have been lost to IEA members. Among IEA members, Japan and the United States would have an immediate loss of 1.93 mbd, and 1.28 mbd, respectively. Moreover, had IEA members sought to replace the 5.63 mbd from other sources (without any global surge production), they would have obtained only .44 mbd, leaving them with a shortfall of 5.19 mbd. A disruption of the magnitude hypothesized in this report would have been large enough to trigger the IEP. This factor is evidence that the Persian Gulf is critically important as a prime source of petroleum to IEA members collectively. The implementation of emergency burden sharing arrangements under the IEP would make it possible for member countries to collectively face a shortage of 4.81 mbd before consuming strategic petroleum reserves to meet their domestic needs. The IEP redistributions would partially alleviate U.S. shortfalls but worsen shortfalls in Japan, West Germany, and non-IEA consuming nations.

Section 5
Analysis of Potential Impact of a Persian
Gulf Oil Disruption

Table 5.2: Estimated Losses From a Total Disruption in Persian Gulf Oil Supplies

Millions of barrels a day			
Country	Immediate loss^a	Free market^b	Full IEP^c
U.S. and territories	1.28	2.30	2.17
Canada	0.10	0.26	0.11
Japan	1.93	0.76	0.80
Australia/ New Zealand	0.08	0.13	0.04
Norway/Sweden	0.03	0.10	0.02
United Kingdom/ Ireland	0.09	0.29	0.04
Benelux/Denmark	0.03	0.24	0.18
West Germany	0.27	0.41	0.65
Austria/ Switzerland	0.04	0.08	0.14
Spain/Portugal	0.40	0.19	0.23
Italy	0.80	0.31	0.26
Greece/Turkey	0.58	0.12	0.18
Total IEA	5.63	5.19	4.81
Non-IEA/ non-OPEC	1.00	1.44	1.82
Total free world	6.63	6.63	6.63

^aLoss to each IEA member from a disruption in the Persian Gulf.

^bEstimated shortfalls of petroleum supplies if each IEA member were to replace a loss by competing for supplies in the global market. Assumption is that supplies to be obtained are normal demand without reliance on reserves or surge in domestic production.

^cEstimated shortfall is based on IEP formula and represents IEP rather than marketplace distribution. Shortfalls could be met from member's strategic petroleum reserves.

Source: GAO estimate based on Department of Energy Disruption Impact Simulator.

Another way to look at the effects of a potential disruption of the flow of petroleum in the Persian Gulf is to consider a disruption of oil shipped through the Strait of Hormuz. Table 5.3, which excludes over-land pipeline delivery systems, indicates the probable effects of shipping disruptions on the Strait of Hormuz—the main sea channel for transportation in the area.

A total loss of petroleum shipped through the Strait of Hormuz in the first quarter of 1987 would have resulted in a 5.1 mbd loss to the free world. Japan would have incurred the largest loss. The disruption would have triggered the sharing of strategic petroleum reserves, thereby lessening the impact of the disruption.

Table 5.3: Estimated Losses Due to a Disruption in the Strait of Hormuz

Millions of barrels a day			
Country	Immediate loss	Free market	Full IEP
U.S. and territories	1.08	1.77	1.65
Canada	0.07	0.20	0.06
Japan	1.82	0.59	0.63
Australia/ New Zealand	0.06	0.10	0.02
Norway/Sweden	0.02	0.08	0.00
United Kingdom/ Ireland	0.05	0.22	-0.01
Benelux/Denmark	0.03	0.18	0.13
West Germany	0.17	0.32	0.57
Austria/ Switzerland	0.02	0.06	0.12
Spain/Portugal	0.26	0.14	0.19
Italy	0.55	0.24	0.20
Greece/Turkey	0.32	0.09	0.15
Total IEA	4.44	4.00	3.71
Non-IEA/non-OPEC	0.67	1.11	1.40
Total free world	5.11	5.11	5.11

Source: Department of Energy Disruption Impact Simulator.

If oil flowing through the pipelines had increased to full capacity and was not disrupted, the impacts shown in the tables may have been mitigated. For example, the impact to free world oil-consuming countries would have been lessened from 5.1 mbd to 1.13 mbd. This loss would not have triggered the emergency sharing system of the IEP. However, there is no assurance that the conflict would have been confined to sea lanes and would not have affected the flow of oil through the pipeline.

Impact of a One-Quarter Oil Disruption on the United States

Dramatic oil price increases have a domino effect on oil-dependent economies, such as the United States, and affect inflation rates, unemployment, and the gross national product. Table 5.4 shows the potential effect on the United States from a disruption in the Strait of Hormuz. The first quarter of 1987 reflects the average costs of oil and its byproducts as well as the consumption and oil imports. These baseline figures, coupled with the assumptions in the model, identify the potential effects of an oil disruption on the U.S. economy.

The analysis is based on Department of Energy's model using the following baseline conditions. In 1987, the price of imported crude oil was at \$18 per barrel, and gasoline prices and heating oil prices averaged \$0.96 and \$0.80 per gallon, respectively. Consumption of petroleum was

**Section 5
Analysis of Potential Impact of a Persian
Gulf Oil Disruption**

estimated at 16.5 mbd with a net import of 6.3 mbd. The analysis assumes that the disruption ends by the start of the second quarter of 1987.

Assuming only a first quarter, 1987, oil disruption from the Strait of Hormuz, the simulation reveals that imported crude oil prices would have more than doubled during the quarter but would have returned to a price of \$24 per barrel by the fourth quarter. If the disruption ended in the first quarter of 1987, the economy would recover quickly with the gross national product loss limited to .58 percent in the fourth quarter.

Table 5.4: The Potential Effect of a Disruption of Petroleum Shipments Through the Strait of Hormuz

	1st qtr (Base line conditions)	1987			
		1st qtr	2nd qtr	3rd qtr	4th qtr
Crude oil price ^a	\$18.13	\$42.56	\$33.23	\$27.46	\$23.90
Gasoline price ^b	\$0.96	\$1.54	\$1.32	\$1.18	\$1.10
Heating oil price ^b	\$0.80	\$1.38	\$1.16	\$1.02	\$0.94
U.S. consumption ^c	16.53	14.76	15.45	15.92	16.42
U.S. net imports ^c	6.26	4.49	4.97	4.90	5.78
GNP loss ^d		-1.78	-1.26	-0.87	-0.58
Unemployment gain ^d		0.71	0.51	0.35	0.23
Inflation gain ^d		2.66	1.90	1.30	0.87
Terms of trade loss ^e		-\$11.77	-\$7.64	-\$4.46	-\$3.19

^aPrice per barrel of imported oil

^bPrice per gallon

^cmillions of barrels per day

^dpercentage points

^ebillions of dollars

Source: GAO estimate based on the Department of Energy Disruption Impact Simulator.

Potential Impact of a Disruption on Gulf Oil-Producing Nations

If a long-term disruption had occurred, the impact on oil-producing countries would have been serious, considering the importance of oil to a country's gross national product and as a foreign currency earner. Oil represents a major part of the gross national product for all the Gulf states. For Gulf states that are friendly with the United States, 1987 oil exports to the OECD varied from 95 percent of Bahrain's 1987 gross national product to 19 percent of Kuwait's gross national product. Oil exports to OECD were important to Iran and Iraq as well. Oil exports for Iran accounted for 6 percent of its gross national product, while Iraq's exports comprised 20 percent of its gross national product. Moreover,

Section 5
Analysis of Potential Impact of a Persian
Gulf Oil Disruption

for all the Gulf states, oil exports were a critical foreign currency earner. For example, in 1987 Iraq earned \$8 billion from petroleum exports to OECD countries. This represented 89 percent of its total exports to these countries. Similarly, Iran's petroleum exports to OECD countries totaled \$10 billion, or 87 percent, of its total exports to these countries. During the period, Saudi Arabia's petroleum exports represented 70 percent of its total exports to OECD countries. Table 5.5 shows the amount of Gulf oil exported to OECD countries in 1987 and its value in U.S. dollars.

Table 5.5: Gulf States Oil Statistics (1987)

Country	Oil exports to OECD countries^a (millions of barrels/day)	Value of 1987 oil exports (U.S. dollars (in billions))	1987 gross national product in (U.S. dollars (in billions))
Bahrain	0.04	\$4 ^b	\$4.3
Kuwait	0.9	5	25.8
Qatar	0.2	2	4.2
Saudi Arabia ^c	2.8	22	69.7 ^d
United Arab Emirates	1.1	9	22.9
Iran	1.2	10	165.9
Iraq	1.1	8	40.0

^aAverage 1987 daily oil exports.

^bBahrain value of oil is only for 1988.

^cOman exports reported with Saudi Arabia.

^dDoes not include Oman's gross national product, which was \$1.3 billion.

Objectives, Scope, and Methodology

Our objectives were to (1) identify the countries involved in sustaining open navigation in the Persian Gulf and the role each played, (2) analyze the value of the contributions provided by those countries, and (3) assess the potential economic impact of the disruption of Gulf oil imports on the Gulf States and industrialized countries. The data obtained covers March 1987 and August 1988.

We contacted embassy officials from Bahrain, Belgium, France, West Germany, Italy, Japan, Kuwait, Luxembourg, the Netherlands, Oman, Qatar, Saudi Arabia, the United Arab Emirates, and the United Kingdom and West Germany, to obtain information on their involvement and cost estimates. For information on U.S. involvement, we contacted officials at the Departments of Defense and State. Because of the time limits involved, we did not verify the information provided to us or obtain written agency comments from the Department of Defense. However, we met with appropriate DOD officials and obtained their official oral comments.

For those countries that were unable to provide us cost data on naval assets, we developed a relative value based on U.S. naval ship operating costs.

Using the Department of Energy's Distribution Impact Simulator, we developed estimates of the probable economic effects of a Persian Gulf oil disruption. The Disruption Impact Simulator has been used by other U.S. government agencies, DOE included, for the assessments of potential economic effects and policy implications of other oil flow disruptions. We did not independently validate the accuracy of the simulator's predictions.

We performed our work between January and March 1990 in accordance with generally accepted government auditing standards.

Major Contributors to This Report

National Security and
International Affairs
Division,
Washington, D.C.

Louis H. Zanardi, Assistant Director
Patricia L. Martin, Evaluator-in-Charge
Gezahegne Bekele, Economist



Requests for copies of GAO reports should be sent to:

**U.S. General Accounting Office
Post Office Box 6015
Gaithersburg, Maryland 20877**

Telephone 202-275-6241

The first five copies of each report are free. Additional copies are \$2.00 each.

There is a 25% discount on orders for 100 or more copies mailed to a single address.

Orders must be prepaid by cash or by check or money order made out to the Superintendent of Documents.

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

Official Business
Penalty for Private Use \$300

First-Class Mail
Postage & Fees Paid
GAO
Permit No. G100