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Oman: Oil System Vulnerability

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A Research Paper

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April 1983

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This paper was prepared by Office of Global Issues. Comments and queries are welcome and may be directed to the Chief, Energy Vulnerability Branch, OGI,

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Key Judgments

Information available as of 11 March 1983 was used in this report.

The simplicity of Oman's oil production and export system—which supports 60 percent of the country's gross national product—makes it highly vulnerable to military or terrorist action. The destruction of oil facilities at Mina al Fahal, Oman's only export terminal, would totally shut down exports and cut Omani export earnings by over 90 percent during repairs.

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We believe the extended loss of oil export revenues—about $3.6 billion annually—caused by destruction of Oman's key oil facilities would threaten the stability of the regime unless foreign financial assistance was made available. US interests, in particular, would be affected far more than the negligible impact that the loss of Omani exports of approximately 340,000 barrels per day (b/d) of crude would have on the world market. Oman's location on the Strait of Hormuz, gateway to the Persian Gulf, and its military facility access arrangements with the United States make Oman an important element of US strategy in Southwest Asia.

We believe Iran currently poses the most likely military threat to Omani oil facilities. The Khomeini government has already demonstrated its willingness and ability to destroy foreign oil production and export facilities. Although Oman also has disputes with most of its Arab neighbors on a variety of issues—several of which are linked to Oman's growing relationship with the United States—we do not believe these disputes pose as great a threat to Oman's oil facilities.

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We believe the cornerstone of a successful contingency plan would be the creation of an inventory of critical parts that could quickly replace equipment damaged in an assault. During periods of crisis, manual operation of the oil system would ensure maximum flexibility and reliability.

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25X1

Contents

25X1

25X1

Approved For Release 2008/04/11 : CIA-RDP84S00558R000300030004-5

25X1

Oman: Oil System Vulnerability

25X1

Oman and Oil [1]

More than 90 percent of Oman's export earnings and 60 percent of its GNP are derived from crude oil sales. With oil production currently targeted at more than 360,000 b/d, the $3.6 billion per year in export revenues earned is vital to the stability of the Sultanate. While Oman's oil exports are not significant in the world oil market, the stability of the generally cooperative Qaboos regime is of substantial importance to the United States' strategic interests in Southwest Asia. Oman's location on the Strait of Hormuz—through which one-fifth of the Free World's crude oil is currently shipped—and its proximity to Iran, the USSR, and the increasingly important Indian Ocean area all make Oman a valued ally of the United States in a highly volatile region.

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The Omani Oil System

The crude oil exports that maintain Muscat's national revenues are produced at three locations from 19 oilfields operated by Petroleum Development (Oman) and from one oilfield operated by the French firm Elf Aquitaine (table 1):

- North Oman—The Fahud-Yibal area contains six oilfields that generate nearly 60 percent of Oman's current production.
- Central Oman—The Qarn Alam area also contains six oilfields and serves as the point through which the remaining 40 percent of the country's production flows. Elf's only producing oilfield is located in central Oman.
- South Oman—Marmul and Rima are the largest of the seven fields producing in this area.

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The crude oil terminal at Mina al Fahal handles all of Oman's petroleum exports. Historically, Oman has provided bunker service to loaded tankers exiting the Strait of Hormuz (figure 2). As crude oil became available for sale, it was added to the bunker service. At present, tanker loadings are handled by two single point moorings (SPMs) capable of loading crude oil and bunker fuel, and a third SPM that loads bunker fuel only. Delivery of crude oil to tankers is by gravity flow from two elevated tank farms. Bunker fuel is pumped to the ships from tanks near sea level (figure 3).

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Potential Threats to the System

We believe Iran presents the greatest potential threat to the Omani oil export system. The Iranians have adequately demonstrated their ability to target key petroleum facilities by their strikes on Iraq's offshore oil-loading terminals at Mina al Bakr and Khor al Amaya in November 1980 and on Kuwait's gas-oil separation plant at Umm al-'Aysh in October 1981. The gunboat and commando attack on the Iraqi terminals eliminated about two-thirds of Iraq's export capacity for the remainder of the war.

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We believe the nominal support Muscat has provided Baghdad in its war with Iran, combined with the Sultan's good relations with the United States and general endorsement of Arab positions toward Iran, could serve as an excuse for a punitive attack, given the general vindictiveness of the Khomeini government.

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Figure 2
Strait of Hormuz

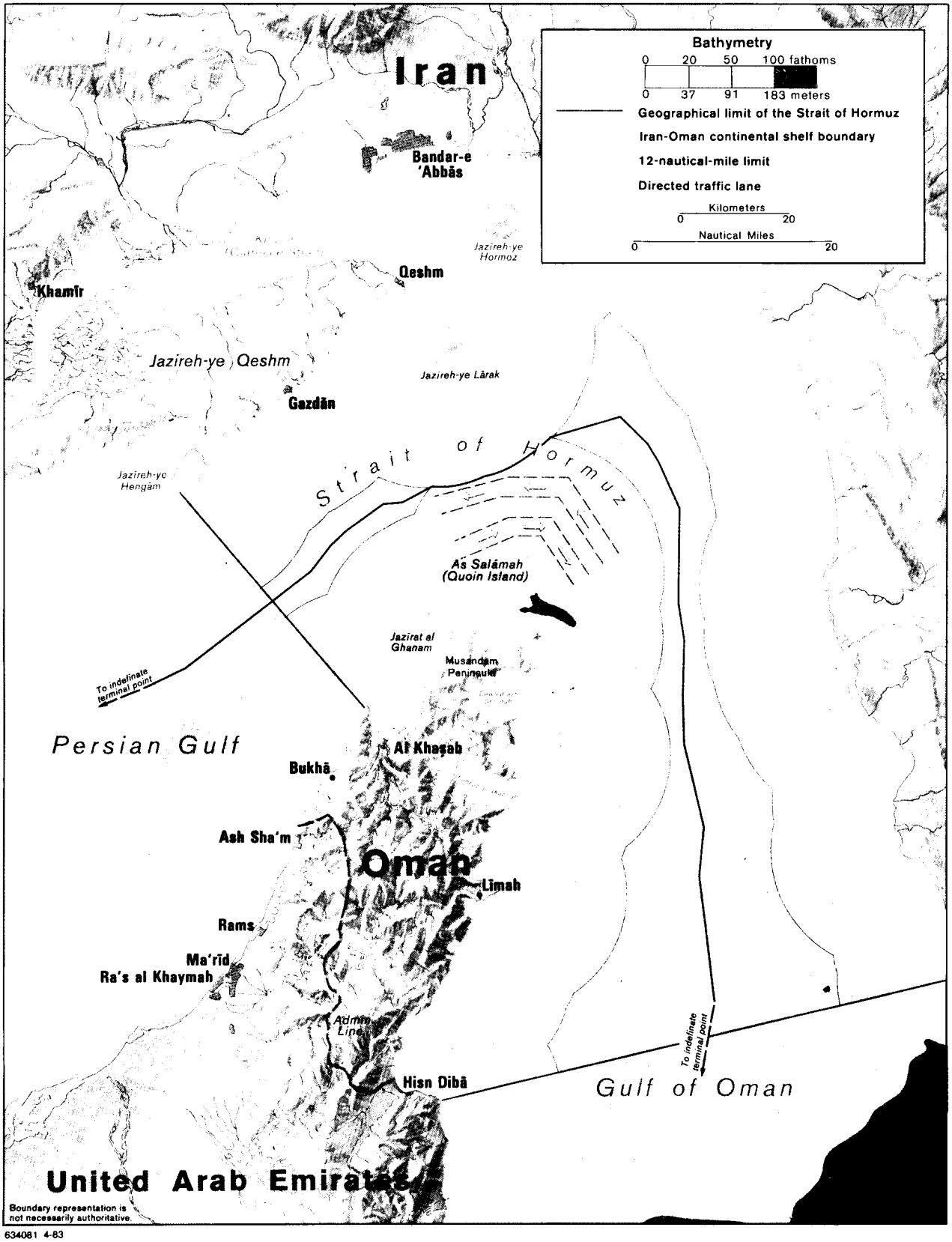

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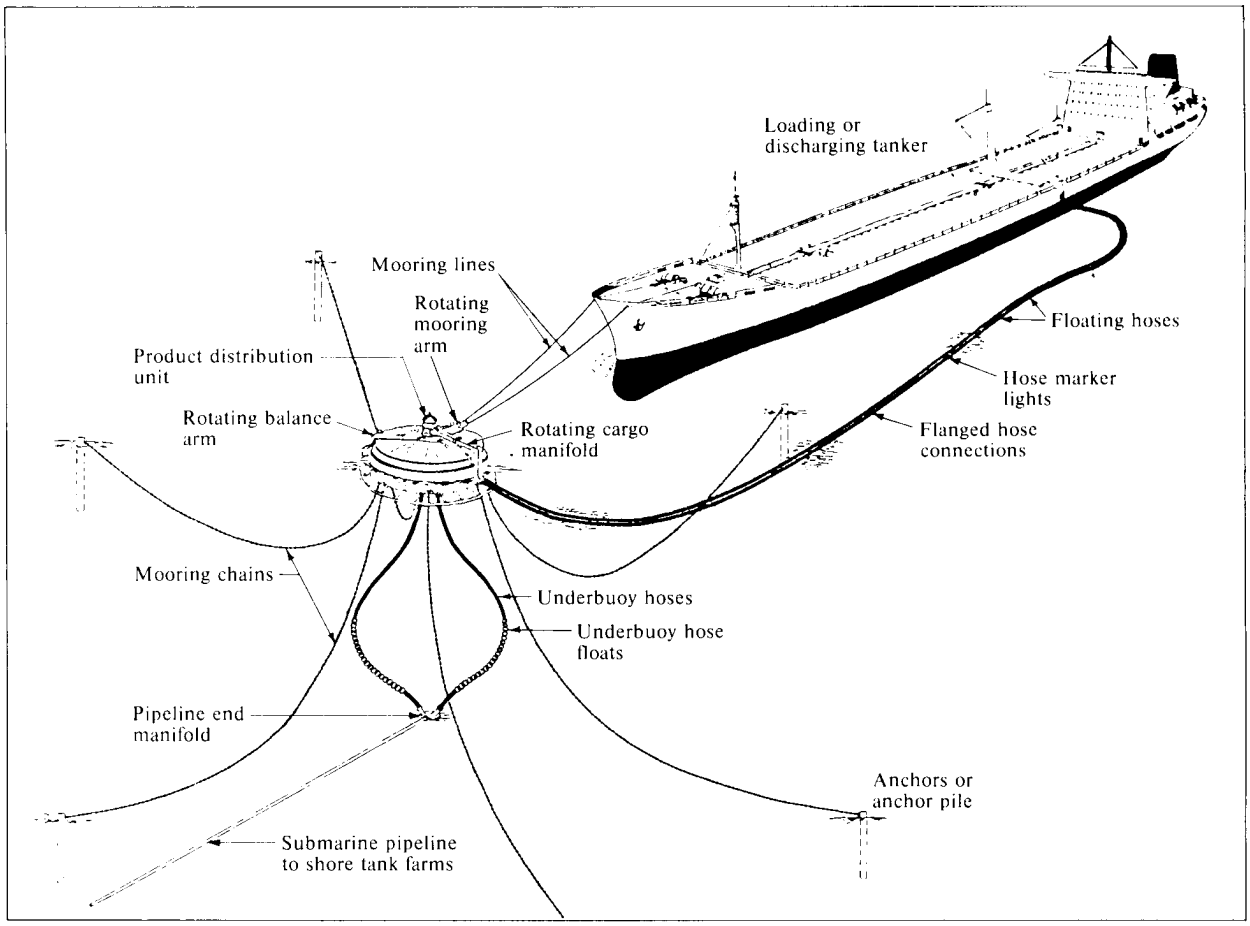
Figure 3
Single Point Mooring System



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We believe Oman also faces lesser threats from some of its Arab neighbors.

Despite a reconciliation agreement concluded last year between Oman and South Yemen, Aden's long-term intentions toward Muscat remain in doubt. Moreover, Oman's continued support of the Camp David Agreements, its full diplomatic relations with Egypt, and its facility access agreements with the United States have also drawn considerable criticism from Arab states and organizations. Although we do not expect trouble in the near term on these points, we cannot rule out the possibility of conflict in the years to come.

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Oman: Estimated Maximum Sustainable Crude Oil Productive Capacity [a]

Thousand barrels per day

Total	**376.9**
Petroleum Development	**366.9**
North Oman	221.1
Al-Huwaisah	23.0
Fahud	62.0
Lekhwair	8.0
Natih	30.0
Shibkah	0.1
Yibal	98.0
Central Oman	50.0
Ghaba North	9.0
Habur	1.0
Mahjour	0.7
Qarn Alam	3.0
Saih Nihayda	23.5
Saih Rawl	12.8
South Oman	95.8
Amal	0.6
Birba	5.0
Rahab	2.0
Rima [b]	30.0
Marmul	48.0
Qaharir	9.0
Qata	1.3
Elf Aquitaine	**10.0**
Sahmah	10.0

[a] Maximum sustainable capacity is the maximum production rate that can be sustained for several months; it considers the experience of operating the total system. Individual field capacities are based on observed production rates. Pipeline constraints between Qarn Alam and Nahada restrict the flow of oil from the Central, South, and Elf Aquitaine fields.

[b] Capacity at Rima, which came on line in October 1982, may expand above this level.

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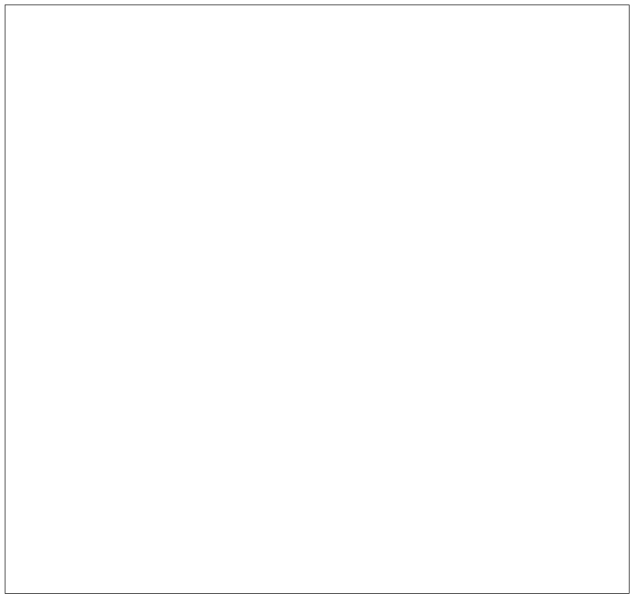
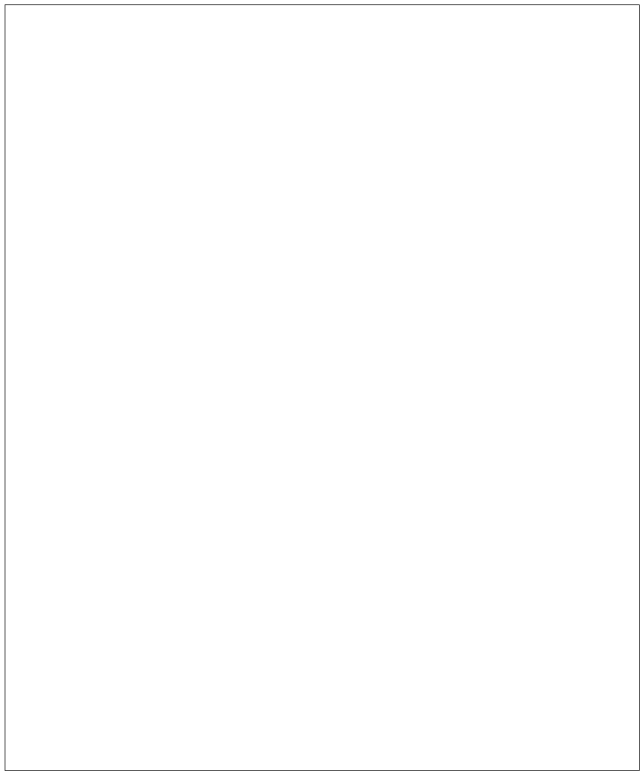


The loss of all crude oil storage at Mina al Fahal would not necessarily halt crude exports for an extended period, in our judgment. The storage tanks could be bypassed, once critical pipeline repairs were completed, by switching the oil flow between the SPMs as long as one tanker was being loaded at all times. Oil production, however, would have to be substantially reduced, if not stopped, during loading disruptions. Dedication of a large tanker to act as a floating storage facility could minimize downtime under these circumstances.



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The security of export operations could also be improved by the construction of underground storage at Mina al Fahal. The relatively high cost of building such a facility—possibly as high as $50 million, according to one estimate—probably makes it impractical in the current economic environment.

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The replacement of ruptured pipeline at Nahada to restore the flow of oil from the northern fields could probably be accomplished within a few days if appropriate pipeline sections and installation equipment were securely stockpiled. Based on industry standards for equipment supply leadtimes, we believe, however, that it would take over a year to acquire replacements for the three pump units that constitute the Nahada booster station. The station's remote location would also hinder transportation and installation. Partial restoration of exports from the central and southern

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fields might be accomplished by cannibalizing the more seriously damaged pumps to repair at least one pump in the station or by moving standby equipment from other locations to Nahada. An inventory of spare parts would facilitate this partial restoration process, and modular pump/driver units could augment production while repairs were in progress.

[redacted]

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[redacted]

We believe acquisition and maintenance of a spare parts inventory of booster and shipping pumps, their associated drivers, and rolled steel plate for the reconstruction of tanks is the best planning option. Inclusion of water disposal pumps, transformers and switchgear in the inventory would also be useful. For maximum flexibility, the oil pump/driver combinations would be modularized so they could be used in a variety of applications. As a temporary measure, an excavated pit with a synthetic liner could serve as a settling tank. While this approach is simple, inexpensive, and relatively invulnerable, the inability to flare dangerous vapors and the risk of dirt entering the crude oil could present significant problems.

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We believe the most efficient option available to Muscat for reducing its vulnerability to oil export disruptions is the development of a strategic inventory of critical parts that could quickly replace equipment damaged in an attack. [redacted] 25X1 In a crisis, all facilities could be operated manually rather than through the normal centralized and automated control process. This would require installation of a new communications network to ensure reliable operation of the system in an emergency. While labor intensive, this approach would allow a much quicker resumption of production and offers far greater reliability and flexibility in a crisis. [redacted] 25X1