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# Energy Threats in the Gulf

## *Closing the Gulf and Preventive Strikes*

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# *Introduction*

# Introduction

Any estimate of energy risk is highly uncertain. The reality can vary sharply according to national and global economic conditions, politics, war, natural disasters, discoveries of new reserves, advances in technology, unanticipated new regulations and environmental issues, and a host of other factors.

Moreover, any effort to model all aspects of world energy supply and demand requires a model so complex that many of its interactions have to be nominal efforts to deal with the variables involved. Even if perfect data were available, there could still be no such thing as a perfect model.

That said, the US Department of Energy (DOE) and its Energy Information Agency (EIA) do provide estimates based on one of the most sophisticated data collection and energy modeling efforts in the world. Moreover, this modeling effort dates back decades to the founding of the Department of Energy and has been steadily recalibrated and improved over time – comparing its projections against historical outcomes and other modeling efforts, including those of the International energy Agency and OPEC.

The DOE modeling effort is also relatively conservative in projecting future demand for petroleum and natural gas. It forecasts relatively high levels of supply from alternative sources of energy, advances in new sources of energy and liquid fuels, and advances in exploration and production. It also forecasts advances in conservation and efficiency, and assumes relatively high growth levels in the use of coal and nuclear power in spite of environment and political issues.

This analysis draws on the work of the EIA to illustrate the energy risks in the Middle East and North Africa affecting the production and export of oil and gas. It draws on a wide range of EIA sources, including its International Energy Outlook for 2012, its preliminary Annual Energy Outlook for 2012, and its various country studies. The data used as referenced in each of the “slides” used in this presentation.

The analysis is divided into several main sections:

**Section One focuses on demand issues and their impact on global and regional demand for liquid fuels, impact on supply, price issues, and the special conditions affecting US demand for energy imports.** It indicates that growth in Asian demand for MENA oil and gas exports will be high through 2035 (the cutoff date for projections), creating a “demand vulnerability” in periods

of moderate to high economic growth that will keep prices high and stimulate major increases in production. It also shows that US political posturing about energy independence is just that – dishonest political opportunism that does not reflect the total different results of US government modeling and analysis.

**Section Two covers North Africa.** It indicates that the projected growth in Algerian and Libyan supply will be limited by global standards, but be of importance to Europe. It also indicates that Algeria and Libya are moderate risk countries because of the political uncertainties in each state and their uncertain ability to attract sustained energy investment over time.

**Section Three Covers Egypt and the Levant.** It indicates that Egypt will increase some aspect of gas production, but that both Egypt and Syria are steadily declining oil producers, and increases in Egyptian gas exports may have a local impact but only a token impact on world markets. Egypt emerges as a moderate risk country and Syria as a high risk country.

**Section Four covers the Gulf and Yemen. It shows that the Gulf remains the key source of additional oil and gas production in spite of major projected gains in the rest of the world's output.** It also shows that these increases are highly dependent on two high risk countries – Iran and Iraq. Yemen is a high risk country, but one with negligible and declining impact on world exports. The Southern Gulf producers –Kuwait, Oman, Qatar, the UAE and Saudi Arabia -- face some individual problems but are rate as low risk with the exception of the potential impact of a future conflict in the Gulf.

**Section Five covers the risk of a war involving Iran.** There is no way to predict the form such a conflict might take or to estimate a probability in any meaningful mathematical model. The risk of some clash in the coming three years is, however, at least moderate and the risk of a serious clash over time will rise to high if Iran does not abandon its nuclear program, and improve its relations with its neighbors.

The first four sections attempt to summarize and quantify key trends in energy production and exports and the key factors shaping risks in a given country and area. Section Five focuses on the build-up and capability of Iranian forces “to close the Gulf” and present a range of threats from low-level asymmetric warfare, to a Gulf-wide conflict that could involve the use of long-range missiles.

# *Closing the Gulf*

## Introduction

There is no way to assign a probability to a conflict or crisis in the gulf that is triggered by the confrontation between Iran and the US, EU, and many Arab states over Iran's nuclear and missile programs, and by the steady build up of military forces in the Gulf. Iran has, however, made threats to "close the Gulf" over these issues. Moreover, in late December 2011 and early January 2012, Iran carried out military drills in the Gulf to demonstrate its stated capability to close the Strait of Hormuz, made threatening statements about the presence of the US' 5<sup>th</sup> Fleet in the region, and the Iranian parliament is considering a bill that would prohibit the presence of foreign warships in the Gulf without the permission of the Iranian navy.

### Iranian Threats to Close The Gulf

While Iran quickly backed down in regard to the movement of US navy warships through the Gulf, even a few excerpts from Iranian statements illustrate the risks involved:

*"Should the enemies desire to use the method and spirit of threats, we will naturally also threaten them. The (military) exercise by the armed forces of the Islamic Republic of Iran's Islamic Revolution, in fact, expresses the will to act against various types of threats that are targeting our national security."* - Hossein Salami, Revolutionary Guards Deputy, February 7, 2012.

<http://www.farsnews.com/newstext.php?nn=13901118000917>

*"[T]he recent statements made by the US and the West about the Strait of Hormuz shows that they are frightened by the awe of the (Islamic) Revolution, otherwise the Iranian nation considers the Strait of Hormuz as the strait of peace. However, the Iranian nation is determined to cut the hand of those who seek adventurism in the Persian Gulf, the Sea of Oman and the Strait of Hormuz."* – Ali Larijani, Speaker of Iranian Parliament, February 1, 2012.

<http://english.farsnews.com/newstext.php?nn=9010173255>

*"Tehran will not remain indifferent to US mischief in the region if Washington tries to cause problems for regional countries. The Strait of Hormuz is a region of peace and Iran has protected its peace for centuries and will continue to do so in order to maintain calm in it,"* - Ali Larijani, Speaker of Iranian Parliament, January 31, 2012. <http://www.presstv.ir/detail/223919.html>

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*"The US has given a role to Saudi Arabia, Qatar and Turkey to direct the regional developments in a way that they move towards these countries' interests in line with the US policies and opposite to Iran's policies. Owing to the fact that Iran's Islamic Revolution serves as a role model for the regional and world nations in their fight against the tyranny of their rulers and arrogant powers, the US and its allies are attempting to prevent Tehran's further political influence in the region."* - Major General Yahya Rahim Safavi, Senior Military Aide to the Supreme Leader, January 31, 2012.

<http://english.farsnews.com/newstext.php?nn=9010173133>

*"The United States did not dare to direct its aircraft carrier through the Strait of Hormuz alone; this is why the carrier was "escorted" by military vessels of other nations. If the Strait is closed, the aircraft carriers will become the war booty of Iran."* - Javad Karimi Qodousi, parliamentary National Security Committee member, January 24, 2012.

<http://www.isna.ir/ISNA/NewsView.aspx?ID=News-1935908&Lang=P>

*"There is no decision to block and close the Strait of Hormuz unless Iran is threatened seriously and somebody wants to tighten the noose. All the options are on the table."* - Mohammad Khazaei, Iranian Ambassador to the United Nations, January 19, 2012.

<http://www.bloomberg.com/news/2012-01-19/iran-s-un-envoy-says-closing-strait-of-hormuz-is-an-option-if-threatened.html>

*"Our capability to provide security in the region, specially the Strait of Hormuz during sensitive times, will not experience any change due to the western warships' trafficking in the region."* -Gholam Reza Karami, Iranian lawmaker and Chairman of the Parliamentary Defense Committee, January 16, 2012. <http://english.farsnews.com/newstext.php?nn=9010171403>

*"Today the Islamic Republic of Iran has full domination over the region and controls all movements within it."* - Navy Rear Admiral Ali Fadavi, Commander of Iran's Islamic Revolution Guards Corps (IRGC), January 6, 2012.

<http://english.farsnews.com/newstext.php?nn=9007270592>

*"The Zolfaqar vessel is considered as a new model of the vessels of the same class which is capable of conducting operations in different marine conditions thanks to its sea-to-sea missiles and proper speed. The sea-to-sea cruise missile with high destructive capability and targeting power has immensely increased the vessel's power."* -Brigadier General Ahmad Vahidi , Iranian Defense Minister, January 2, 2012. <http://english.farsnews.com/newstext.php?nn=9007279956>

*"Iran has total control over the strategic waterway. Closing the Strait of Hormuz is very easy for Iranian naval forces."* -Rear Admiral Habibollah Sayyari, Iran's naval commander, December 28, 2011.

[http://www.nytimes.com/2011/12/29/world/middleeast/noise-level-rises-over-iran-threat-to-close-strait-of-hormuz.html?\\_r=2](http://www.nytimes.com/2011/12/29/world/middleeast/noise-level-rises-over-iran-threat-to-close-strait-of-hormuz.html?_r=2)

*"If they impose sanctions on Iran's oil exports, then even one drop of oil cannot flow from the Strait of Hormuz."* - Mohammad-Reza Rahimi, Iran's first vice president, December 27, 2011.

<http://www.nytimes.com/2011/12/28/world/middleeast/iran-threatens-to-block-oil-route-if-embargo-is-imposed.html?pagewanted=all>

*"Closure of the Strait of Hormuz is not on the Islamic Republic of Iran's agenda (at present), but if threats against Iran come to trample upon the rights of our nation while others use the strait for exporting their oil, then Iran will be entitled to the right to close the Strait of Hormuz. The international conventions reserve such rights for the Islamic Republic of Iran as well. For the time being, the Islamic Republic of Iran has not decided to close the strait, but this (closing the strait) depends on the conditions of the region."* - Mohammad Taqi Rahbar, Iranian lawmaker, December 19, 2011.

<http://english.farsnews.com/newstext.php?nn=9007277986>

*"According to the international laws, including Paragraph 4 of Article 14 of the Geneva Convention, in case Iranian oil is sanctioned, we will not allow even a single barrel of oil to pass through to reach the hostile countries".* -Isa Jafari, Senior Iranian lawmaker, December 18, 2011. <http://english.farsnews.com/newstext.php?nn=9007277872>

# *Closing the Gulf: The Conditions that Shape Military Energy Risk:*

*The Challenge of Export Vulnerability: Petroleum  
Exports, Key Infrastructure, and Key Imports*



## Closing the Gulf: Conflict, Negotiations, or An Open-ended Arms Race?

While it is not possible to make any meaningful prediction of the timing, nature, or intensity of a conflict in the Gulf, it is possible to illustrate the options, the Iranian forces involved, and the kinds of escalation that might take place.

- **Risk to Gulf Liquids Production by Country Through 2035:** Petroleum production capacity is a rough measure of Gulf export capacity, although four Gulf states are major gas producers, and growing domestic consumption limits export capability, as does an increase focus on down stream product exports. A future conflict with Iran might involve any combination of Gulf states over different periods of time. EIA estimates indicate, however, that any serious interruption in Gulf supply would affect roughly 30% of World liquids production through 2035. Since importer would compete on a world market, subject to existing contracts when a conflict began, it is not possible to estimate the impact on national economies or the global economy in any detail. It is clear, however, that Asian states are exceptionally dependent on Gulf oil and gas exports, and that any contingency this broad would so threaten the global economy that it would almost certainly lead to a massive military response to both secure Gulf exports and ensure that Iran could not repeat such a threat at any point in the foreseeable future.
- **Most Alternative Routes Have Little or No Surplus Capacity or Are Not Operating:** The Gulf is a unique chokepoint, largely because there no clear alternative routes that are not currently being used or that would take impractical time periods to activate. According to EIA online reporting as off March 2012:
  - The Saudi Trans-Arabian Pipeline (Tapline) from Qaisumah to Sidon, Lebanon, completed in 1974, has been mothballed, in part, since 1984 (the portion to Jordan was closed in 1990, through there has been talk of reopening this portion). Also, a 1.65 million-bbl/d, 48-inch Iraqi Pipeline across Saudi Arabia (IPSA), which runs parallel to the Petroline from pump station #3 (there are 11 pumping stations along the Petroline) to the port of Mu'ajjiz, just south of Yanbu, was built in 1989, but closed indefinitely following the August 1990 Iraqi invasion of Kuwait. In June 2001, Saudi Arabia seized ownership of IPSA. Theoretically, IPSA could be used for Saudi oil transport to the Red Sea, although the Saudis have reported that the pipeline has been converted to carry gas as part of the Master Gas System. A private Saudi company has offered to rehabilitate the IPSA oil pipeline, but this idea has not gone beyond the proposal state.
  - Two trans-national pipelines across Syria have been built to transport oil from Saudi Arabia and Iraq to terminals on the Mediterranean. The 500,000 bbl/d Tapline was built during the 1940's to transport Saudi crude oil to an export terminal in Lebanon, but was closed during the 1970's because it had become uneconomical. Proposals have been made to rehabilitate the Tapline, but the pipeline remains closed. The second was built during the 1950's to transport oil from Kirkuk in northern Iraq to the Baniyas terminal in Syria and to Tripoli in Lebanon. This approximately 800 kilometer (500 mile) pipeline system had been re-habilitated in 2000, but closed in 2003 during the war in Iraq. Syrian and Iraqi ministers have discussed rehabilitating this pipeline, as well as building new ones. In June 2011, Syria and Iraq signed yet another Memorandum of Understanding to repair the existing 800,000 bbl/d pipeline system, and to build two new ones, including a 1.5 million bbl/d pipeline to carry heavy Iraqi crude oil, as well as a 1.25 million bbl/d pipeline to transport light crude oil from Iraq.

- Iraq has one major crude oil export pipeline, the Kirkurk-Ceyhan (Iraq-Turkey) pipeline, which transports oil from the north of Iraq to the Turkish Mediterranean port of Ceyhan. This pipeline has been subject to repeated disruptions this decade, limiting exports from the northern fields. Iraq signed an agreement with Turkey to extend the operation of the 1.6 million bbl/d pipeline, as well as to upgrade its capacity by 1 million bbl/d. In order for this pipeline to reach its design capacity, Iraq would need to receive oil from the south via the Strategic Pipeline, which was designed to allow flows of crude oil from the south of Iraq to go north via Turkey, and vice-versa. Iraq has proposed building a new strategic line from Basra to the northern city of Kirkuk, with the line consisting of two additional crude oil pipelines. The Iraq-Syria-Lebanon Pipeline has been closed and the Iraqi portion reported unusable since the 2003 war in Iraq. Discussions were held between Iraqi and Syrian government officials to re-open the pipeline, which had a design capacity of 700,000 bbl/d, although actual volumes never reached this level. The Russian company Stroytransgaz accepted an offer to fix the pipeline in December 2007, but no follow-up was made. Iraq and Syria have discussed building several new pipelines, including a 1.5 million bbl/d pipeline carrying heavy crude oil, and a 1.25 million bbl/d pipeline for carrying light crudes. The 1.65 million bbl/d Iraq Pipeline to Saudi Arabia (IPSA) has been closed since 1991 following the Persian Gulf War. There are no plans to reopen this line.
- The UAE has the largest export pipeline project in development: the Abu Dhabi Crude Oil Pipeline (ADCOP) Project. The International Petroleum Investment Corporation (IPIC) is spearheading the project, along with the China Petroleum Engineering & Construction Corporation (CPECC), a subsidiary of the China National Petroleum Corporation (CNPC). The 230-mile pipeline is scheduled for completion by August 2011 and will transport 1.5 million bbl/d from ADCO's Habshan facility to the Fujairah export terminals. This will allow more than half of UAE's exports to bypass the strategic chokepoint at the [Strait of Hormuz](#). This pipeline's capacity, however, will soon be exceeded by increases in Gulf oil production, and the export terminals are potentially vulnerable to Iran.
- Oman's pipeline system is mostly focused on delivering crude oil to the country's only oil export terminal at Mina al-Fahal. Located near the capital, Muscat, both the export terminal at Mina al-Fahal and the Main Oil Line feeding the facilities are run by PDO. Pipelines also feed industrial complexes and petrochemical plants, which form an integral part of economic diversification and Oman's expansion into downstream activities. PDO operates about 1,000 miles of oil pipelines which run throughout the country.
- **Hormuz: Breaking the Bottle at the Neck:** This makes the Strait of Hormuz is the world's most important oil chokepoint due to its daily oil flow of almost 17 million barrels in 2011, up from between 15.5-16.0 million bbl/d in 2009-2010. Flows in 2011 were roughly 35 percent of all seaborne traded oil, or almost 20 percent of oil traded worldwide.
- **Abu Musa:** Abu Musa in one of three islands in the Gulf shipping channels that Iran seized from the UAE. A satellite photo shows Iran has built a major air strip on the island and it can rapidly deploy force, mines, and anti-ship missiles.
- **But, Bottles Don't Need to be Broken at the Neck: Vulnerability of Gulf Oil & Gas Fields:** That said, conflict can occur anywhere in the Gulf and even low-level threats and "wars of attrition" can affect petroleum cost and tanker movements, put political pressure on Gulf states, focus on key coastal or off-shore loading areas and targets.

- **Iran's Energy Access to the Gulf:** Each Gulf country faces a different problem in terms of its distance from the Strait, tanker and shipping routes, dependence on the free movement of ships through the Gulf. As the “tanker war” of 1987-1988 demonstrates, it also is not clear that Iran could not single out a given country for attack. Iran too, however, is vulnerable. It needs to export, it needs product and other imports, and it has no major alternatives to the Strait.
- **Iran's Strategic Depth:** Iran does, however, have an advantage that most Gulf states lack. It has considerable strategic depth, as well as mountains near its coast that limit radar coverage of its air operations. Some targets in Iran are more than 500 miles from the coast – a long distance for strike fighters. Others are well over 500 miles from the nearest entry point Israel could use in preventive attacks. Moreover, Iran has vast spaces in which to conceal missiles, disperse forces, and secret nuclear facilities, and 2,440 kilometers of coastline to conceal small ships and other naval asymmetric forces, as well as numerous islands and offshore facilities.
- **The Military Geography of the Strait of Hormuz:** The military geography of the Gulf raises additional issues. The Strait of Hormuz is only part of the “chokepoint” at the entry to the Gulf. Tanker channels extend nearly 100 miles to the West part Iranian and Iranian held Islands. Long-range anti-ship missiles can be land based and target by small craft in the Gulf. As is the case in the rest of the Gulf – which is never deeper than the length of US nuclear attack submarine --Current and depth affect mine operations and submersible operations, and “noise” can conceal submarines and submersibles.
- **Vulnerability of the Upper Gulf:** As became all too clear during the Iran-Iraq War, the upper Gulf present special vulnerability problems, particularly for Kuwait and Iraq which have small coast lines, limited export terminals, and relatively shallow waters. There are many facilities and areas where Iran can deploy small ships and elements of its Revolutionary Guards, and free floating or moored mines can present major challenges.
- **Vulnerability of the Arabian Sea:** Iran is not limited to operating in the Gulf. It can use its submarines best in the Gulf of Oman and Arabian Sea. It can use its long-range patrol aircraft, UAVs/UCAVs, smart mines, small craft with or without anti-ship missiles, and long-range guided torpedoes.
- **Iranian Gulf Military Installations:** There are no accurate unclassified lists of Iranian military facilities in the Gulf, but even a partial list shows that Iran has facilities along its entire coastline inside and outside the Gulf.
- **Saudi Arabian Oil Vulnerability:** Saudi Arabia not only has major oil loading facilities, but many offshore targets, and major facilities where it runs a risk of raids or sabotage. The military geography of the Gulf extends beyond the coastline and include civil as well as petroleum and military facilities.

- **Ras Tanura** is a critical Saudi oil export facility. A satellite photo shows it provides both a larger area target and a facility where a precision attack or sabotage could do major damage. The Ras Tanura complex alone has approximately 6 million bbl/d capacity, and is the world's largest offshore oil loading facility. It includes the 2.5-million bbl/d port at Ras Tanura. More than 75 percent of exports are loaded at the Ras Tanura Facility. Saudi Arabia does, however, also have The Yanbu' terminal on the Red Sea, from which most of its remaining 25 percent is exported, with a loading capacity of approximately 4.5 million bbl/d crude and 2 million bbl/d for NGL and products. The facility is reportedly not used to full capacity. These and a dozen other smaller terminals throughout the country, appear capable of exporting up to 14-15 million bbl/d of crude and refined products, 3-4 million bbl/d higher than Saudi Arabia's current crude oil production capacity
- **Desalination Plant.** The Southern Gulf states have a unique vulnerability in that their water and much of their power comes from desalination plants, and there is no quick way to ship in or truck water. Iran, however, also has a major vulnerability in its refineries and gas and electric grids.

# Risk to Gulf Liquids Production by Country Through 2035

(Million Barrels Per Day)

Region/country	History (estimates)			Projections					Average annual percent change, 2008-2035
	2007	2008	2009	2015	2020	2025	2030	2035	
<b>OPEC*</b>	<b>34.4</b>	<b>35.6</b>	<b>33.4</b>	<b>38.6</b>	<b>40.8</b>	<b>43.1</b>	<b>45.0</b>	<b>46.9</b>	<b>1.0</b>
Middle East	23.1	24.2	22.5	27.0	28.9	31.2	33.3	35.2	1.4
Iran	4.0	4.2	4.1	4.0	3.8	3.7	3.8	3.9	-0.3
Iraq	2.1	2.4	2.4	2.9	3.6	4.5	5.5	6.3	3.7
Kuwait	2.6	2.7	2.5	3.0	3.1	3.3	3.7	4.0	1.4
Qatar	1.1	1.2	1.2	1.9	2.1	2.3	2.5	2.6	2.7
Saudi Arabia	10.2	10.7	9.8	11.6	12.8	13.9	14.6	15.4	1.4
United Arab Emirates	2.9	3.0	2.8	3.6	3.5	3.5	3.3	3.2	0.2
North Africa	4.0	4.1	3.9	3.5	3.4	3.4	3.3	3.2	-0.9
Algeria	2.2	2.2	2.1	2.6	2.7	2.6	2.5	2.3	0.3
Libya	1.8	1.9	1.8	0.9	0.7	0.7	0.8	0.8	-3.0
Middle East (Non-OPEC)	1.5	1.5	1.5	1.6	1.4	1.3	1.1	1.1	-1.3
Oman	0.7	0.8	0.8	1.0	0.8	0.7	0.6	0.6	-1.1
Syria	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.2	-1.9
Yemen	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	-3.3
Other	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	3.6
<b>Gas-to-liquids</b>									
Qatar	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.2	15.5
<b>Total world</b>	<b>84.9</b>	<b>85.7</b>	<b>83.9</b>	<b>93.3</b>	<b>97.6</b>	<b>103.2</b>	<b>108.0</b>	<b>112.2</b>	<b>1.0</b>
OPEC share of world production	40%	42%	40%	41%	42%	42%	42%	42%	
Persian Gulf share of world production	27%	28%	27%	29%	30%	30%	31%	31%	

\*OPEC=Organization of the Petroleum Exporting Countries (OPEC-13).

Note: Conventional liquids include crude oil and lease condensates, natural gas plant liquids, and refinery gains.

Sources: History: U.S. Energy Information Administration (EIA), Office of Energy Markets and End Use. Projections: EIA, Generate World Oil Balance Model (2008).



Selected Oil and Gas Pipeline Infrastructure in the Middle East



**Most  
Alternative  
Routes to  
the Straits  
of Hormuz  
Have Little  
or No  
Surplus  
Capacity or  
Are Not  
Operating**

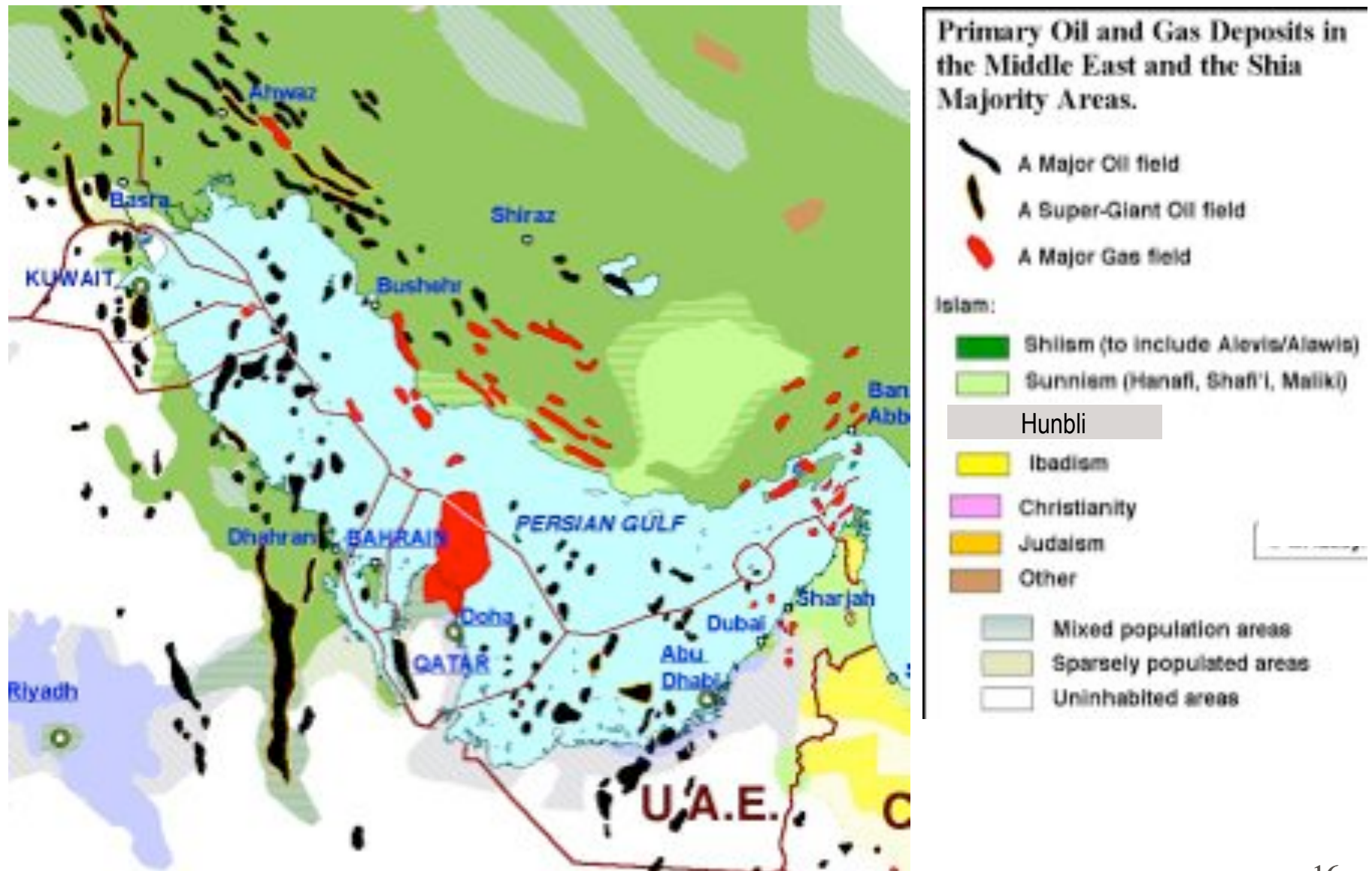
# Hormuz: Breaking the Bottle at the Neck



- In 2011, total world oil production amounted to approximately 88 million barrels per day (bbl/d), and over one-half was moved by tankers.
- Strait of Hormuz is the world's most important oil chokepoint due to its daily oil flow of almost 17 million barrels in 2011, up from between 15.5-16.0 million bbl/d in 2009-2010.
- Flows in 2011 were roughly 35 percent of all seaborne traded oil, or almost 20 percent of oil traded worldwide.
- On average, 14 crude oil tankers per day passed through the Strait in 2011, with a corresponding amount of empty tankers entering to pick up new cargos. More than 85 percent of these crude oil exports went to Asian markets, with Japan, India, South Korea, and China representing the largest destinations.
- At its narrowest point, the Strait is 21 miles wide, but the width of the shipping lane in either direction is only two miles, separated by a two-mile buffer zone. The Strait is deep and wide enough to handle the world's largest crude oil tankers, with about two-thirds of oil shipments carried by tankers in excess of 150,000 deadweight tons.
- Closure of the Strait of Hormuz would require the use of longer alternate routes at increased transportation costs.



## But, Bottles Don't Need to be Broken at the Neck: Vulnerability of Gulf Oil & Gas Fields





## Iran's Energy Access to the Gulf



Charge Island, the site of the vast majority of Iran's exports, has a crude storage capacity of 20.2 million barrels of oil and a loading capacity of 5 million bbl/d. Lavan Island is the second-largest terminal with capacity to store 5 million barrels and loading capacity of 200,000 bbl/d. Other important terminals include Kish Island, Abadan, Bandar Mahshahr, and Neka (which helps facilitate imports from the Caspian region).

Khatam Al-Anbia Construction Headquarters (KACH), controlled by Iran's Islamic Revolutionary Guard Corps (IRGC), is constructing three other pipelines that will deliver crude oil and petroleum products. These include the Naveen-Kashan, Rafsanjan-Mashhad, and Bandar Abbas-Rafsanjan pipelines.

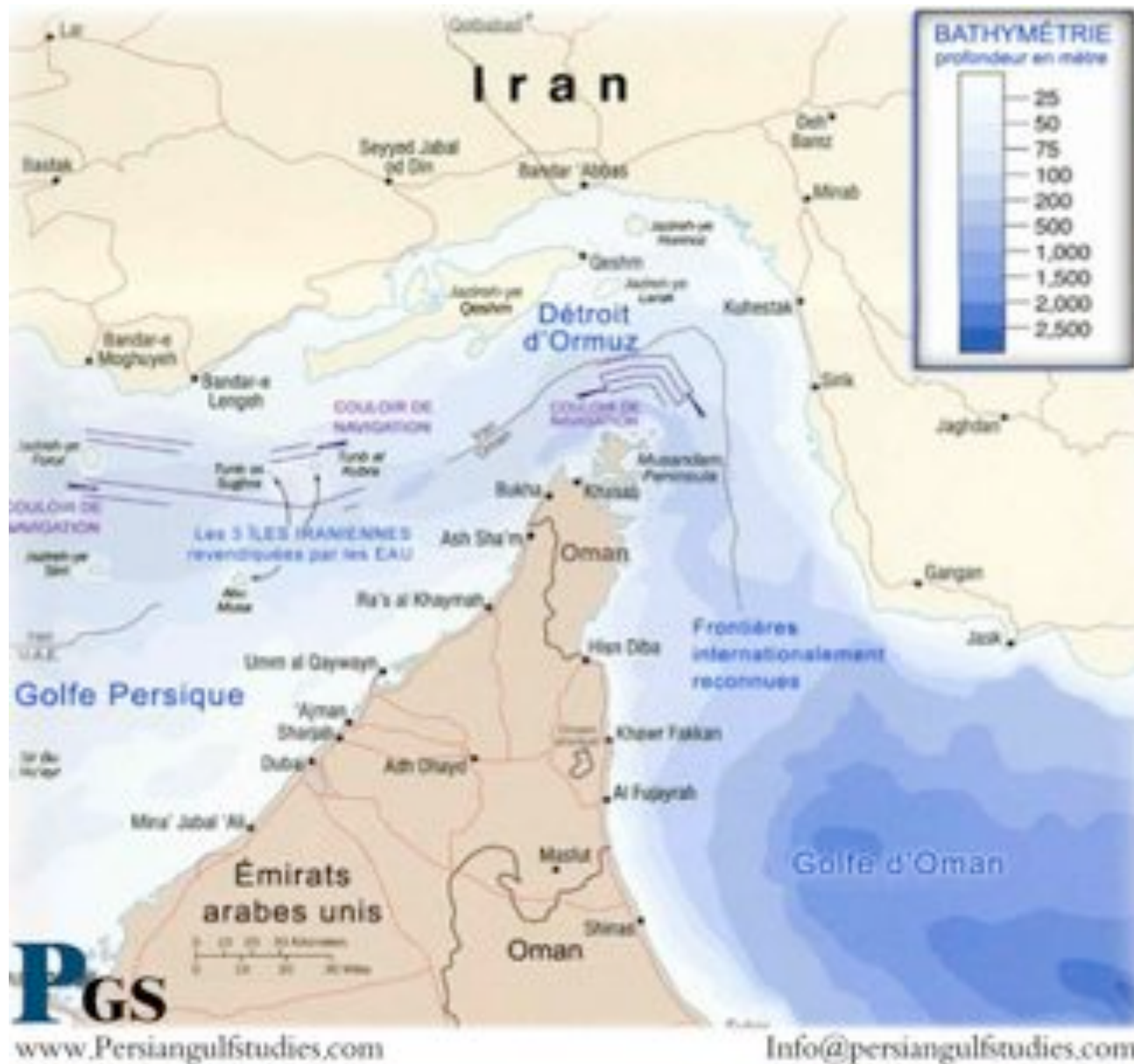
Iran exports natural gas via pipeline to Turkey and Armenia. The Iran-Turkey pipeline began exports in 2001 with 34 million cubic feet (MMcf) per day and exports gradually rose to 762 MMcf per day in 2010. Exports to Armenia totaled 24 MMcf per day of gas in 2010 in exchange for electricity. Pipeline exports to Armenia are expected to increase to 224 MMcf per day in 2020.

## Iran's Strategic Depth





## The Military Geography of the Strait of Hormuz



- 280 km long, 50 km wide at narrowest point.
- Traffic lane 9.6 km wide, including two 3.2 km wide traffic lanes, one inbound and one outbound, separated by a 3.2 km wide separation median
- Antiship missiles now have ranges up to 150 km.
- Smart mines, guided/smart torpedoes,
- Floating mines, small boat raids, harassment.
- Covert as well as overt sensors.

## Abu Musa



20

Source: Google maps

200

## Vulnerability of the Upper Gulf



## Vulnerability of the Arabian Sea



# Iranian Gulf Military Installations

**Bandar-e Khomeini** (30°25'41.42"N, 49° 4'50.18"E)

**Bandar-e Mahshahr** (30°29'43.62"N, 49°12'23.91"E)

**Khorramshahr** (30°26'2.71"N, 48°11'34.25"E)

**Khark Island** (29°14'48.01"N, 50°19'48.88"E)

**Bandar-e Bushehr** (28°58'2.58"N, 50°51'50.74"E)

**Asalouyeh** (27°27'21.08"N, 52°38'15.55"E)

**Bandar-e Abbas** (Naval base: 27° 8'35.79"N, 56°12'45.61"E; IRGCN missile boat base: 27° 8'30.91"N, 56°12'5.58"E; IRGCN torpedo & MLRS boat base: 27° 8'21.13"N, 56°11'53.28"E; Hovercraft base and nearby naval air strip: 27° 9'15.68"N, 56° 9'49.97"E)

**Jask** (25°40'40.90"N, 57°51'4.54"E)

**Bostanu** (27° 2'58.22"N, 55°59'3.22"E)

**Chabahar**

IRGCN base. It is the farthest east of all of Iran's military port facilities.

**Qeshm** (26°43'10.09"N, 55°58'30.94"E)

**Sirri Island** (25°53'40.20"N, 54°33'7.82"E)

**Abu Musa** (25°52'22.32"N, 55° 0'38.62"E)

Occupied by Iran but claimed by the UAE. Suspected to house a small number of IRGCN forces. Also known to house HAWK SAMs and HY-2 "Silkworm" anti-ship missiles.

**Greater Tunb and Lesser Tunb** (GT: 26°15'54.33"N , 55°19'27.75"E; LT: 26°14'26.08"N, 55° 9'21.18"E)

Occupied by Iran but claimed by the UAE. Home to heavily fortified airstrips and AA guns.



# Saudi Arabian Oil Vulnerability



260 billion barrels of proven oil reserves (plus 2.5 billion barrels in the Saudi-Kuwaiti shared "Neutral" Zone), amounting to around one-fifth of proven, conventional world oil reserves.

• Although Saudi Arabia has around 100 major oil and gas fields (and more than 1,500 wells), over half of its oil reserves are contained in only eight fields, including the giant 1,260-square mile Ghawar field (the world's largest oil field, with estimated remaining reserves of 70 billion barrels). The Ghawar field alone has more proven oil reserves than all but six other countries.

Saudi Arabia maintains the world's largest crude oil production capacity, estimated by U.S. Energy Information Administration (EIA) at over 12 million bbl/d at end-2010. Over 2 million bbl/d of capacity was added in 2009 with the addition of increments at Khurais, AFK (Abu Hadriya, Fadhili and Khursaniyah), Shaybah, and Nu'ayyim. For 2010, the EIA estimates that Saudi Arabia produced on average 10.2 million bbl/d of total oil

Saudi Arabia exported an estimated 7.3 million bbl/d of petroleum liquids in 2009 (7.5 million bbl/d in 2010), the majority of which was crude oil. Asia now receives an estimated 55 percent of Saudi Arabia's crude oil exports, as well as the majority of its refined petroleum product and natural gas liquids (NGL) exports.

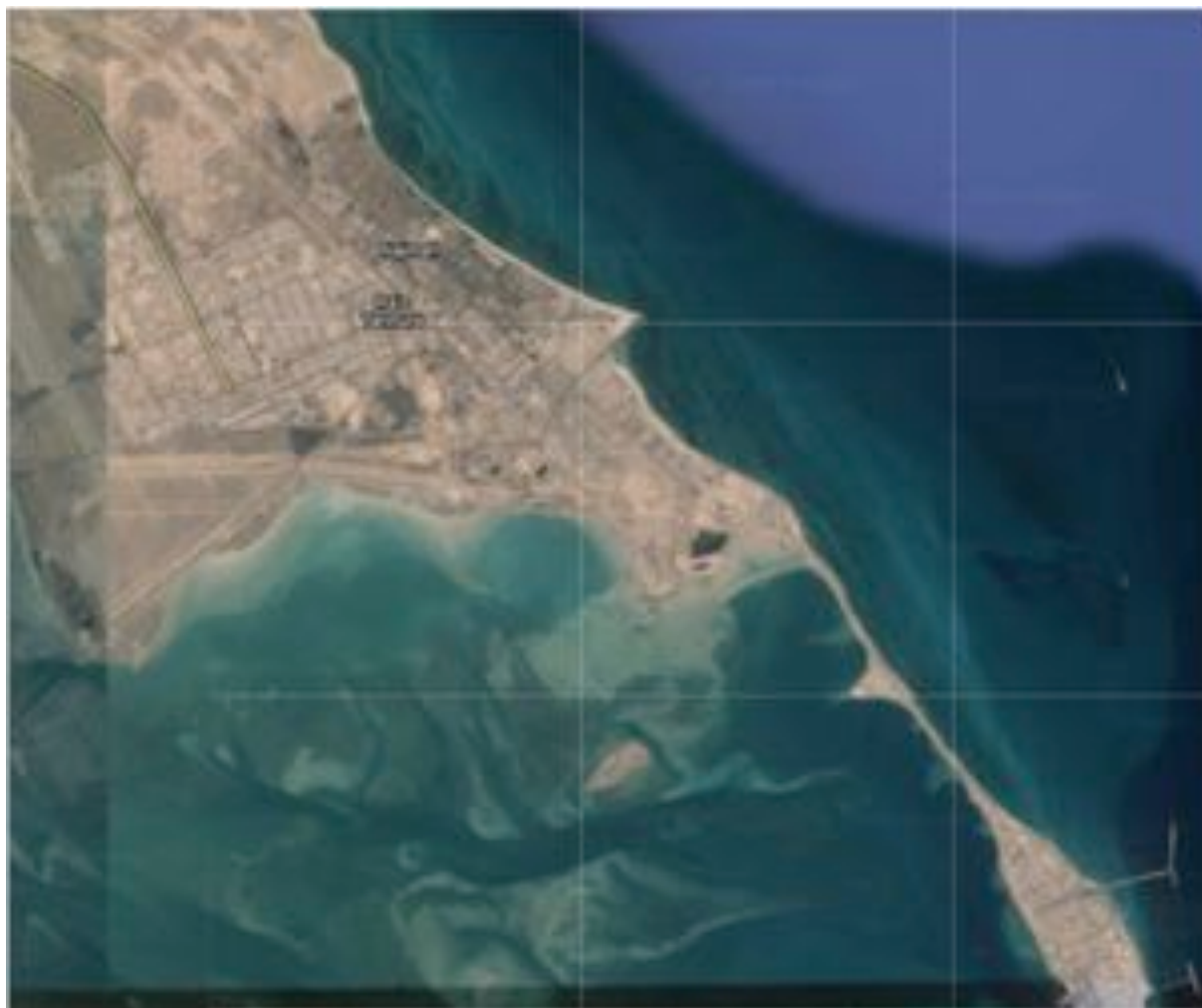
In 2009, Saudi Arabia exported an average of 1 million bbl/d of petroleum liquids to the United States, (down from 1.5 million bbl/d in 2008) accounting for 9 percent of total U.S. petroleum imports. For this time period, Saudi Arabia ranked fourth after Canada, Mexico, and Venezuela as a petroleum exporter to the United States. Other major Saudi customers in 2009 included Japan (1.2 million bbl/d), South Korea (850,000 bbl/d), and China (839,000 bbl/d).

Saudi Arabia has three primary oil export terminals:

- The Ras Tanura complex has approximately 6 million bbl/d capacity, and the world's largest offshore oil loading facility. It includes the 2.5-million bbl/d port at Ras Tanura. More than 75 percent of exports are loaded at the Ras Tanura Facility.
- The 3 to 3.6-million bbl/d Ras al-Ju'aymah facility on the Persian Gulf.
- The Yanbu' terminal on the Red Sea, from which most of the remaining 25 percent is exported, has loading capacity of approximately 4.5 million bbl/d crude and 2 million bbl/d for NGL and products. The facility is reportedly not used to full capacity. These and a dozen other smaller terminals throughout the country, appear capable of exporting up to 14-15 million bbl/d of crude and refined products, 3-4 million bbl/d higher than Saudi Arabia's current crude oil production capacity.



## Ras Tanura



25

Source: Google maps

25

## Desalination Plant



# *The Challenge of Asymmetric Warfare:*

*Intimidation, Deterrence, and Warfighting*

## The Challenge of Asymmetric Warfare: Intimidation, Deterrence, and Warfighting

It is difficult to put the complexity of the military threats to the Gulf into the proper perspective. A summary of Iran's forces and Southern Gulf and US capabilities can easily run over several hundred pages, and there is no way to know how a clash or war might start, the pattern of escalation, and what forces and target might become involved over time. It is important to understand, however, that Iran is scarcely the hegemon of the Gulf. It is a relatively weak conventional power relative to the Southern Gulf states even without US, British, and French reinforcements. At the same time, Iran has built up massive capabilities of asymmetric warfare, can attempt to deter escalation or carry out political or terror strikes with conventionally armed missiles, and would have far more capability to deter the US and Southern Gulf states from responding to its use of asymmetric forces if it had nuclear armed missile forces.

There are a number of key points that must be kept in mind:

- **Iran already poses a threat or acts as “competitor” with a wide range of tools inside the Gulf and on far broader regional and geographic basis.**
- **The Broader Patterns in Iranian Activity reveal a wide range of Iranian national security actors and potential allies or “proxies.”**
- **Most Likely Iranian Threats Are Not Formal Conflicts:** They are the direct and indirect threats of using force. (I.e. Iranian efforts at proliferation) and the use of irregular and “proxy” forces and asymmetric attacks
- **Closing the Gulf:” An Escalation Ladder:** This leads to a wide range of possible scenarios, depending on Iran's reactions to sanctions, “accidents,” and preventive strikes.
- **Growing IRGC Land and Air Forces:** The Iranian Islamic Revolutionary Guards have built up major capabilities for land and naval operations, and are developing air and missile capabilities. While some estimates over-rate the IRGC land forces in terms of conventional force numbers, they are becoming a steadily more effective force for unconventional warfare of all kinds and now deploy many of Iran's longer range surface-to-surface and air to surface missiles.
- **IRGC Naval Forces:** The IRGC has a naval branch consists of approximately 20,000 men, including marine units of around 5,000 men. It is now a major force with extensive numbers of small boats that can be used to swarm or in wars of attrition, anti-ship missiles, mine warfare capabilities, and the ability to attack tankers, offshore facilities, and coastal facilities.
- **Rapid Expansion of IRGC Naval Forces:** These forces would now lead naval operations in the Gulf, and are steadily expanding their capabilities and exercise training for a wide range of potential forces of attack or warfare.

- **The Iranian Al Qods Force** is a force designed to train, advise, arm, fund, and partner foreign forces like the Hezbollah and Sadr militia in Iran. It gives Iran a unique ability to develop partners or proxies and conduct war by indirect means and with limit attribution. It works closely in some areas with the Sevak and Iranian diplomats.

***Iran's Conventional Forces: Better Equipped to Support Asymmetric Warfare than Conduct Conventional Operations***

Iran has upgrade and modernized some elements of its conventional forces, but they are much better equipped to resist an invasion – or support asymmetric warfare operations -- than conduct conventional naval, air, or land operations against the US, Southern Gulf, or other allied forces. Most key major weapons platforms date back to the time of the Shah or are aging or low grade imports from the FSU, Russia, and China.

- **Iranian Naval Threats:** Iran can pose conventional naval threats, but would be far more effective in using its navy in unconventional warfare.
  - **Key Iranian and Gulf Ships for Asymmetric Warfare:** Iran's naval strength is now tailored around submarines and smaller surface suited for concealment, missions like mine laying and raids, or "swarming." Its larger surface ships cannot compete or survive in air-sea combat with other Gulf and the US Navy. Iran can also use any of the dhows and q00s of smaller ships crossing the Gulf.
  - **Missile-Armed Combat Warships: 2011:** Iran has a lead in smaller missile craft, but Southern Gulf navies have a lead in larger vessels.
  - **Iranian Support Ships and Submarines Relative to Total Naval Strength :** Iran does have an advantage over other Gulf navies in support ships for extended operations, and in submarines and midget submarines.
  - **Iranian Mine Warfare Ships:** Iran has a major lead in conventional and smart mines. It can use a wide range of civilian and military ships, dhows, small craft and aircraft for mine laying, including the use of free floating mines.
  - **Amphibious Ships & Landing Craft:** Ferries and cargo vessels can provide substantial additional lift if Iran can secure ports in target countries.
  - **Midget Submarines:** Iran has a growing number of midget submarines, submersibles, and unmanned underwater vehicles.
- **Iranian Air/ Surface-to-Air Missile Threats:** Iran has significant air assets, although it has problem making some fully operations and could not sustain high sortie rates.

- **Range of Iran's Air Power:** Iran has a number of long-range strike fighters, and could attack most Gulf targets. It would need secure refueling for longer range strikes against Israel, however, have to stage out of bases in Syria, or fly one-way missions.
- **Comparative Gulf Fixed Wing Combat Air Strength:** Iran has extensive holdings of combat aircraft, but 40% to 60% of Iranian inventory is not normally fully operational
- **Comparative High Quality Fighter/Attack Aircraft:** Iran is heavily dependent on aircraft it had at the time of the Shah and aging Soviet export versions of designs from the 1980s. It cannot compete with today's Southern Gulf air forces in high quality combat aircraft, much less the US. This could be decisive in any major clash or air-sea combat.
- **Gulf Reconnaissance and AWACS Aircraft in 2011:** Iran has some maritime patrol aircraft, electronic warfare, and intelligence aircraft, and a growing number of UAVs and some UCAVs, but cannot compete with the US in intelligence, surveillance, and reconnaissance (IS&R) or any aspect of force enablers, and in quality with aircraft like the Saudi E-3s.
- **Gulf Attack & Naval Helicopters:** Iran still has significant helicopter forces but they are aging badly, their operational status is often uncertain, and their avionics and subsystems are dated. The Southern Gulf, US, and allied forces would have a significant lead, but Iran has enough assets for raids and surprise attacks in the Gulf.
- **Gulf Armed Helicopters:** Iran appears to have large numbers of attack helicopters, but readiness, avionics, and armament are all problems and real world capability for a serious engagement is limited.
- **Gulf Land-Based Air Defenses:** Iran's surface-to-air missiles and other land-based defense often have ingenious work-arounds, but its SAMs, data systems, and sensors have significant vulnerabilities to countermeasures, electronic warfare, and ARMs. Many of its systems date back to the Shah or are aging Soviet bloc and PRC designs.
- **Illustrative Iranian UAV Projects /Assets:** Iran is steadily improving its UAV and UCAV capabilities, and already showed the ability to use them innovatively in the fighting between Israel and the Hezbollah.
- **Iranian Army Threats:** Iran has a large Army with large numbers of functioning – if usually aging – weapons systems. It does not compete with the US and Southern Gulf in modern artillery and armor, however, and trains more as counterinvasion and defensive forces than a maneuver force. Selected elements do exercise in asymmetric combat and could be effective working with the IRGC.



- **Comparative Armored Forces:** As in other areas, Iran has a large inventory, but much dates back to the Shah, was worn in the Iran-Iraq War, and is dated or even obsolescent. The Southern Gulf state and US have far more modern and sustainable armor and better ability to support it in defensive maneuver operations than Iran has in any power projection case outside its borders. Iran's lack of effective forward air support and air cover would also be a critical problem.
- **Comparative Gulf Artillery:** Iran acquired a massive towed artillery and rocket force in the relatively static battle it fought with Iraq during the Iran-Iraq War. It has since created its own impressive rocket forces. It is not, however, organized to use most artillery in rapid armored maneuvers. Its self-propelled systems are aging, and it is not properly equipped for rapid precision and counterbattery fire at the levels of US forces.
- **The Iran-Iraq Challenge:** The one key area where Iran would have a conventional combat advantage is in the case of Iraq. The US invasion destroyed Iraq's ability to defend and deter, and Iraq would need immediate and massive aid from US airpower in any contingency where Iran threatened or invaded.

# Iran: Threat or “Competitor”

## Non-Military Competition

- *Ideology, religion, and political systems*
- *“Terrorism” and violent extremism vs. “counterterrorism”*
- *Energy, sanctions, and global economic impacts*
- *Arms control, arms exports, and arms imports*
- *International diplomacy*

## Military Competition

- *Weapons of mass destruction*
- *Conventional forces*
- *Asymmetric and irregular warfare*
- *Proxy use of state and non-state actors*
- *Threat and intimidation*

## Nations and Sub-Regions of Competition

- *Gulf Cooperation Council countries*
- *Yemen*
- *Iraq*
- *Jordan*
- *Syria*
- *Lebanon*
- *Israel*
- *Gaza and West Bank*
- *Pakistan*
- *Turkey*
- *Afghanistan*
- *Central Asia*
- *Europe*
- *Russia*
- *China*
- *Japan and Asia*
- *Venezuela, Cuba, Brazil*



## The Broader Patterns in Iranian Activity

<b>Iranian Actors</b>	<b>Related States/ Non-State Actors</b>	<b>Target/Operating Country</b>
<b>Revolutionary Guards</b>	<b>Iran</b>	<b>Iraq</b>
<b>Al Qaeda force</b>	<b>Syria</b>	<b>Israel</b>
<b>Vevak/other intelligence</b>	<b>Hezbollah</b>	<b>Egypt</b>
<b>Arms transfers</b>	<b>Hamas</b>	<b>Kuwait</b>
<b>Military and security advisors</b>	<b>Mahdi Army</b>	<b>Bahrain</b>
<b>Clerics, pilgrims, shrines</b>	<b>Yemeni Shi' ites</b>	<b>Yemen</b>
<b>Commercial training</b>	<b>Bahraini Shi' ites</b>	<b>Lebanon</b>
<b>Finance/investment</b>	<b>Saudi Shi' ites</b>	<b>Afghanistan</b>
<b>Investment/training companies</b>		<b>Venezuela</b>
<b>Education: scholarships, teachers</b>		
<b>Cultural exchanges</b>		
<b>Athletic visits</b>		

## **Most Likely Iranian Threats Are Not Formal Conflicts**

- **Direct and indirect threats of using force. (I.e. Iranian efforts at proliferation)**
- **Use of irregular forces and asymmetric attacks.**
- **Proxy conflicts using terrorist or extremist movements or exploiting internal sectarian, ethnic, tribal, dynastic, regional tensions.**
- **Arms transfers, training in host country, use of covert elements like Quds force.**
- **Harassment and attrition through low level attacks, clashes, incidents.**
- **Limited, demonstrative attacks to increase risk, intimidation.**
- **Strike at critical node or infrastructure.**

## **Closing the Gulf:” An Escalation Ladder**

- **Clash or minor incident – no escalation, but oil market panic.**
- **Non-attributable or deniable of responsibility attack: sabotage. Oil slick, free floating mines, IRGC raid excused as “rogue,” accidental missile firing.**
- **Proxy conflicts using terrorist or extremist movements or exploiting internal sectarian, ethnic, tribal, dynastic, regional tensions.**
- **Deliberate, systematic harassment and war of attrition through low level attacks, clashes, incidents.**
- **Strike(s) or raids at critical node, infrastructure, offshore facility. Use of mine or missile to sink a tanker, closing of sea access to key port or facility.**
- **Actual effort to “close the Strait of Hormuz using IRGC, Navy, Air Force, land-based missiles.**
- **Broadly based war in entire Gulf and Gulf of Oman using full range of Iranian conventional and asymmetric assets.**

# IRGC Land and Air Forces

- The IRGC has small elements equipped with armor and has the equivalent of conventional army units, and some units are trained for covert missions and asymmetric warfare, but most of its forces are lightly equipped infantry trained and equipped for internal security missions.
- These forces are reported to have between 120,000 and 130,000 men, but such totals are uncertain as are all unclassified estimates of the strength, organization, equipment, and industrial base of the IRGC. This manpower pool includes conscripts recruited from the same pool as regular army conscripts, and training and retention levels are low.
- Some sources, like the International Institute for Strategic Studies (IISS), report a force structure with 20 “divisions,” but most IRGC units seem to be large battalion-sized elements. According to a *Jane’s* report, estimates of the IRGC’s organization differ sharply.
- Some sources claim that there are two armored, five mechanized, 18 infantry, and one Special Forces division, and about 15-20 independent brigades. The report concludes that many alleged divisions are equivalent to large brigades and the personnel numbers of the IRGC could support only three to five divisions.
- The total manpower pool of the IRGC could support only about five to six light infantry divisions. There is supposedly also one airborne brigade.
- The IRGC often claims to conduct large exercises, sometimes with 100,000 men or more. The exact size of such exercises is unclear, but they are often a small fraction of what the IRGC claims. With the exception of a limited number of more elite elements, training is limited and largely suitable for internal security purposes.
- The air force of the IRGC is believed to operate Iran’s three Shahab-3 intermediate-range ballistic missile units, and may have had custody of its chemical weapons and any biological weapons. The IRGC may operate Iran’s ten EMB-312 Tucanos. It also seems to operate many of Iran’s 45 PC-7 training aircraft, as well as some Pakistani-made trainers at a training school near Mushak
- Most forces would require substantial refresher training to act in any mission other than static infantry defense and using asymmetric warfare tactics like hit-and-run operations or swarming elements of forces when an invader appears vulnerable.

# Growing IRGC Land and Air Forces

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# IRGC Naval Forces

**The IRGC has a naval branch consists of approximately 20,000 men, including marine units of around 5,000 men.**

**The IRGC is now reported to operate all mobile land-based anti-ship missile batteries and has an array of missile boats; torpedo boats; catamaran patrol boats with rocket launchers; motor boats with heavy machine guns; mines as well as Yono (Qadir)-class midget submarines; and a number of swimmer delivery vehicles.**

**The IRGC naval forces have at least 40 light patrol boats, 10 Houdong guided missile patrol boats armed with C-802 anti-ship missiles.**

**The IRGC controls Iran's coastal defense forces, including naval guns and an HY-2 Seersucker land-based anti-ship missile unit deployed in five to seven sites along the Gulf coast.**

**The IRGC has numerous staging areas in such places and has organized its Basij militia among the local inhabitants to undertake support operations.**

**IRGC put in charge of defending Iran's Gulf coast in September 2008 and is operational in the Gulf and the Gulf of Oman, and could potentially operate elsewhere if given suitable sealift or facilities.**

**Can deliver conventional weapons, bombs, mines, and CBRN weapons into ports and oil and desalination facilities.**

**Force consists of six elements: surface vessels, midget and unconventional submarines, missiles and rockets, naval mines, aviation, and military industries.**

**Large numbers of anti-ship missiles on various types of launch platforms.**

**Small fast-attack craft, heavily armed with rockets or anti-ship missiles.**

# Rapid Expansion of IRGC Naval Forces

- More fast mine-laying platforms.
- Enhanced subsurface warfare capability with various types of submarines and sensors.
- More small, mobile, hard-to-detect platforms, such as semi-submersibles and unmanned aerial vehicles.
- More customized or purpose-built high-tech equipment.
- Better communications and coordination between fighting units.
- More timely intelligence and effective counterintelligence/deception.
- Enhanced ability to disrupt the enemies command, control, communications, and intelligence capability.
- The importance of initiative, and the avoidance of frontal engagements with large US naval surface warfare elements.
- Means to mitigate the vulnerability of even small naval units to air and missile attack.
- Numerous staging areas in such places and has organized its Basij militia among the local inhabitants to undertake support operations.
- The naval branch has bases and contingency facilities in the Gulf, many near key shipping channels and some near the Strait of Hormuz. These include facilities at Al-Farsiyah, Halul (an oil platform), Sirri, Abu Musa, Bandaer-e Abbas, Khorramshahr, and Larak.
- 
- Iran recently started constructing new naval bases along the coasts of the Gulf and the Sea of Oman for an “impenetrable line of defense.”

**On October 27, 2008, Iran opened a new naval base at Jask, located at the southern mouth of the Strait of Hormuz, a strategic chokepoint for Persian Gulf oil.**

# The Iranian Al Qods Force

- Comprised of 5,000 - 15,000 members of the IRGC (Increased size of force in 2007)
- Equivalent of one Special Forces division, plus additional smaller units
- Special priority in terms of training and equipment
- Plays a major role in giving Iran the ability to conduct unconventional warfare overseas using various foreign movements as proxies
- Specialize in unconventional warfare mission
- Control many of Iran's training camps for unconventional warfare, extremists, and terrorists
- Has offices or "sections" in many Iranian embassies throughout the world
- Through its Al Qods Force, Iran provides aid to Palestinian terrorist groups such as Hamas, Lebanese Hezbollah, Iraq-based militants, and Taliban fighters in Afghanistan.
- Despite its pledge to support the stabilization of Iraq, Iranian authorities continued to provide lethal support, including weapons, training, funding, and guidance through its Al Qods Force.
- Al Qods Force continues to provide Iraqi and Afghani militants with:
  - specialized training, funding,
  - Iranian-produced advanced rockets, sniper rifles, automatic weapons, mortars,
  - Improvised Explosive Devices (IEDs) and explosively formed projectiles (EFPs) that have a higher lethality rate than other types of IEDs
- Since 2006, Iran has arranged a number of shipments of small arms and associated ammunition, rocket propelled grenades, mortar rounds, 107mm rockets, and plastic explosives, possibly including man-portable air defense systems (MANPADs), to the Taliban.
- Israeli defense experts continue to state that they believe the IRGC and Al Qods Force not only played a major role in training and equipping Hezbollah, but may have assisted it during the Israeli-Hezbollah War in 2006, and played a major role in the Hezbollah anti-ship missile attack on an Israeli Navy Sa'ar-class missile patrol boat.
- The Al Qods Force is widely believed to have been behind the plot to assassinate Saudi Arabia's ambassador to the US, Adel al-Jubeir in 2011.
- **Role of MOIS/Vevak?**



# *Iran's Conventional Forces*

*Better Equipped to Support Asymmetric Warfare  
than Conduct Conventional Operations*

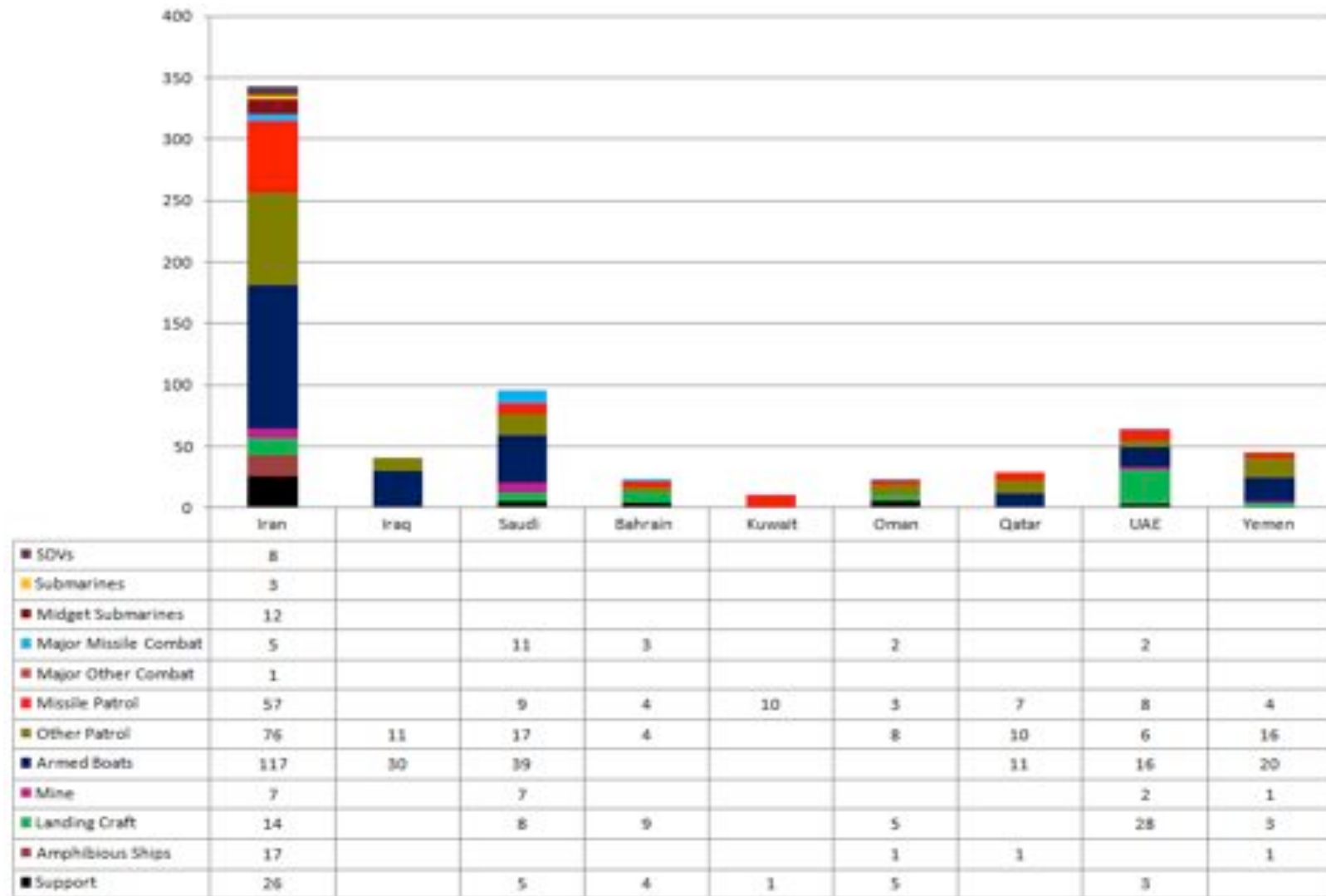
## Iranian Naval Threats

- Iranian effort to “close the Gulf.”
- Iranian permissive amphibious/ferry operation.
- Variation on 1987-1988 “Tanker War”
- Raids on offshore and critical shore facilities.
- “Deep strike” with air or submarines in Gulf of Oman or Indian Ocean.
- Attacks on US facilities

***But:***

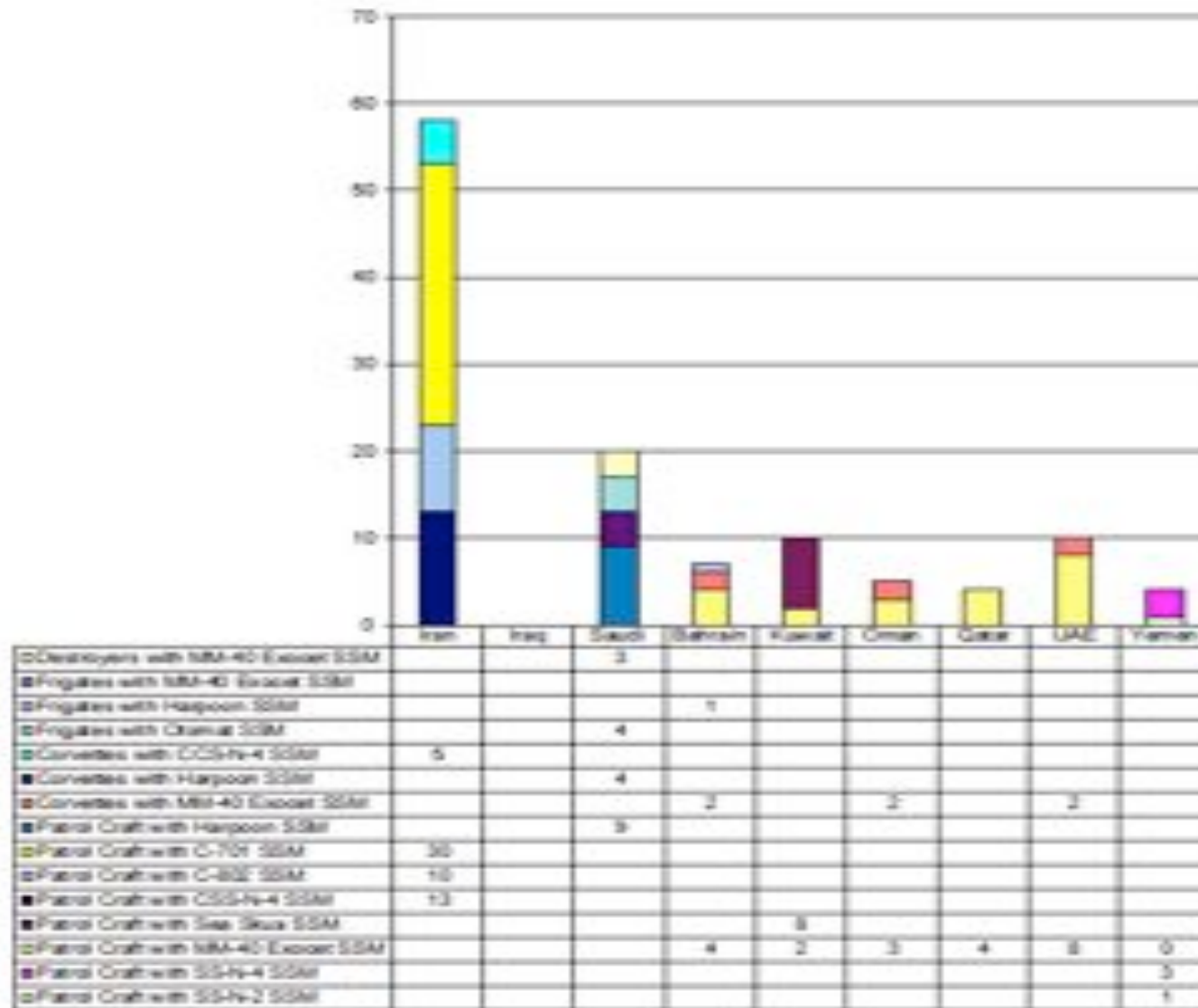
- *Low near-term probability.*
- *High risk of US and allied intervention.*
- *Limited threat power projection and sustainability.*
- *Unclear strategic goal.*

## Key Iranian and Gulf Ships for Asymmetric Warfare



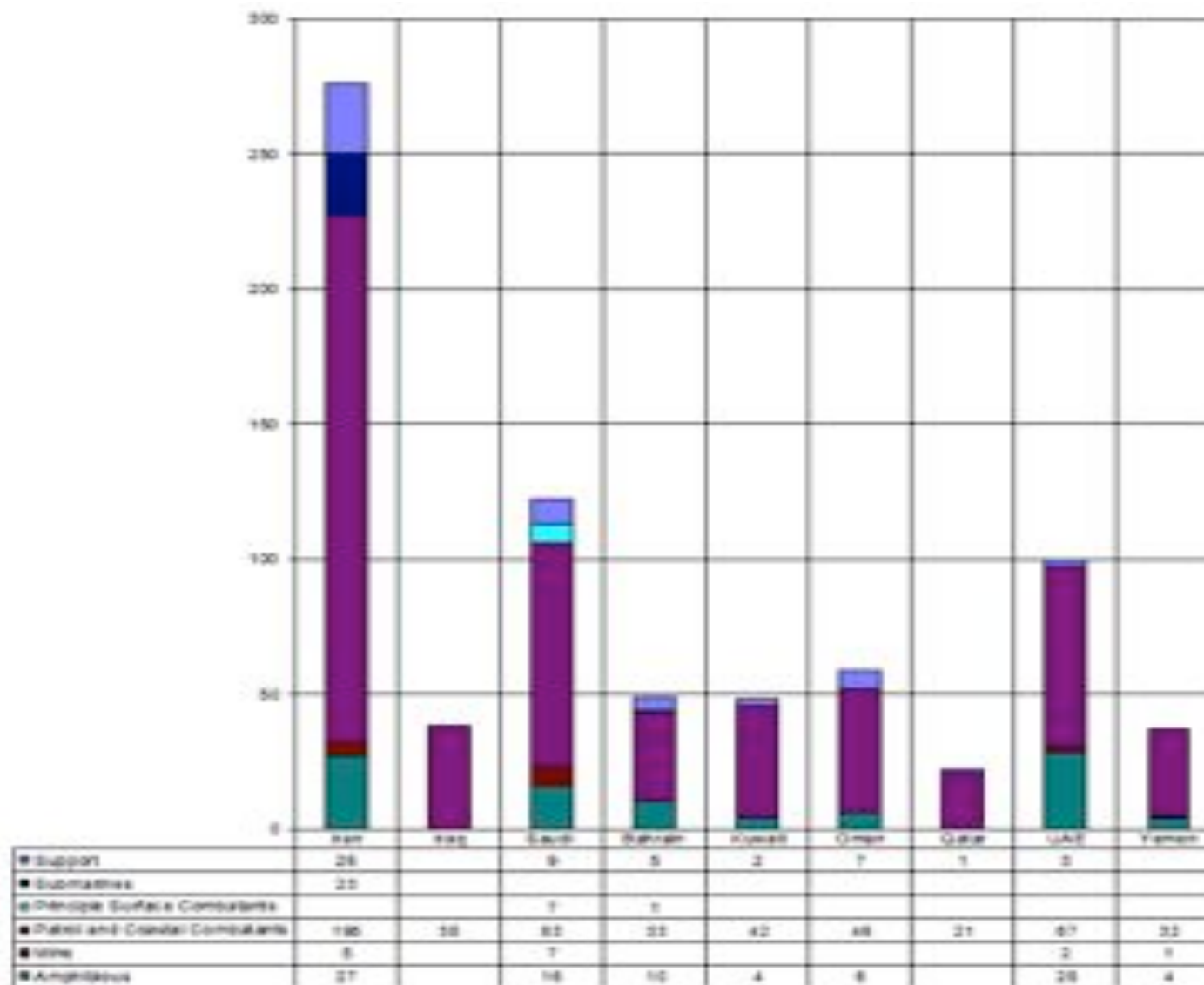
Source: Adapted by Anthony H. Cordesman from IISS, The Military Balance, various editions; Jane's Sentinel series; Saudi experts

# Missile-Armed Combat Warships: 2011



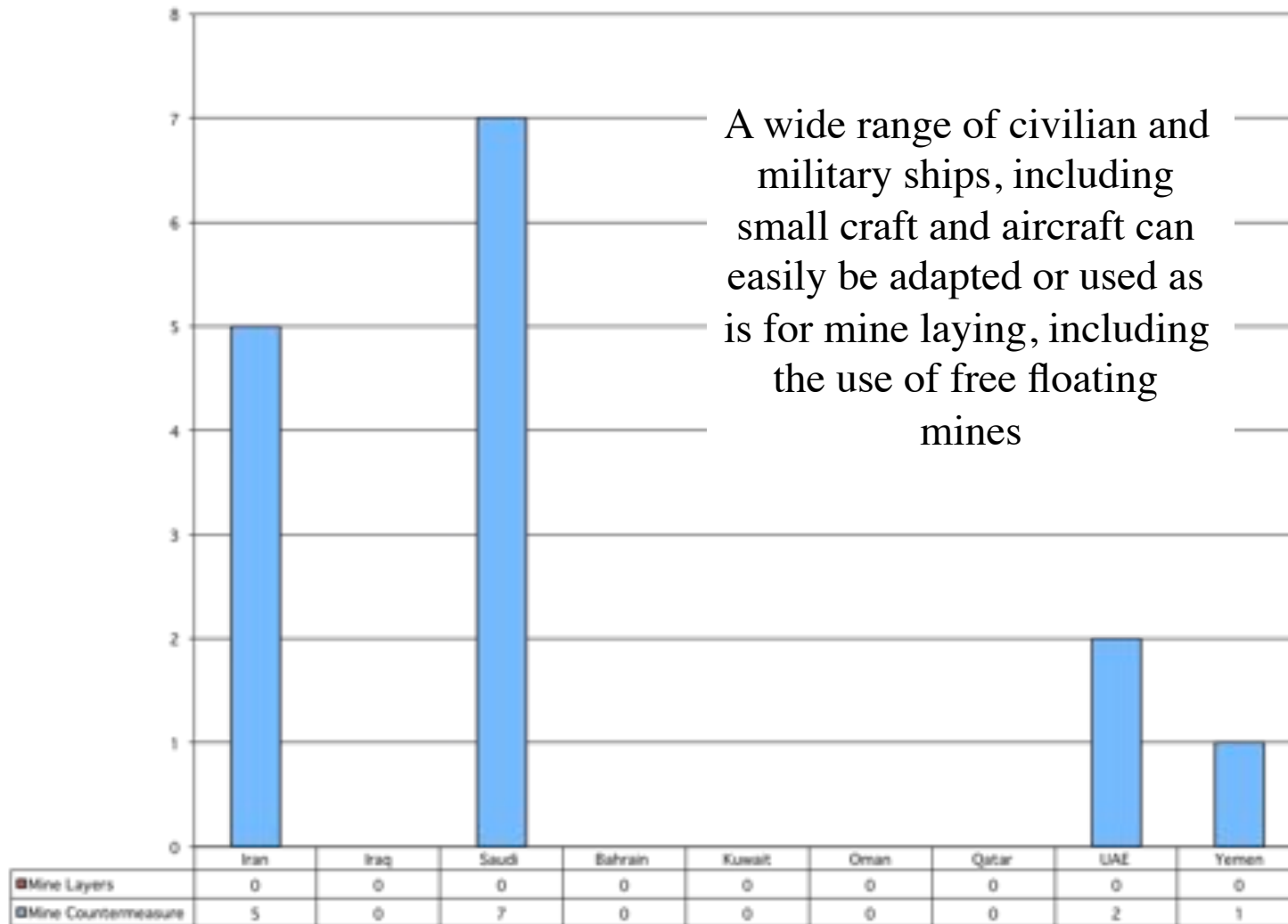
Source: Adapted from IISS, The Military Balance, Periscope, JCSS, Middle East Military Balance, Jane's Sentinel and Jane's Defense Weekly. Some data adjusted or estimated by the author.

## Iranian Ships and Submarines Relative to Total Naval Strength



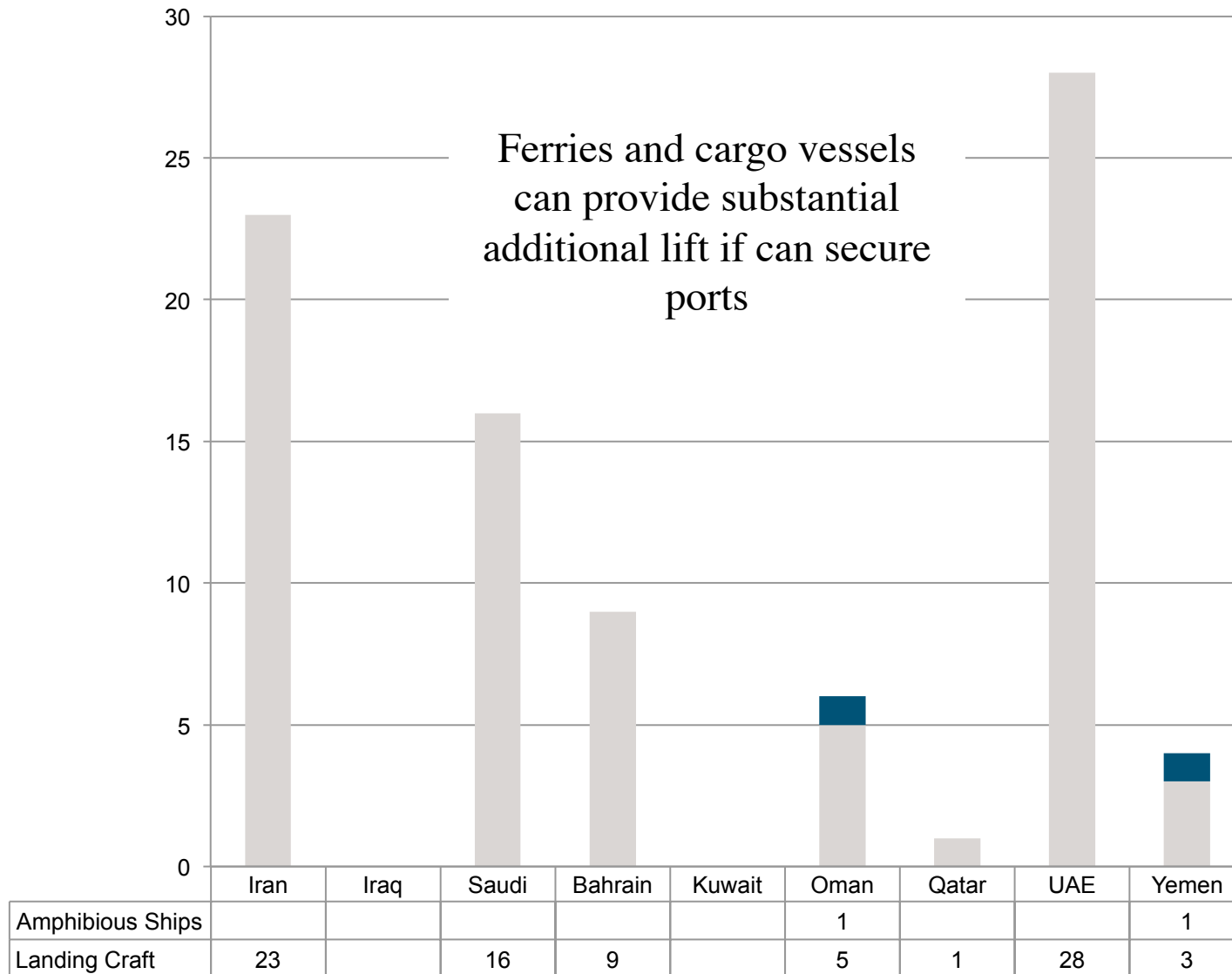
Source: Adapted by Anthony H. Cordesman from IISS, The Military Balance, various editions; Jane's Sentinel series; Saudi experts

## Iranian Mine Warfare Ships





# Amphibious Ships & Landing Craft



Source: Adapted by Anthony H. Cordesman from IISS, The Military Balance, various editions, Jane's Sentinel series, and material provided by US and Saudi experts..

## Midget Submarines

### IS-120 Ghadir “midget” submarine

Number in Service: 11-14

Displacement: 120 tons

Speed: 11 kts surfaced/8 kts submerged

Max Depth: Unknown

Armament: 2 x 533 mm torpedoes. Can carry mines instead of torpedoes.

Some reporting indicates that MANPADs are carried aboard.

Electronics: I Band surface search or navigation

Sonar: Active/Passive

### *Nahong*-class:

Number in Service: 1

Displacement: 100 tons

Speed: 8kts

Max Depth: 200 m

Armament: 2 x 533 mm torpedoes in drop collars. Can also carry 4 MDM-6 or EM-52 smart mines.

Electronics: Surface search or navigation radar.

Sonar: Bow-mounted active/passive sonar.

EW: ESM mast similar to Russian “Stop Light” type.

Note: The *Nahong* is reportedly stationed in the Caspian Sea, but can be transported overland to the Gulf.

## Iranian Air/Missile Threats

- **Precision air strikes on critical facilities: Raid or mass attack.**
- **Terror missile strikes on area targets; some chance of smart, more accurate kills.**
- **Variation on 1987-1988 “Tanker War”**
- **Raids on offshore and critical shore facilities.**
- **Strikes again tankers or naval targets.**
- **Attacks on US-allied facilities**
- **Use of UAVs as possible delivery systems (conventional or Unconventional munitions)**

***But:***

- ***Low near-term probability.***
- ***High risk of US and allied intervention.***
- ***Limited threat power projection and sustainability.***
- ***Unclear strategic goal.***

## Range of Iran's Air Power



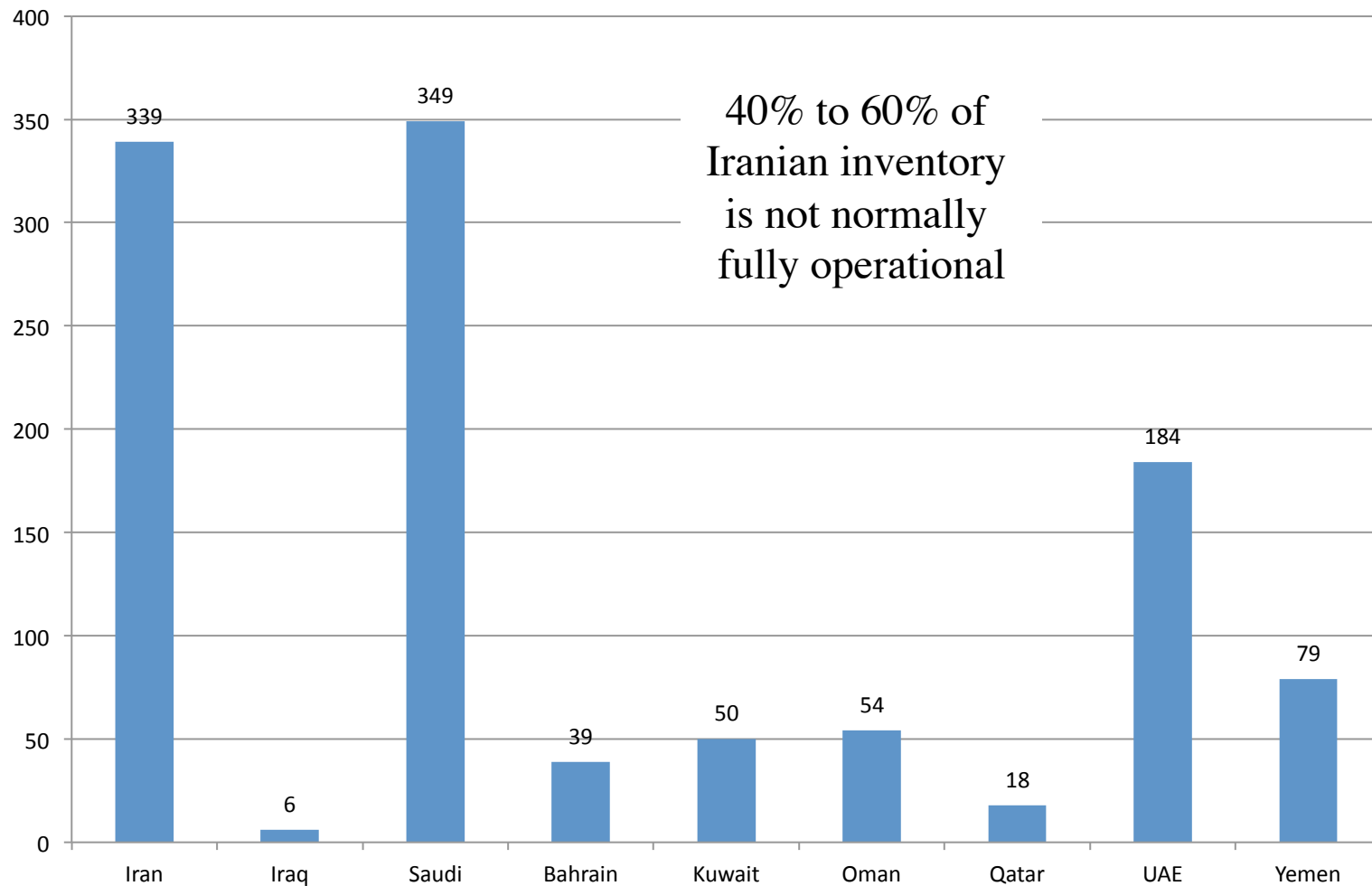
### Mission Profile: Hi-Lo-Hi

F-4E (Bastard)  
(A) MOAB 1000lb Bombs  
(T) 600 Gallon Fuel Tank  
(C) 10 minutes loiter time  
Range = 400 nmi

BL-24 (Shah)  
(A) 500 kg/1000 lb Bombs  
(T) 600 gallon tank  
(C) 10 minutes loiter time  
Range = 500 nmi

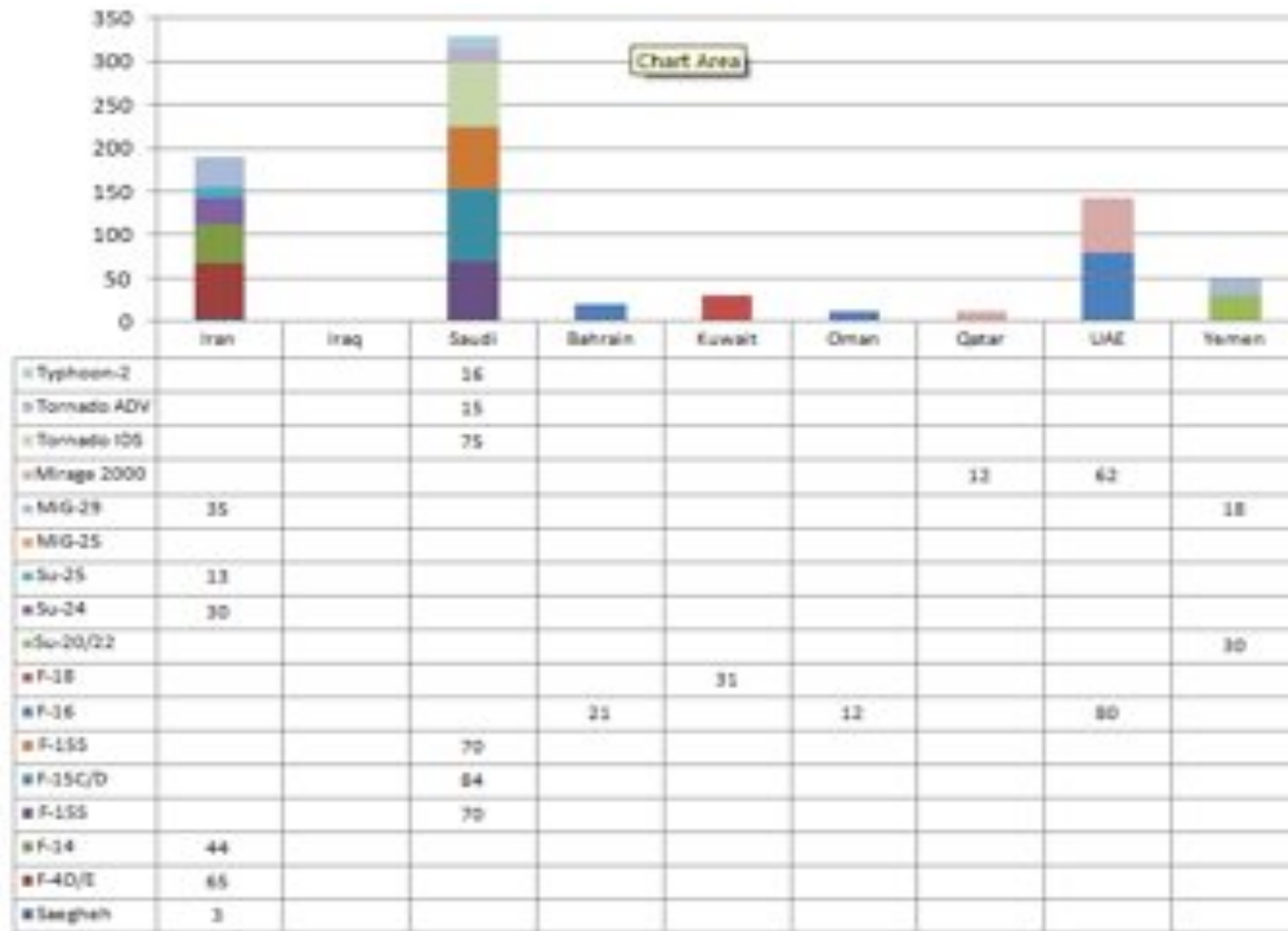
BL-25 (Shah)  
(A) 500kg/1000lb Bombs  
(T) 600 gallon tank  
(C) 10 minutes loiter time  
Range = 600 nmi

# Comparative Gulf Fixed Wing Combat Air Strength



Note: Only armed or combat-capable aircraft are counted, not trainers, recce or other aircraft. Iraq has 6 Cessna AC-208Bs fulfilling dual recce and attack roles.

## Comparative High Quality Fighter/Attack Aircraft



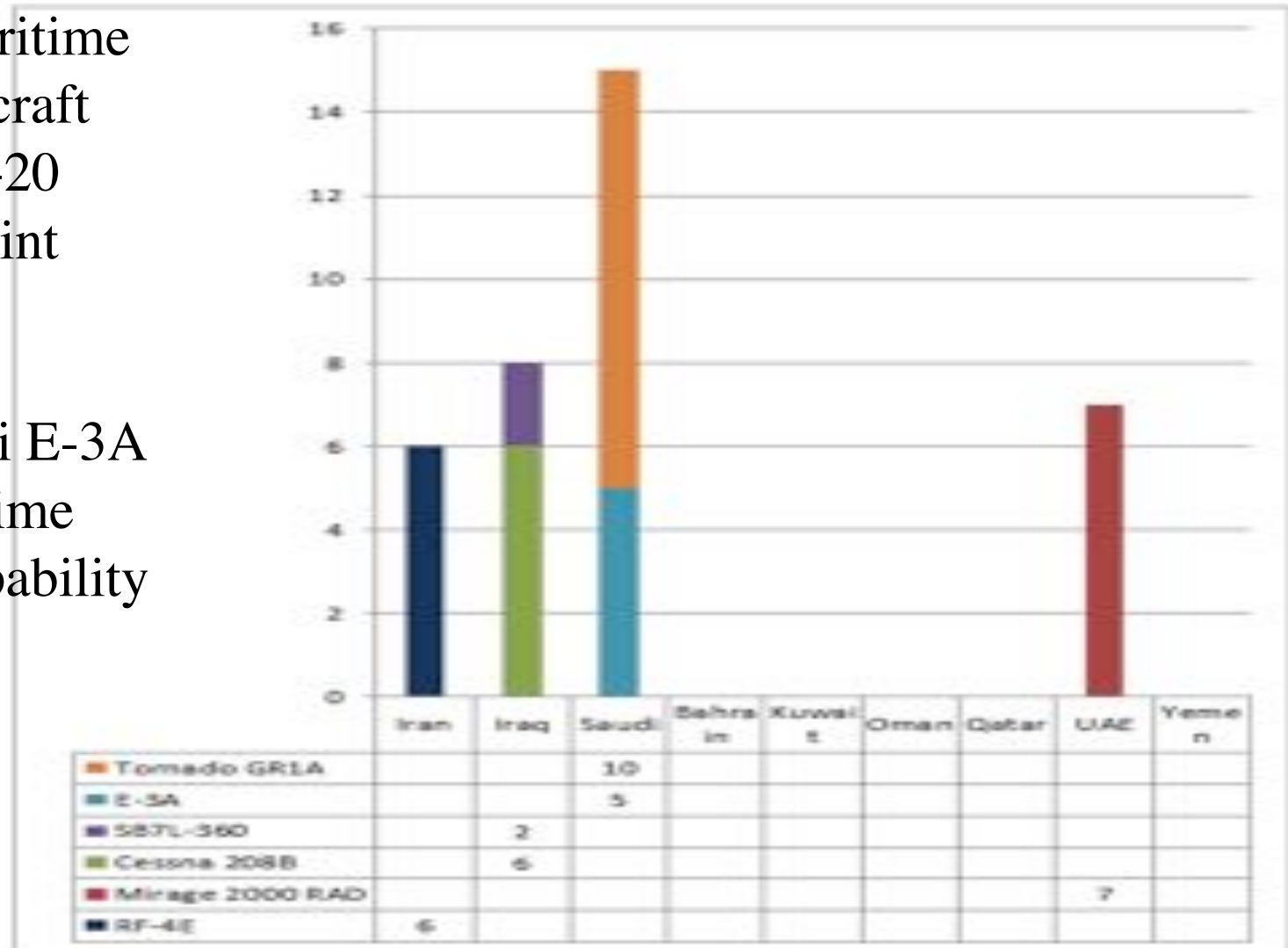
Source: Adapted from the IISS, **Military Balance**, 2011; and the Jane's Sentinel series



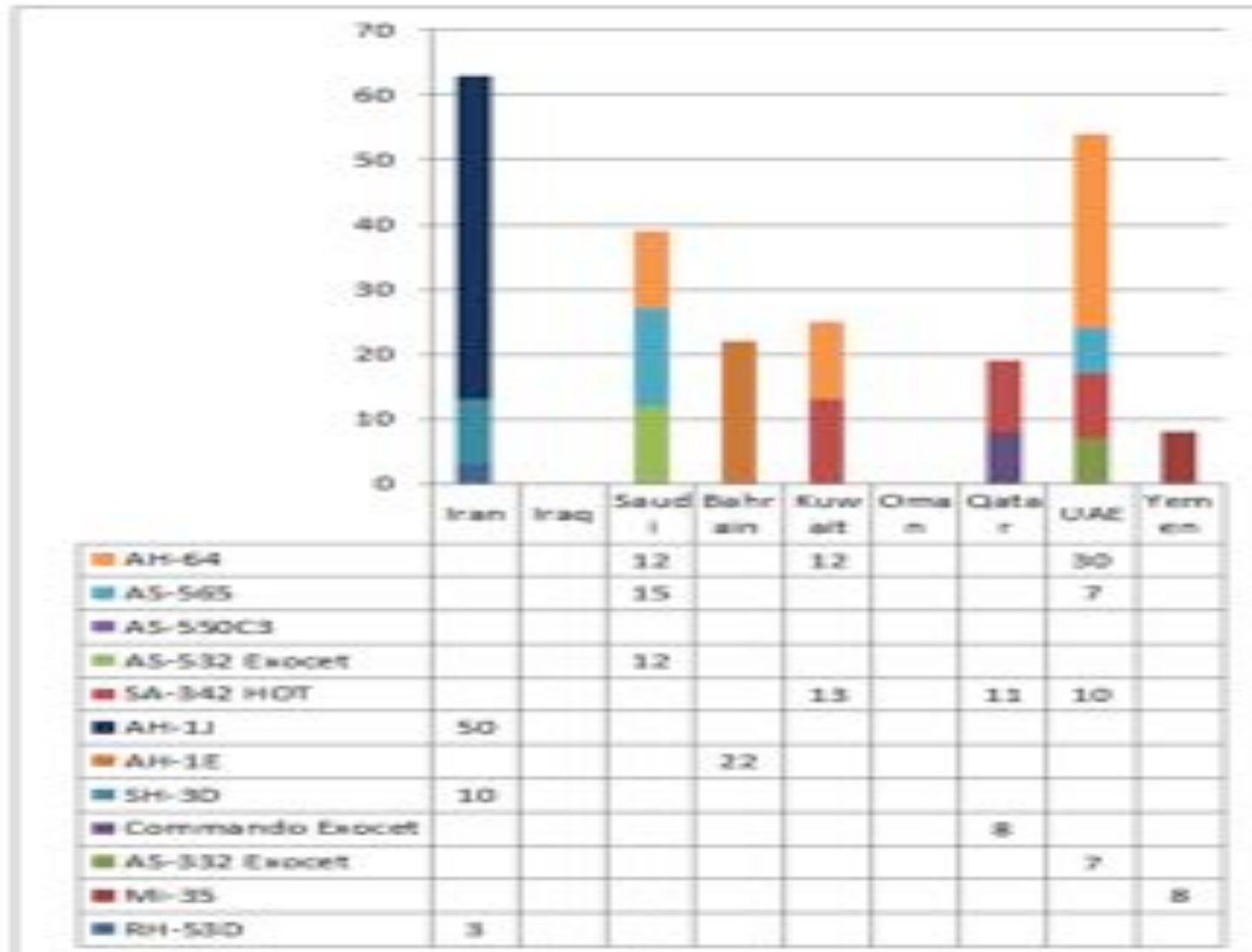
## Gulf Reconnaissance and AWACS Aircraft in 2011

Iran has 3 P-3F Orion maritime patrol aircraft and 3 Da-20 Falcon Elint aircraft

The Saudi E-3A has maritime patrol capability

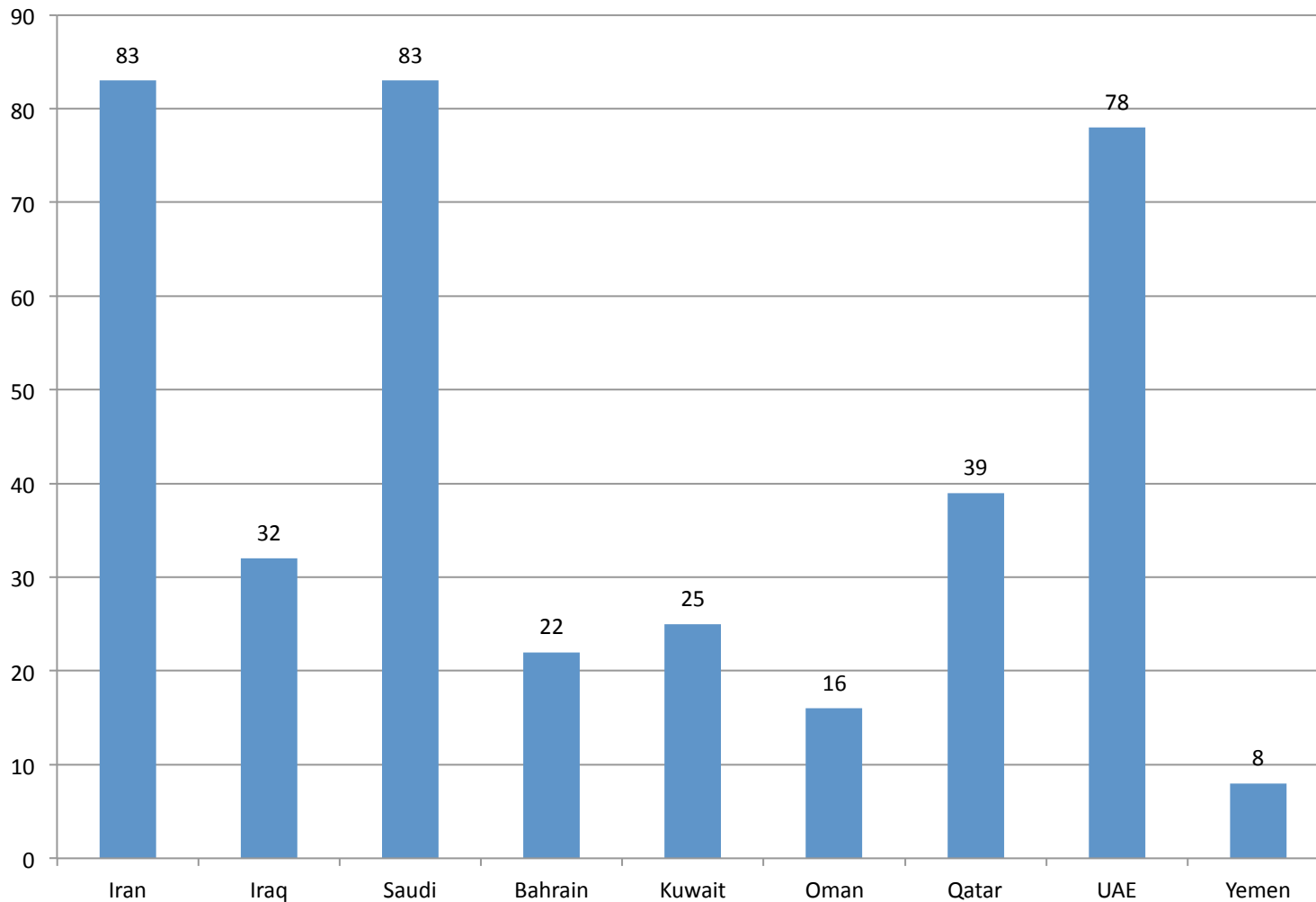


## Gulf Attack & Naval Helicopters



Source: Adapted from IISS, The Military Balance, 2011, Periscope, JCSS, Middle East Military Balance, Jane's Sentinel and Jane's Defense Weekly. Some data adjusted or estimated by the author.

## Gulf Armed Helicopters



Source: Adapted from IISS, The Military Balance, 2011, Periscope, JCSS, Middle East Military Balance, Jane's Sentinel and Jane's Defense Weekly. Some data adjusted or estimated by the author.

# Gulf Land-Based Air Defenses In 2011

Country	Major SAM	Light SAM	AA Guns
Bahrain	8 Hawk MIM-23B	60 R BS-70 18 FIM-92A Stinger 7 Crotale	15 27 guns Oerlikon 35 mm 12 L/70 40 mm
Iran	16/150 I Hawk 3/10 SA-5 45 SA-2 Guideline	SA-7/14/16, HQ-7 29 SA-15 Some QW-1 Misaq 29 TOR-M1 Some HN-5 5/30 Rapier 10 Pantsyr (SA-22) Some FM-80 (Ch Crotale) 15 Tigercat Some FIM-92A Stinger	1,700 Guns ZSU-23-4 23mm ZPU-2/4 23mm ZU-23 23mm M-1939 37mm S-60 57mm ZSU-57-2
Iraq			
Kuwait	5 / 24 I Hawk Phase III 5/40 Patriot PAC-2	12 Aspide 12 St a rburst Aspide Stinger	12 Oerlikon 35mm
Oman	None	Blowpipe 8 Mistral 2 SP 12 Panstysr S1E  34 SA-7 6 Blindfire S713 Martello 20 Javelin 40 Rapier	26 guns 4 ZU-23-2 23 mm 10 GDF-005 Skyguard 35  12 L-60 40 mm
Qatar	None	10 Blowpipe 12 FIM-92A Stinger 9 Roland II 24 Mistral 20 SA-7	?
Saudi Arabia	16/128 I Hawk 4-6/16-24 Patriot 2 17/73 Shahine Mobile	40 Crotale 500 Stinger (ARMY) 500 Mistral (ADF)	92 1,220 guns M-163 Vulcan 20 mm 30 M-167 Vulcan 20 mm
(NG)	16/96 PAC-2 launchers 17 ANA/FPS-117 radar 73/68 Crotale/Shahine	500 500 FIM-43 Redeye Redeye (ADF) 73 -141 Shahine static	128 8 50 AMX-30SA 30 mm GDF Oerlikon 35mm 150 L-70 40 mm (in store) 130 M-2 90 mm (NG)
UAE	2/6/36 I Hawk	20+ Blowpipe 20 Mistral Some Rapier Some Crotale Some RB-70 Some Javelin Some SA-18	62 guns 42 M-3VDA 20 mm SP 20 GCF-BM2 30 mm
Yemen	Some SA-2, 3 Some SA-6 SP	Some 800 SA-7 Some SA-9 SP Some SA-13 SP Some SA-14	530 guns 20 M-163 Vulcan SP 20mm 50 ZSU-23-4 SP 23 mm 100 ZSU-23-2 23 mm 150 M-1939 37 mm 50 M-167 20mm 120 S-60 57 mm 40 M-1939 KS-12 85 mm

Source: Adapted by Anthony H. Cordesman from IISS, [The Military Balance](#), [Periscope](#), JCSS, [Middle East Military Balance](#), Jane's [Sentinel](#) and [Jane's Defense Weekly](#). Some data adjusted or estimated by the author.

## Illustrative Iranian UAV Projects /Assets

Prime Manufacturer	Designation	Development / Production	Operation	Payload Wt.	Endurance (hr.)	Range	Ceiling (ft.)	Mission
Unknown	Stealth	Underway / Underway	Deployed			700 km		R/S*
HESA	Ababil (Swallow)	Complete / Underway	Deployed	45 kg	1.5+	150 km	14,000	Multiple variants for R/S* - attack – ISR**
Shahbal Group, Sharif Univ.	Shahbal	Underway		5.5 kg		12 km	4,500	R/S*
Asr-e Talai Factories	Mini-UAV	Underway						Surveillance
FARC	Sobakbal	Underway / Underway	Deployed	0.35 kg	2	2.7 - 13.5 mi	19,686	Surveillance
Qods Aeronautics Industries	Mohajer II/III (Dorna); Mohajer IV (Hodhod); Saeqeh I/II; Tallash I/ Endeavor; Tallash II Hadaf 3000	Complete / Underway	Deployed					Multirole aka Lightning Bolt Target drone - aka Target 3000

Iran is developing a range of UCAVs, and has made recent claims to a long-range “stealth” UCAV bomber

Source: Adapted by Adam C. Seitz from AIAA Aerospace 9 Worldwide UAV Roundup; available at: [http://www.aiaa.org/Aerospace/images/articleimages/pdf/UAVs\\_APR2009.pdf](http://www.aiaa.org/Aerospace/images/articleimages/pdf/UAVs_APR2009.pdf).

<http://www.aiaa.org/>

\*R/S: Reconnaissance / Surveillance; \*\*ISR: Intelligence / Surveillance / Reconnaissance

# Iranian Army Threats

The Army has some 350,000 men (220,000 conscripts) organized into four corps,

It has four armored divisions, six infantry divisions, six artillery groups, two commando divisions, an airborne division, aviation groups, and other smaller independent formations.

These latter units include independent armored, infantry, and commando brigades.

In practice, each Iranian division has a somewhat different organization

Iran does have at least one elite Special Forces Division, which was formed in 1993–1994, and the 55th paratroop division.

According to one source, the 23rd Special Forces Division has 5,000 full-time regulars and is one of the most professional units in the Iranian Army.

The regular army also has a number of independent brigades and groups. These include some small armored units, one infantry brigade, one airborne and two to three Special Forces brigades, coastal defense units, a growing number of air-defense groups, five artillery brigades/regiments, four to six army aviation units, and a growing number of logistic and supply formations. The land forces have six major garrisons and 13 major casernes.

There is a military academy at Tehran, and a signal-training center in Shiraz. The airborne and Special Forces train at a facility in Shiraz, too.

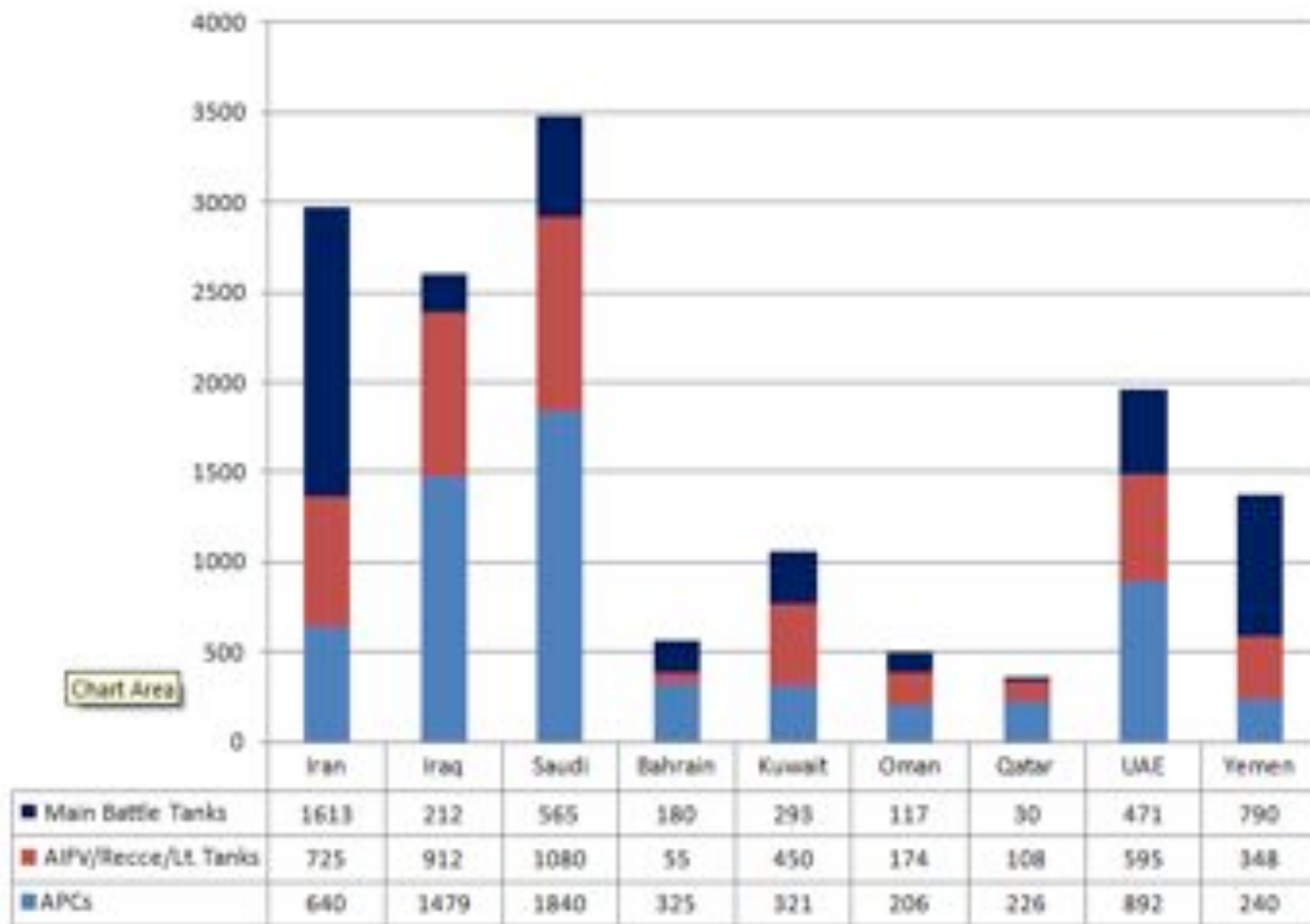
No reliable data exist on the size and number of Iran's smaller independent formations.

There are reports that the lighter and smaller formations in the regular army include an Airmobile Forces group created since the Iran-Iraq War, and which includes the 29th Special Forces Division, which was formed in 1993-1994, and the 55th paratroop division.

There are also reports that the regular army and IRGC commando forces are loosely integrated into a corps of up to 30,000 men with integrated helicopter lift and air assault capabilities. The airborne and special forces are trained at a facility in Shiraz..

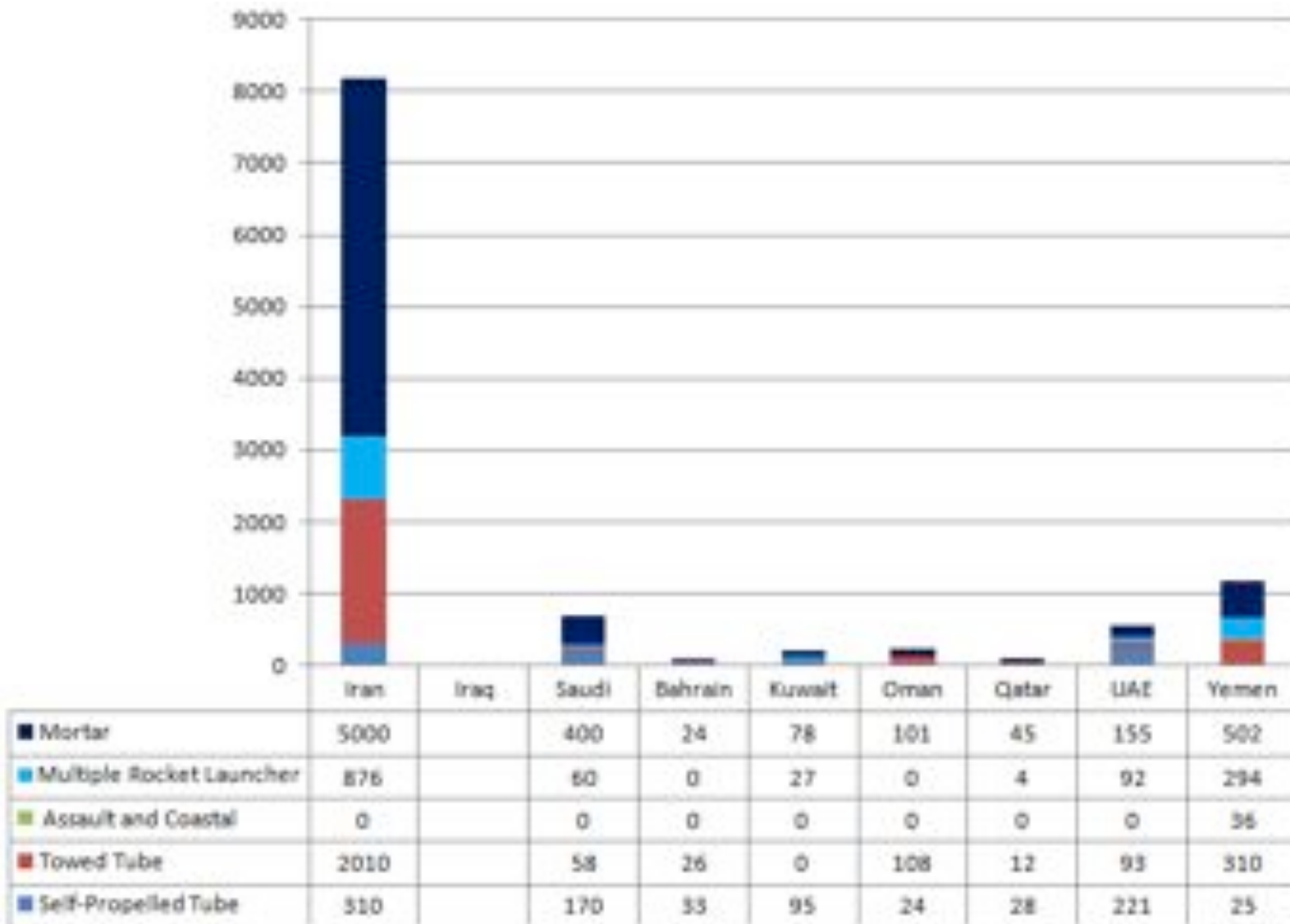


# Comparative Armored Forces



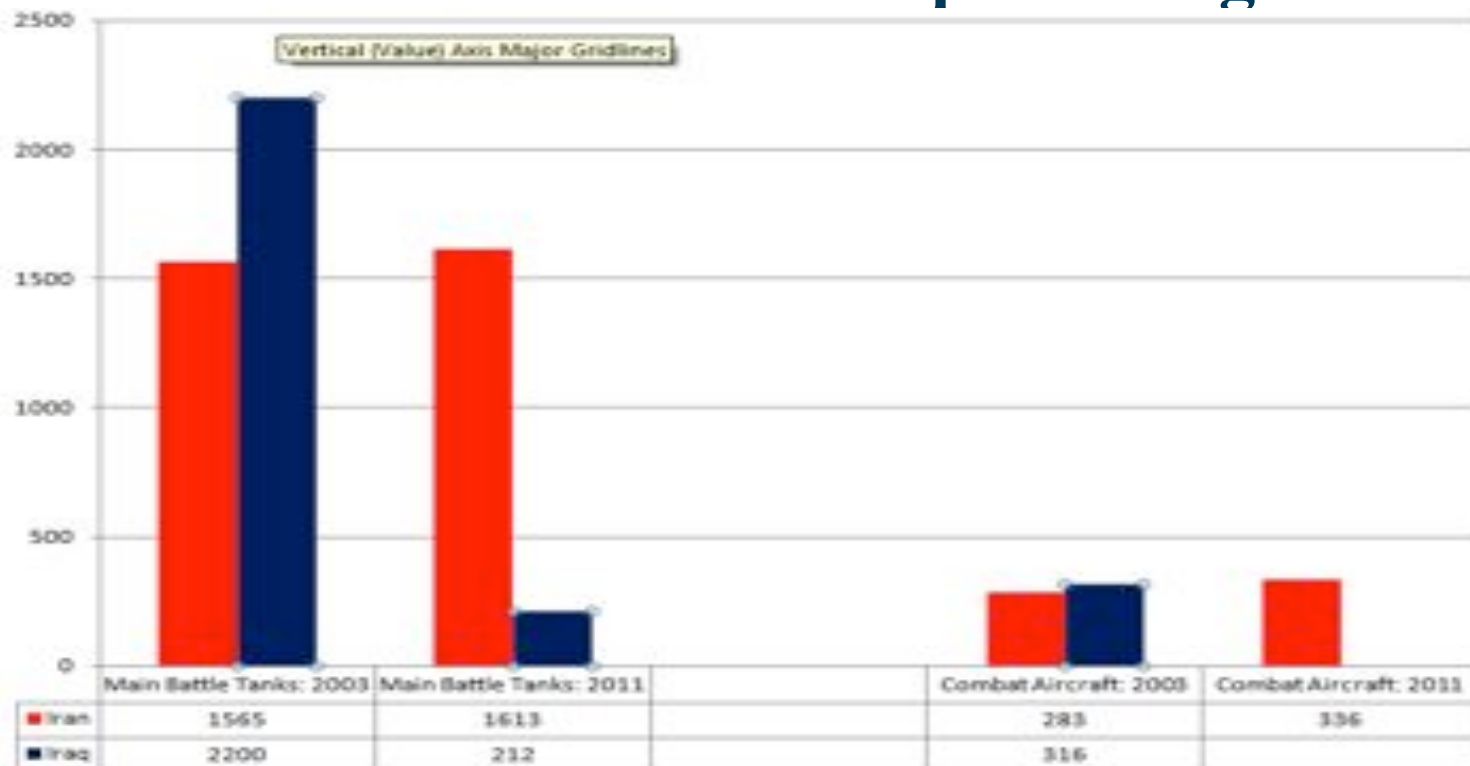
Source: Adapted from IISS, The Military Balance 2011, various editions and Jane's Sentinel series

# Comparative Gulf Artillery



Source: Adapted from IISS, The Military Balance 2011, various editions and Jane's Sentinel series

# The Iran-Iraq Challenge



Category	Iraq	2003 Iran	Force Ratio	Iraq	2011 Iran	Force Ratio
Active Manpower	424,000	513,000	8:10	245,782	523,000	2:5
Reserve Manpower	650,000	350,000	19:10	0	350,000	NA
Main Battle Tanks	2,200	1,565	7:5	212	1,613	1:8
OAFVs	1,300	815	8:5	434	725	1:1.7
Reconnaissance				478	35	
APCs	2,400	590	4:1	1,479	640	23:10
Towed Artillery	1,900	2,085	9:10	0	2,010	NA
SP Artillery	150	310	1:2	0	310	NA
MRLs	200	889	1:5	0	876	NA
Combat Aircraft	316	283	11:10	0	336	NA
Attack Helicopters	100	85	6:5	0	50	NA
Major SAM Launchers	225	205	11:10	0	289	NA

Source: Adapted from IISS, The Military Balance 2011, various editions and Jane's Sentinel series

# *Preventive Strikes and Iranian Missile Threats*

## Preventive Strikes

The previous analysis focuses on the kind of clashes and confrontations that might grow out of the steadily escalating pressure from sanctions and other tensions in the Gulf region. There is, however, a far more serious set of scenarios that could grow out of Israeli or US preventive strikes, and that might involve Iran's long-range missile forces. These do not seem probable near term contingencies, particularly for the US. They are, however, possible contingencies and the ones most likely to lead Iran to move towards a high level of escalation in spite of the risk of a devastating US and Southern Gulf response.

It is not possible to analyze the options involved in any detail in a summary brief, but it is possible to illustrate the seriousness of the kind of attacks and conflicts that might result:

- **Israeli Preventive Strikes:” An Escalation Ladder:** Israel faces serious limits on the level of strikes it could conduct, and the size of the Iranian target base it could cover. It could, however, potentially set Iran's program back by a year or more by focusing on key facilities. The main problems it would face include overflight of Arab territory, refueling and supporting enabling aircraft in hostile air space, range-payload problems in penetrating deeply into Iran and the risk of losing aircraft to fuel problems if they had to make combat maneuvers, and the ability to do lasting damage to Iranian hard target like Frodo and Natanz.
- **US Preventive Strikes:” An Escalation Ladder:** The US would not face anything like the same problems if it used forward base strike attack aircraft, cruise missiles, and stealth bombers. It could penetrate deeply, cover the full range of Iranian targets, conduct damage assessment and then restrike. This could produce much more lasting damage and could include key Iranian missile, air defense, and other military forces and facilities. If it had the support of Southern Gulf allies it could also maintain overwatch and strike at suspect Iranian activity and keep closing the entrance to Iran's underground and shelter facilities, effectively making them traps for the facilities inside. This could produce a lasting halt to Iran's nuclear programs.
- **Possible Iranian Responses to US and Israeli Strikes:** There are serious risks involved in both Israeli and US preventive strikes. Iran has a wide range of ways to respond and might lash out in ways where it would escalate to “closing the Gulf” and producing a major energy crisis.
- **Key Iranian Nuclear Targets:** Iran has a limited number of priority suspect targets and ones that could directly contribute to its ability to produce a nuclear weapon. Only two – Frodo and Natanz – are hardened. Only one reactor – Bushehr – might produce serious radiological effect if attacked. These, however, are known, unclassified sites. The target list known to Israeli or US intelligence and given priority in any preventive strike might be very different. The distance indicator on this map is important. It shows that Israel might face range-payload problems in covering the full range of targets unless it risked refueling over hostile airspace.

- **Possible Range of Nuclear Targets:** Iran does have a much, much longer list of known nuclear facilities that may be usable for a weapons effort or weapons-related research. There are similar lists for missile, chemical, and biological facilities. Israel could not possibly strike the full range of these targets, although its intelligence almost certainly allows it to formulate a much shorter list.
- The US could attack the full range of targets, but would probably need access to Southern Gulf bases and facilities for a rapid, full-scale attack and to sustain an overwatch operation.
  - **Natanz Centrifuge Facility: Vehicle Entrance Ramp (before burial)**
  - **Natanz Centrifuge Facility: Vehicle Entrance Ramp (after burial)**
  - **Natanz: Effective Concealment:** These three images of Natanz illustrate the efforts to conceal Iran's main centrifuge facility and what a hardened underground target looks like.
  - **Frodo Fuel Enrichment Plant – In Process**
  - **Frodo Fuel Enrichment Plant- Finishing:** These two images of Fordo illustrate similar efforts to conceal a centrifuge facility in a mountainside.
  - **Bushehr City and Reactor Area**
  - **Bushehr Reactor:** These two image illustrate the vulnerability of the Bushehr reactor, but also its proximity to populated areas.

It should be stressed that the preventive attacks illustrated here cannot be assessed fully without access to classified intelligence, targeting, and operations data. Moreover, much depends on how Israel, the US, and Iran's neighbors assess the risks over time. In broad terms, Iran seems to be relatively conservative as a risk taker, and might well be "detractable." Much depends, however, on how Iran approaches both negotiations and improvements in its nuclear and delivery system capabilities in the future, and on how the Iranian regime evolves as a risk taker.



## Israeli Preventive Strikes:” An Escalation Ladder

- **Single set of strikes against limited number (4 to 8?) of main forward facilities. “Close” entrance of Natanz and Frodo. Do Not strike Bushehr reactor.**
- **Single set of strikes against limited number (4 to 8?) of main forward facilities. Attempt major damage to Natanz and Frodo. Do strike Bushehr reactor.**
- **Single or multiple strikes against broad range of known and suspect facilities including centrifuge produce and research reactor; hit all main sites. Do strike Bushehr reactor (?)**
- **Tailor strikes to stimulate maximum Iranian hostile attack: “Trigger force” to push US and Gulf states to respond.**
- **Restrike after Iran attempts to recover; escalation to other key infrastructure or military target to deter further Iranian efforts.**
- **Preventive/preemptive nuclear strike on Iranian force after test or deployment; threat to attack Iranian population centers if Iran responds.**

# Possible Iranian Responses to US and Israeli Strikes

**Withdraw from the NPT and increase its long-term resolve to develop a nuclear deterrent program.**

- **Create an all-out nuclear weapons program with its surviving equipment and technology base, using Israel's strike and aggression as an excuse to openly pursue a nuclear program.**
- **Shift to genetically engineered biological weapons if such a program does not already exist.**
- **Immediate retaliation using its ballistic missiles on Israel. Multiple launches of Shahab-3 including the possibility of CBR warheads against Tel Aviv, Israeli military and civilian centers, and Israeli suspected nuclear weapons sites.**
- **Accuse the US of "green lighting" the Israeli strike, and being the real cause of the attacks.**
- **Launch political attacks on Arab regimes friendly to the US on the grounds they did nothing to prevent an attack on Israel's greatest enemy.**
- **Use allied or "proxy" groups such as Hezbollah or Hamas to attack Israel proper with suicide bombings, covert CBR attacks, and rocket attacks from southern Lebanon.**
- **Launch asymmetric attacks against American interests and allies in the Arabian Gulf.**
- **Target US and Western shipping in the Gulf, and possibly attempt to interrupt the flow of oil through the Strait of Hormuz.**
- **Attack US forces, ships, or facilities in the Gulf or anywhere in the world as a way of showing that Iran could attacks the "great Satan" and Israel 's closest ally.**
- **Strike at Israeli or Jewish targets anywhere in the world using Iranian agents or anti-Israeli-proxies.**
- **Try to use the UN and/or World Court to attack Israel for aggression and war crimes.**
- **Transfer high technology small air-to-surface and guided anti-armor weapons to Hamas, Hezbollah, or other extreme anti-Israeli groups. Provide them with more lethal rockets, UCAVs, and chemical weapons.**
- **Seek to use its leverage with Iraq, Syria, and Hezbollah to create an actual "Shi'ite crescent" to create a more intense range of threats to Israel.**
- **Try to use the transfer of funds and arms, the MOIS/Vevak, and other covert means to influence the new regimes coming out of unrests in the Arab world to be far more aggressively anti-Israel.**

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## Possible Range of Nuclear Targets

### Nuclear Conversion:

1. Jabr Ibn Hayan Multipurpose Laboratories
2. Rudan Conversion Facility
3. Uranium Conversion Facility (UCF)

### Nuclear Education and Training:

1. Amir Kabir University of Technology
2. Imam Hussein University (IHU)
3. Institute for Studies in Theoretical Physics and Mathematics (IPM)
4. Malek Ashtar University (MAU)
5. Sharif University of Technology (SUT)
6. University of Tehran (UT)

### Nuclear Enrichment:

1. 7<sup>th</sup> of Tir Industries
2. Defense Industries Organization (DIO)
3. Farayand Technique
4. Fordow Fuel Enrichment Plant
5. Fuel Enrichment Plant (FEP)
6. Kalaye Electric Company
7. Kaveh Cutting Tools Company
8. Lashkar Ab'ad
9. Natanz Enrichment Complex
10. Pars Trash
11. Pilot Fuel Enrichment Plant (PFEP)
12. Tehran Nuclear research Center (TNRC)

### Nuclear Fuel Fabrication:

1. Fuel Fabrication Laboratory (FFL)
2. Fuel Manufacturing Plant (FMP)
3. Zirconium Production Plant (ZPP)

### Nuclear Heavy Water Production:

1. Heavy Water Production Plant (HWPP)

### Nuclear Mining and Milling:

1. Ardakan Yellowcake Production Plant
2. Bandar Abbas Uranium Production Plant (BUP)
3. Saghand

### Nuclear Power Reactors:

1. Bushehr Nuclear Power Plant (BNPP)
2. Darkhovin Nuclear Power Plant

### Nuclear – Regulatory:

1. Atomic Energy Organization of Iran (AEOI)

### Nuclear Reprocessing:

1. Tehran Nuclear Research Center (TNRC)

### Nuclear Research Reactors:

1. IR-40
2. Miniature Neutron Source Reactor (MNSR)
3. Tehran Research Reactor (TRR)

### Nuclear Research and Development:

1. Bonab Atomic Energy Research Center
2. Graphite Sub-Critical Reactor (ENTC GSCR)
3. Heavy Water Zero Power Reactor (ENTC-HWZPR)
4. Isfahan Nuclear Fuel Research and Production Center (NFRPC)
5. Isfahan Nuclear Technology Center (NTC)
6. Karaj Agricultural and Medical Research Center
7. Light Water Sub-Critical Reactor (ENTC-LWSCR)
8. Plasma Physics Research Center (TNRC)
9. Yazd Radiation Processing Center (YRPC)

### Nuclear Waste Management:

1. Anarak Waste Storage Facility
2. Isfahan Nuclear Waste Storage Facility
3. Karaj Waste Storage Facility
4. Qom Waste Disposal Site

### Nuclear Weaponization:

1. Institute of Applied Physics (IAP)
2. Kimia Maadan Company (KM)
3. Parchin Military Complex
4. Physics Research Center (PHRC)
5. Tehran Nuclear Research Center (TNRC)



# Natanz Centrifuge Facility: Vehicle Entrance Ramp (before burial)

Bunkered underground  
production halls

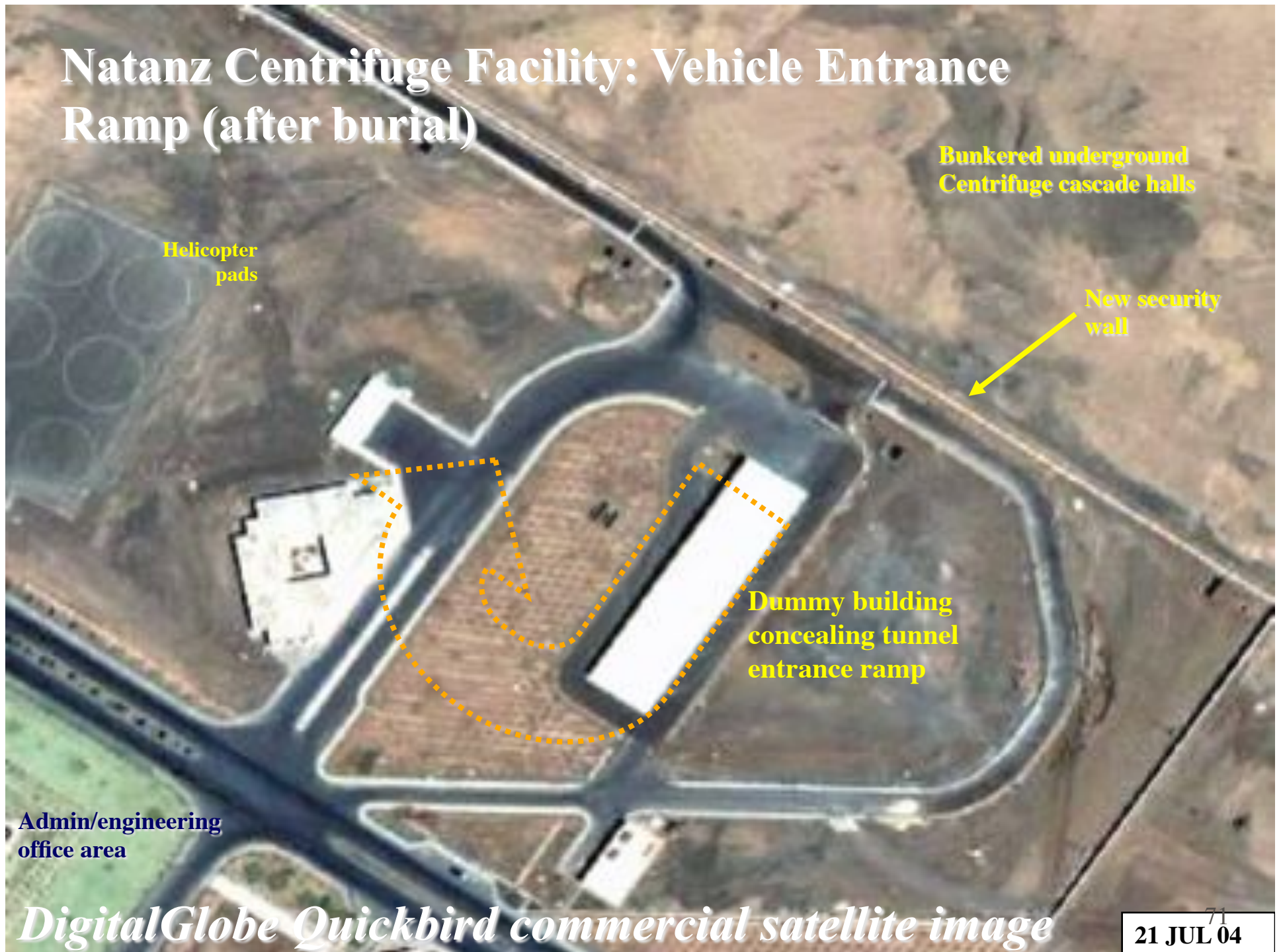
Admin/engineering  
office area

*DigitalGlobe Quickbird commercial satellite image*

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# Natanz Centrifuge Facility: Vehicle Entrance Ramp (after burial)

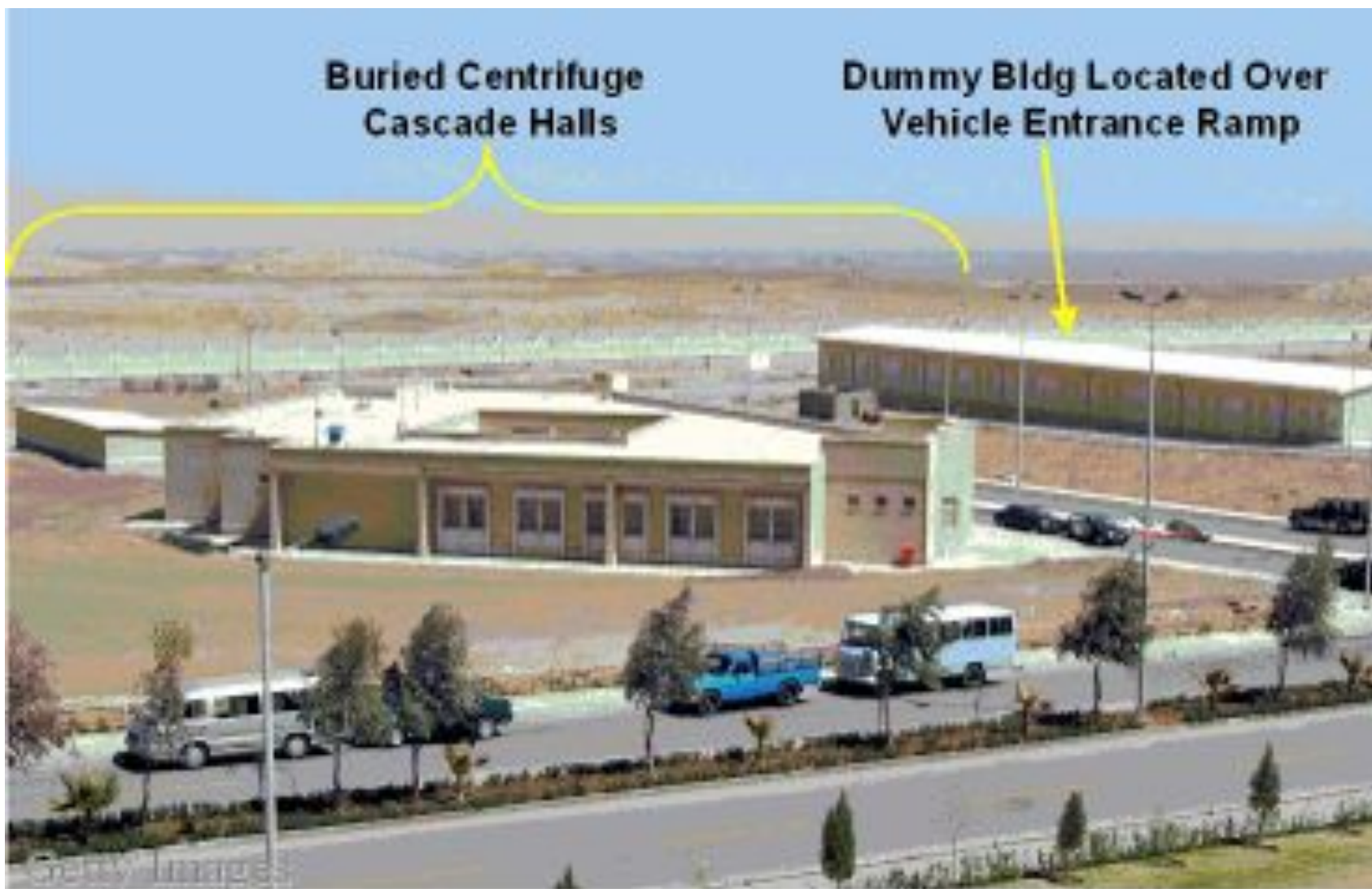


Admin/engineering  
office area

*DigitalGlobe Quickbird commercial satellite image*

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## Natanz: Effective Concealment



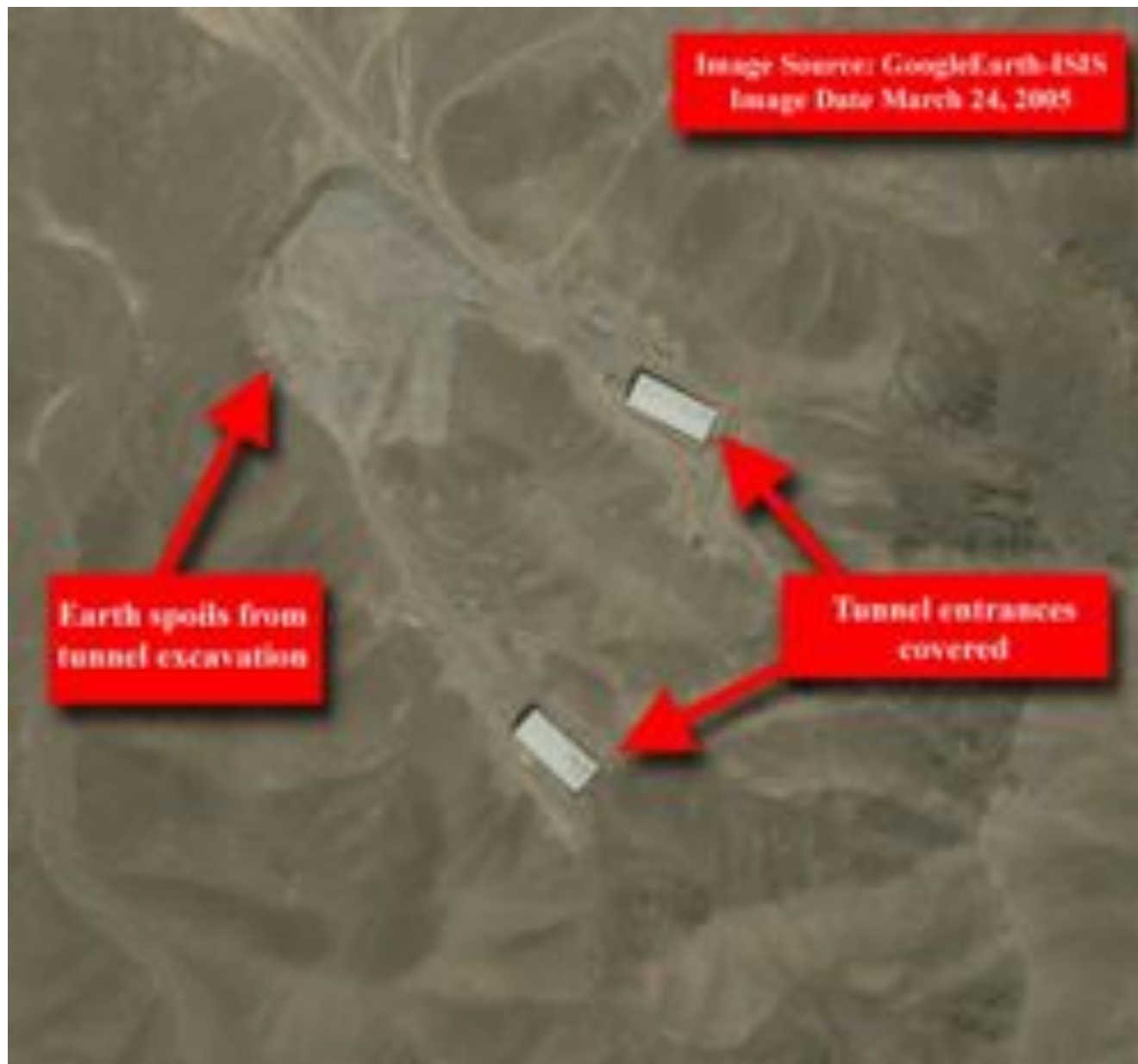


# **Fordo Fuel Enrichment Plant – In Process**



Source: GeoEye

# Fordow Fuel Enrichment Plant- Finishing



Source: ISIS. "New Satellite Image Further Narrows Fordow Construction Start Date." 2009.  
<http://isis-online.org/isis-reports/detail/new-satellite-image-further-narrows-fordow-construction->

## Bushehr City and Reactor Area





## Bushehr Reactor



Source: Google maps