

The Iranian Sea-Air-Missile Threat to Gulf Shipping

An aerial photograph of a large oil tanker ship sailing on the open sea. The ship is viewed from a high angle, showing its deck with various structures, pipes, and equipment. The hull is dark, and the water is a deep blue. The ship is moving towards the bottom right of the frame, leaving a white wake.

AUTHOR

Anthony H. Cordesman

with Aaron Lin

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Center for Strategic & International Studies
1616 Rhode Island Avenue, NW
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I. The Role of Energy Exports in Determining the Importance of the Iranian Threat

Iran has good strategic reasons to seek political accommodation with its Arab Gulf neighbors, to reach an agreement with the P5+1 over its nuclear programs, and to put an end to decades of tension with the US and other Western countries. It is as vulnerable – or more vulnerable – to any interruption in the flow of maritime traffic in the Gulf region as its neighbors, and cannot match the combination of US, UK, and Arab Gulf countries in any sustained military conflict.

Iran's current regime has also long been cautious about any form of military action or adventure that would threaten its survival and control over the country. It certainly has strategic ambitions -- and has pursued the development of military weapons and a series of efforts to expand its influence in the Levant, the Gulf, and Central Asia -- but has shown few signs of recklessness or a desire for any form of major conflict. The failure of its religious revolution to spread to other countries, the minority status of "Persians" and Shi'ites at a time of violent sectarian confrontation, and the grim lessons of the Iran-Iraq War and the fate of Saddam Hussein's regime in Iraq, all act to reinforce its caution.

The fact remains, however, that restraint in peacetime has often failed when states come under pressure, try to manage what begins as a limited military crisis, or become trapped in the conflicting pressures of a major crisis. Moreover, the tensions between Iran and the Arab Gulf and outside states remain all too real. The Gulf is now involved in a massive arms race, triggered largely by the fear that Iran will try to use its military forces to intimidate or dominate its neighbors. Iran has threatened to close the Gulf and carried out a wide range of large military exercises to show its capabilities. Iran has steadily increased its ability to exploit the threat of conventional and asymmetric warfare to maritime traffic in the Gulf.

The build-up of Iran's naval, air, and missile capability poses a wide range of threats to maritime traffic into and outside of the Gulf. One potential target of this threat is the steady increase in bulk cargo shipments into the Gulf, Arabia Sea/Gulf of Oman, and Red Seas – shipments that are of steadily growing strategic importance to each of the other the Gulf states.

Iraq, Kuwait, Bahrain, and Qatar depend on the secure and stable flowing shipping into the Gulf as their only access to the sea. Oman and the UAE do have ports on the Indian Ocean, but they are near enough to Iran so its forces can threaten such maritime traffic, and Dubai is a key transshipment hub linking Asian, Middle Eastern and East African trade routes. Dubai alone was the world's 9th largest container port as early as 2009. It had maritime a traffic above 11.6 million standard container size (TEU or Twenty Foot Equivalents) and Dubai's port must be reached through the Strait of Hormuz. Saudi Arabia has major ports on the coast of the Red Sea, but also normally makes major use of its Gulf ports as well and Iran might covertly mine key Saudi ports like Jiddah,

It is the threat Iran poses to Gulf energy exports, however, that is the most critical threat to the economies and stability of the Arab Gulf states, and any significant interruption in Gulf energy exports poses key threat to both international maritime traffic and the global economy. The secure flow of maritime traffic from the Gulf through the Strait of Hormuz into the Indian Ocean and beyond is critical to the global economy and every developed nation.

The scale of this global dependence on the stable flow of energy out of Gulf is illustrated by the fact that average of 14 tankers a day pass through the Strait of Hormuz. The United States Government's Energy Information Agency (EIA) – part of its Department of Energy -- reported in 2012 that,¹

The Strait of Hormuz is the world's most important oil chokepoint due to its daily oil flow of about 17 million bbl/d in 2011, up from between 15.7-15.9 million bbl/d in 2009-2010. Flows through the Strait in 2011 were roughly 35 percent of all seaborne traded oil, or almost 20 percent of oil traded worldwide. More than 85 percent of these crude oil exports went to Asian markets, with Japan, India, South Korea, and China representing the largest destinations. In addition, Qatar exports about 2 trillion cubic feet per year of liquefied natural gas (LNG) through the Strait of Hormuz, accounting for almost 20 percent of global LNG trade. Furthermore, Kuwait imports LNG volumes that travel northward through the Strait of Hormuz. These flows totaled about 100 billion cubic feet per year in 2010.

An EIA study issued in July 2014 described the importance of such energy exports as follows:²

The Strait of Hormuz, on the southeastern coast of Iran, is an important route for oil exports from Iran and other Persian Gulf countries. At its narrowest point, the Strait of Hormuz is 21 miles wide, yet an estimated 17 million bbl/d of crude oil and oil products flowed through it in 2013 (roughly one-third of all seaborne traded oil and almost 20% of total oil produced globally). Liquefied natural gas (LNG) volumes also flow through the Strait of Hormuz. Approximately 3.9 Tcf of LNG was transported via the Strait of Hormuz in 2013, almost all of which was from Qatar, accounting for about one-third of global LNG trade.

The Growing Global Importance of Maritime Traffic to and From the Gulf

The International Energy Agency, OPEC, and the US Department of Energy all project a steady increase in Gulf production over time. The EIA estimates that Gulf producers will make up some 36% to 40% of total global energy liquids production through 2040, and production will rise by some eight to ten million barrels a day by 2040.³ Such estimates are uncertain both in terms of alternative fuels, new sources of production, and the politics and stability of key producers in the region.

As the EIA notes, an examination of possible scenarios affecting the three largest Gulf producers results in very different estimate of future liquids production. The EIA cases examine the following possible futures:⁴

- **Scenario 1: Past as prologue:** In this scenario, Saudi Arabia, Iran, and Iraq are assumed to continue to provide the share of their combined petroleum production that they held in 2011 throughout the projection period. That is, Saudi Arabia supplied 62 percent of the petroleum produced from the three countries in 2011 and it is assumed to provide 62 percent of the supply from these three countries through 2040. The result is that Saudi Arabia production rises from 11.1 million barrels per day in 2011 to 15.5 million barrels per day in 2040. Iran's share of production from the three countries was 24 percent in 2011 and, in this scenario; its liquids production in 2040 would reach 5.9 million barrels per day. The remaining 15 percent is ascribed to Iraq, and results in 3.7 million barrels per day of liquids production in 2040. In this business-as-usual scenario Saudi Arabia continues to dominate OPEC Middle East production, and Iraq makes only minimal advances.
- **Scenario 2: Iraq success:** In scenario 2, Iraq is assumed to be able to restore its petroleum production infrastructure and resolve the many above-ground issues that have negatively impacted the industry for more than two decades. In this case, Iraq's production rises to 8.0 million barrels per day by 2030 and then to 11.0 million barrels per day in 2040, from 2011 production of 2.6 million barrels per day.

The remainder is prorated to Iran and Saudi Arabia based upon each country's share of combined 2011 production. That is, Iran accounted for 28 percent of combined Iran and Saudi Arabian liquids production in 2011; Saudi Arabia 72 percent. In this case, production in Saudi Arabia is lower than that of Iraq in 2040 at 10.2 million barrels per day.

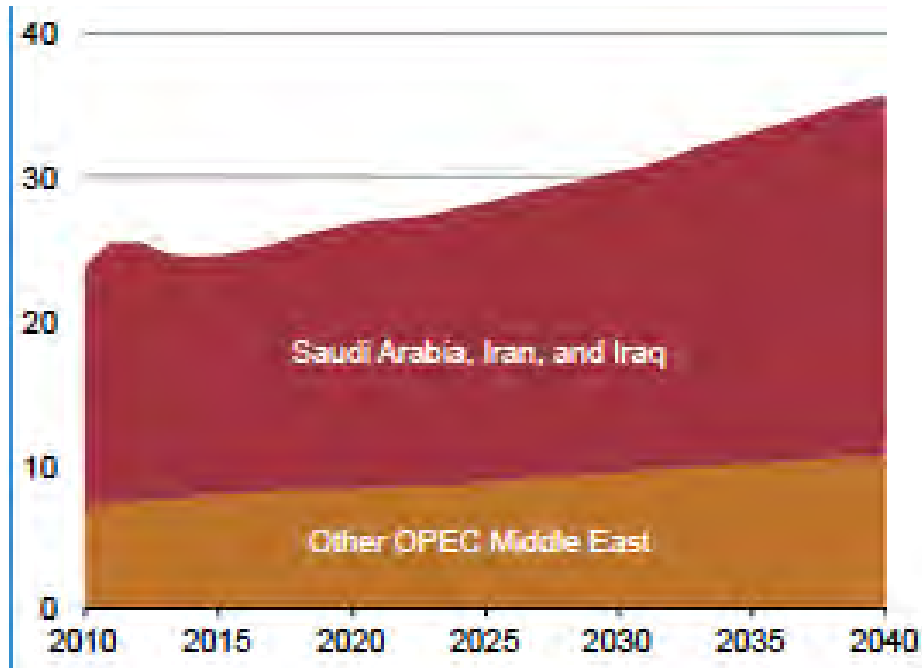
- **Scenario 3: Iran success:** This scenario is similar to scenario 2, but substituting Iran as the growth story. In this case, Iran is assumed to have resolved its aboveground issues, including resolution of international sanctions and it attracts the investment necessary to restore and expand the oil production industry. Here, Iran is able to restore production to its 1974 annual peak of 6.1 million barrels per day in 2030 and then production increases to 8.1 million barrels per day by 2040. The remaining production is allotted according to the Iraq and Saudi Arabia shares of their combined 2011 production. In this case, Saudi Arabia's share of the 2011 Iraq- Saudi Arabian combined production is 81 percent; Iraq's share 19 percent. As a result, Saudi production would increase to 13.8 million barrels per day. Iraq's 2040 production rises to only 3.3 million barrels per day, only slightly higher than its 2011 production and far from its stated ambitions.
- **Scenario 4: Iraq success, Iran success, and Saudi Arabia takes the rest** This final scenario envisions production increasing strongly in both Iraq and Iran, with Saudi Arabia willing to reduce its own liquids output to hold the level of OPEC production at the level projected in the *IEO2013* Reference case. Here, Iraq's production profile is the same as in scenario 2, increasing to 8.0 million barrels per day in 2030 and then to 11.0 million barrels per day in 2040. Iran's production profile is the same as in scenario 3, increasing production to 6.1 million barrels per day in 2030 and then further to 8.1 million barrels per day by 2040. Saudi Arabia produces the remaining part of the Reference case production for the three countries. In this case, Saudi Arabian liquids production in 2040 is 6.0 million barrels per day, slightly more than half its 2011 liquids output.

The relative impact of each scenario is shown in **Figure 1**, along with an EIA estimate of the critical role that the security of petroleum exports from three Gulf states – Iran, Iraq, and Saudi Arabia could play in the future. It should be stressed that these scenarios assume that Iran and Iraq will achieve a level of stability and ability to develop their petroleum resources efficiently, without civil conflict or sanction, and with market-driven access to investment and technology.

As the Iraqi civil war and sanctions against Iran make all too clear, the Iranian sea-air-missile threat is only one key threat affecting both current and future exports. At the same time, it is all too clear that the global economy, and a critical aspect of the world's maritime traffic, will remain dependent on the overall security of Gulf maritime shipping – both exports and imports – indefinitely into the future.

Figure 1: Liquid Fuels Production in the Gulf and Middle East

Liquids production by country grouping in the *IEO2013* Reference case, 2010-2040 (million barrels per day)



Liquids Production in Four Reference case Scenarios, 2011 and 2040 (million barrels per day)

Country	2011	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Production Range
Saudi Arabia	11.1	15.5	10.2	13.8	6.0	9.5
Iran	4.2	5.9	3.9	8.1	8.1	4.2
Iraq	2.6	3.7	11.0	3.3	11.0	7.7
Other Middle East						
OPEC	7.5	10.7	10.7	10.7	10.7	--
Total Middle East						
OPEC	25.4	35.8	35.8	35.8	35.8	--

Source: adapted from EIA, *International Energy Outlook 2013*, July 2013, 31-32, [http://www.eia.gov/forecasts/ieo/pdf/0484\(2013\).pdf](http://www.eia.gov/forecasts/ieo/pdf/0484(2013).pdf).

The importance of the potential Iranian sea-air missile threat to maritime shipping is further reinforced by the fact that Gas exports are an increasingly important part of maritime traffic through the Gulf. The EIA summarizes the present and future role of the key Gulf gas producing states as follows:⁵

“Four major natural gas producers in the Middle East—Qatar, Iran, Saudi Arabia, and the United Arab Emirates—together accounted for 85 percent of the natural gas produced in the Middle East in 2010. With more than 40 percent of the world’s proved natural gas reserves, the Middle East accounts for 21 percent of the total increase in world natural gas production in the *IEO2013* Reference case, growing from 15.9 trillion cubic feet in 2010 to 31.5 trillion cubic feet in 2040.

...The strongest growth among Middle East producers from 2010 to 2040 in the Reference case comes from Iran, where natural gas production increases by 5.4 trillion cubic feet, followed by Qatar (4.9 trillion cubic feet of new production) and Saudi Arabia (2.3 trillion cubic feet). Although Iraq is the region’s fastest-growing supplier of natural gas, with average increases of 11.6 percent per year over the projection, it remains a relatively minor contributor to regional natural gas supplies. In 2040, Iraq’s natural gas production totals 1.2 trillion cubic feet, or about 4 percent of the Middle East total...Natural gas production in Saudi Arabia grows by an average of 1.9 percent per year, from 3.1 trillion cubic feet in 2010 to 5.4 trillion cubic feet in 2040.

Chokepoints and the Broader Maritime Threat

The EIA sees the primary threat to petroleum exports in terms of shipping through the Strait of Hormuz. An EIA study of the world’s maritime chokepoints in 2012 noted that,⁶

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

...Most potential options to bypass Hormuz are currently not operational. Only Iraq, Saudi Arabia, and the United Arab Emirates (UAE) presently have pipelines able to ship crude oil outside of the Gulf, and only the latter two countries currently have additional pipeline capacity to circumvent Hormuz. At the start of 2012, the total available pipeline capacity from the two countries combined, which is not utilized, was approximately 1 million bbl/d. The amount could potentially increase to 4.3 million bbl/d by the end of this year, as both countries have recently completed steps to increase standby pipeline capacity to bypass the Strait.

Iraq has one major crude oil pipeline, the Kirkuk-Ceyhan (Iraq-Turkey) Pipeline that transports oil from the north of Iraq to the Turkish Mediterranean port of Ceyhan. This pipeline pumped about 0.4 million bbl/d in 2011, far below its nameplate capacity of 1.6 million bbl/d and it has been the target of sabotage attacks. Moreover, this pipeline cannot send additional volumes to bypass the Strait of Hormuz unless it receives oil from southern Iraq via the Strategic Pipeline, which links northern and southern Iraq. Currently, portions of the Strategic Pipeline are closed, and renovations to the Strategic Pipeline could take several years to complete.

Saudi Arabia has the 745-mile-long Petroline, also known as the East-West Pipeline, which runs from across Saudi Arabia from its Abqaiq complex to the Red Sea. The Petroline system consists of two pipelines with a total nameplate capacity of about 4.8 million bbl/d...The 56-inch pipeline has a nameplate capacity of 3 million bbl/d and its current throughput is about 2 million bbl/d. The 48-inch pipeline had been operating in recent years as a natural gas pipeline, but Saudi Arabia recently converted it back to an oil pipeline. The switch could increase Saudi Arabia’s spare oil pipeline capacity to bypass the Strait of Hormuz from 1 million bbl/d to 2.8 million bbl/d, which is only attainable if the system is able to operate at its full nameplate capacity.

The UAE constructed a 1.5 million bbl/d Abu Dhabi Crude Oil Pipeline that runs from Habshan, a collection point for Abu Dhabi’s onshore oil fields, to the port of Fujairah on the Gulf of Oman, allowing crude oil shipments to circumvent Hormuz...The pipeline will be able to export up to 1.5 million bb/d, or more than half of UAE’s total net oil exports, once it reaches full operational capacity in the near future. However, the UAE does not currently have the ability to utilize this pipeline

completely, until it ramps to full capacity...Fujairah ruler Sheikh Hamad bin Mohammed Al-Sharqi noted that this pipeline capacity could rise further to a maximum 1.8 million bbl/d.

Saudi Arabia also has two additional pipelines that run parallel to the Petrolina system and bypass the Strait of Hormuz, but neither of them have the ability to transport additional volumes of oil should the Strait of Hormuz be closed. The Abqaiq-Yanbu natural gas liquids pipeline has a capacity of 290,000 bbl/d and is running at capacity. The IPSA (Iraqi Pipeline through Saudi Arabia) is used to transport natural gas to Saudi Arabia's western coast. It was originally built to carry 1.65 million bbl/d of crude oil from Iraq to the Red Sea, but Saudi Arabia later converted it to carry natural gas, and has not announced plans to convert it back to transport crude oil.

Other pipelines, such as the Trans-Arabian Pipeline (TAPLINE) running from Qaisumah in Saudi Arabia to Sidon in Lebanon, have been out of service for years due to war damage, disuse, or political disagreements, and would require a complete renovation before being usable. Relatively small quantities, several hundred thousand barrels per day at most, could be trucked to mitigate closure of the Strait of Hormuz.

The Strait of Hormuz may be the most vulnerable point for an attack on maritime shipping, but Iran can carry out sea-air-missile attacks that affect maritime traffic at any place in the Gulf, and Iran has steadily increased its capability to attack targets in the Gulf of Oman, Arabian Sea, Indian Ocean, and Red Sea. Oil and gas pipelines will reduce dependence on maritime traffic through the Strait of Hormuz over time, but shifting tanker loading to ports in Oman and the UAE will not eliminate the risk of Iranian military action, and as Libya once showed, a nation like Iran could also carry out covert mine warfare or submarine attacks in the Red Sea.

The increase in output that bypasses the Strait will not reduce the need to increase traffic through the Strait because of rising global demand. It also will not affect a steady increase in the flow of maritime traffic into the Gulf and nearby ports to meet the needs of its steadily rising population.

Unfortunately, there is no reliable and up-to-date unclassified set of estimates of the global economic cost of various levels of energy interruption to maritime traffic in and out of the Gulf. Virtually all sources agree, however, that Europe will remain highly dependent on Gulf energy exports; and that key Asia exporters like China, India, Japan, and South Korea will become even more dependent on the stable flow of Gulf energy exports – and imports that compensate for the cost of such Gulf exports -- over time.

Even the US – which some experts feel may be able to eliminate its need for direct energy imports in the future -- cannot begin to eliminate the risk inherent in any major cut in Gulf energy exports for the foreseeable future. While there are many estimates of future US import dependence – based on very different models of new oil and gas supplies, unconventional fuels, and changes in demand – the official US estimate by the Energy Information Agency of the Department is that the US will still be at least 32% dependent on imports of total petroleum liquids through 2040 – a dependence that is absolutely critical to the US transportation sector, and therefore to its entire economy. The US *Annual Energy Outlook* for 2014 states that,⁷

With strong growth in domestic crude oil and natural gas production, U.S. use of imported fuels falls sharply. In the AEO2014 Reference case, U.S. domestic energy production increases from 79.1 quadrillion Btu in 2012 to 102.1 quadrillion Btu in 2040, and net use of imported energy sources, which was 30% in 2005, falls from 16% of total consumption in 2012 to 4% in 2040. In the AEO2013 Reference case, domestic energy production reached a total of 98.5 quadrillion Btu, and energy imports is projected to decline as a percentage of consumption to 9% in 2040. The larger increase in domestic

energy production in AEO2014 is primarily a result of higher projections of production of natural gas and biomass/other renewables. Crude oil production (including lease condensate) increases from 13.9 quadrillion Btu in 2012 to a peak of 20.5 quadrillion Btu in 2019 before dropping to 16.0 quadrillion Btu in 2040.

With domestic crude oil production rising to 9.5 MMbbl/d in 2016, the import share of U.S. petroleum and other liquids supply falls to about 25%. Domestic production begins to decline after 2019, and the import share of total petroleum and other liquids supply grows to 32% in 2040, still lower than the 2040 level of 37% in the AEO2013 Reference case.

... U.S. use of imported petroleum and other liquid fuels continues to decline in *AEO2014* mainly as a result of increased domestic oil production. Imported petroleum and other liquid fuels as a share of total U.S. use reached 60% in 2005 before dipping below 50% in 2010 and falling further to 40% in 2012. The import share continues to decline to 25% in 2016 and then rises to about 32% in 2040 in the *AEO2014* reference case, as domestic production of tight oil begins to decline in 2022.

As is discussed later in this analysis, direct import dependence is only part of the story. The US has to pay world prices for oil in a crisis even if it is domestically produced, and this is true regardless of whether the US is dependent on Gulf oil exports at the time.

Even more importantly, US dependence on total imports of manufactured goods rises every year --particularly from Asia that is the region most dependent on Gulf energy exports.⁸ The CIA estimates that the US had \$2,273 trillion in imports in 2013, out of a GDP of \$16.72 trillion. Some 95.1% were manufactured goods and services in some form and even in 2013 only 8.2% were crude oil. Some 30.4% were capital goods, 31.8% were consumer goods, and 24.7% were industrial goods other than petroleum.

A total of 25.4% of these imports came from just two energy import dependent countries: China and Japan. In short, US dependence on indirect energy imports is far more important than direct imports of petroleum, and the rate of increase in indirect energy import dependence may well offset any reduction in US direct energy imports.⁹

The Iranian Maritime Threat to Iran

As the last three decades of near-constant conflict and instability in the Gulf have shown, there is no clear way to predict what kind of threat Iran may pose if Iran ever chose to use force against the maritime traffic in the region, but it is important to note that Iran is as dependent on the stable flow of maritime traffic and energy exports as its neighbors.

Iran is one of the world's most important potential exporters. At the same time, as **Figure 2** shows, Iran's economy has already suffered from major development problems because of Iran's threatening behavior and the risk it might acquire and deploy nuclear weapons:¹⁰

Iran holds some of the world's largest deposits of proved oil and natural gas reserves, ranking as the world's fourth- and second-largest reserve holder of oil and natural gas, respectively. Iran also ranks among the world's top 10 oil producers and top 5 natural gas producers. Iran produced 3.2 million barrels per day (bbl/d) of petroleum and other liquids in 2013 and more than 5.6 trillion cubic feet (Tcf) of dry natural gas in 2012.

...Iran's oil production has declined substantially over the past few years, and natural gas production growth has slowed, despite the country's abundant reserves. International sanctions have stymied progress across Iran's energy sector, especially affecting upstream investment in both oil and natural gas projects. The sanctions have prompted a number of cancellations and delays of upstream projects, resulting in declining oil production capacity. The United States and the European Union (EU) enacted measures at the end of 2011 and during the summer of 2012 that have affected the Iranian energy sector more profoundly than any previously enacted sanctions. The sanctions impeded Iran's ability to sell oil,

resulting in a 1.0-million bbl/d drop in crude oil and condensate exports in 2012 compared with the previous year.

According to the International Monetary Fund (IMF), Iran's oil and natural gas export revenue was \$118 billion in the 2011/2012 fiscal year (ending March 20, 2012). In the 2012/2013 fiscal year, oil and natural gas export revenue dropped by 47% to \$63 billion. The IMF estimates that Iran's oil and natural gas export revenue fell again in the 2013/2014 fiscal year by 11% to \$56 billion. The revenue loss is attributed to the precipitous decline in the volume of oil exports from 2011 to 2013. Iran's natural gas exports actually increased slightly over the past few years. However, Iran exports a small volume of natural gas, as most of its production is domestically consumed.

Nonetheless, international sanctions have also affected Iran's natural gas sector. Iran's natural gas sector has been expanding, but production growth has been lower than expected as a result of the lack of foreign investment and technology. The South Pars natural gas field is the largest hydrocarbon upstream project currently being developed in Iran and continues to encounter delays. South Pars, located offshore in the Persian Gulf, holds roughly 40% of Iran's proved natural gas reserves. It is currently being developed largely by Iranian companies because most international companies have pulled out. The field's development entails 24 phases, of which phases 1-10 are completed, and phase 12 started production in February 2014.

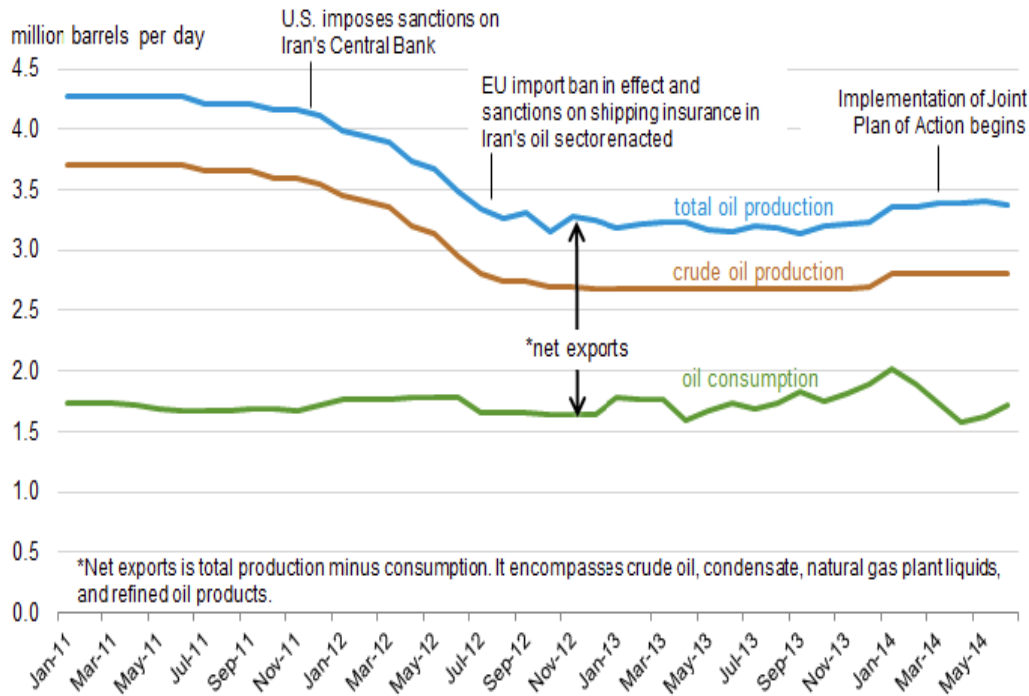
On November 24, 2013, a Joint Plan of Action (JPOA) was established between Iran and the five permanent members of the United Nations Security Council (the United States, United Kingdom, France, Russia, and China) plus Germany (P5+1). Implementation of the JPOA started in January 2014. Under the JPOA, Iran agreed to scale back or freeze some of its nuclear activities during the six months of negotiations in exchange for some sanctions relief. The period of negotiations was recently extended for another four months to November 24. The JPOA aims to reach a long-term comprehensive plan that ensures that Iran's nuclear program is peaceful, which may lead to the lifting of international sanctions.

The JPOA does not directly allow for additional Iranian oil sales, although it does suspend sanctions on associated insurance and transportation services. However, Iran and the countries that are continuing to import Iranian oil have increasingly been able to find alternatives to European Protection and Indemnity Clubs (P&I) coverage from EU companies.

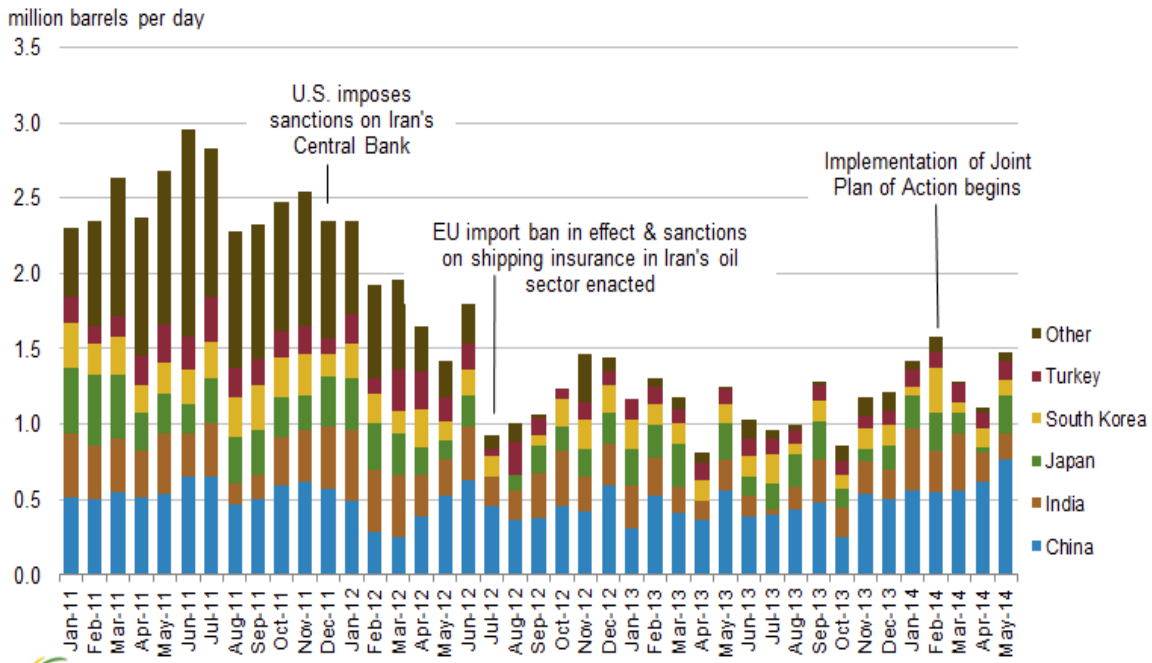
Iran's crude oil and condensate exports increased in late 2013 and have maintained a level above the 2013 average. From January to May 2014, Iran's crude oil and condensate exports averaged 1.4 million bbl/d, roughly 300,000 bbl/d higher than the 2013 average, according to the International Energy Agency (IEA). Exports to China and India account for almost all of the increase.

Figure 2: Iran's Petroleum Exports and the Impact of Sanctions

Net Exports per Month vs. Domestic Consumption



Exports by Key Importing Country and Export Dependence on Maritime Traffic



Source: EIA, "Iran," July 22, 2014, 11, 15, <http://www.eia.gov/countries/analysisbriefs/Iran/iran.pdf>.

Figure 3 shows just how vulnerable Iran's major export facilities are to any conflict that threatens the flow of Gulf energy exports. Its key pipelines all still go to ports in the upper Gulf, which make secure shipping inside the Gulf as critical as shipping outside. Moreover, most of its petroleum is in onshore and offshore areas in the upper Gulf. "According to FGE, approximately 70% of Iran's crude oil reserves are located onshore and the remainder offshore, mostly in the Gulf. Roughly 85% of Iran's on shore reserves are located in the Luristan-Khuzestan basin in the southwest near the Iraqi border, according to the Arab Oil and Gas Journal."¹¹

The vulnerability of Iran's facilities to sea-air-missile attacks is clear from a list of its export facilities and their capacity – only a limited number of which are operational and constitute a potential targeting list in any maritime conflict:¹²

The Kharg, Lavan, and Sirri Islands, located in the Persian Gulf, handle almost all of Iran's crude oil exports. Iran also has two small crude oil terminals at Cyrus and Bahregansar, one terminal along the Caspian Sea, and other terminals that handle mostly refined product exports and imports. Condensate from the South Pars natural gas field is exported from the Assaluyeh terminal.

Kharg Island is the largest and main export terminal in Iran. Roughly 90% of Iran's exports are sent via Kharg. Kharg's loading system has a capacity of 5.0 million bbl/d. The terminal processes all onshore production (the Iranian Heavy and Iranian Light Blends) and offshore production from the Froozan field (the Froozan Blend). The Kharg terminal includes the main Tjetty, the Sea Island that is located on the west side of Kharg, and the Dariush terminal to the south. Kharg Island relies on storage to ensure even operations, and its current storage capacity is expected to increase to 28 million barrels of oil in 2014.

Lavan Island mostly handles exports of the Lavan Blend sourced from offshore fields. Lavan is Iran's highest -quality export grade and one of Iran's smallest streams. Lavan's production averaged less than 100,000 bbl/d in 2013, but the Lavan facilities have the capacity to process 200,000 bbl/d of crude oil. Lavan has a two-berth jetty, which can accommodate vessels up to 250,000 deadweight tons. Lavan's storage capacity is 5.5 million barrels.

Sirri Island serves as a loading port for the Sirri Blend that is produced in the offshore fields of the same name. The Sirri terminal includes a loading platform equipped with four loading arms that can load tankers from 80,000 to 330,000 deadweight tons. Its storage capacity is 4.5 million barrels.

The small offshore loading terminal at Cyrus can handle tankers up to 70,000 deadweight tons. Crude is stored on a barge moored nearby, according to Arab Oil and Gas Journal

The Bahregansar field in the northern Persian Gulf has its own loading terminal. It features one single buoy mooring that can load tankers up to 250,000 deadweight tons.

Neka is Iran's Caspian Sea port and was built to receive crude oil imports from Caspian region producers that are delivered under swap agreements. The port was built in 2003 and has a storage capacity of 1 million barrels and can handle up to 100,000 bbl/d of crude oil, according to FGE. Neka has not been operational since 2011. The terminal was previously used to facilitate swap agreements with Azerbaijan, Kazakhstan, and Turkmenistan. Under these agreements, Iran received crude oil at its Caspian Sea port of Neka, which was processed in the Tehran and Tabriz refineries. In return, Iran exported the same amount of crude oil through its Persian Gulf ports.

The export terminals Bandar Mahshahr and Abadan (also known as Bandar Imam Khomeini), are near the Abadan refinery and are used to export refined product from the Abadan refinery. Bandar Abbas, located near the northern end of the Strait of Hormuz, is Iran's main fuel oil export terminal.

Iran's vulnerability also extends to air and precision-guided missile strikes on its power grid, water systems, and other petroleum facilities -- especially on its refineries and key gas facilities:¹³

Iran is the second-largest oil-consuming country in the Middle East, second to Saudi Arabia. Iranian domestic oil consumption is mainly diesel, gasoline, and fuel oil. Total oil consumption averaged approximately 1.75 million bbl/d in 2013, almost 3% higher than the year before. In the past, Iran had limited domestic oil refining capacity and was heavily dependent on imports of refined products, especially gasoline, to meet domestic demand. In response to international sanctions and the resulting difficulty in purchasing refined products, Iran expanded its domestic refining capacity.

As of September 2013, Iran's total crude oil distillation capacity was nearly 2.0 million bbl/d, about 140,000 bbl/d more than the previous year, according to FGE. Most of that increase came from expansion projects that were recently completed at the Arak and Lavan refineries. Iran also extracts petroleum products at natural gas processing plants (naphtha and liquefied petroleum gas). A small amount of crude oil, approximately 4,000 bbl/d, is directly burned for power generation.

Almost all of Iran's product consumption was locally produced. In 2013, FGE estimates that Iran imported almost 17,000 bbl/d of petroleum products, of which roughly 85% was gasoline. Over the past several years, Iran's gasoline import dependence has decreased significantly as a result of increased domestic refining capacity and subsidy cuts. Iran plans to increase gasoline production capacity at the Isfahan and Bandar Abbas refineries by the end of 2014. Despite refinery expansions, FGE expects Iran's gasoline imports to increase over the medium and long term because of increased gasoline demand and the government's plan to reduce gasoline production at petrochemical plants. However, gasoline demand is expected to decrease in the short term because of higher prices as a result of subsidy cuts.

It is one thing for Iran to use the threat of attacking such traffic or ports and offshore facilities in the Gulf, Arabian Peninsula, and Red Sea – or limited asymmetric attacks that do not escalate to a major conflict – to intimidate or pressure other Gulf state and outside powers. It is quite another to actually escalate to a level of conflict that does critical damage to regional and global strategic interest and can trigger a massive or all out military response.

This means that there is a wide range of potential scenarios that could lead Iran to using forces in ways that pose a maritime threat. They can range from very low-level asymmetric warfare to serious threats to shipping in the Gulf to “closing” the Strait of Hormuz. They can involve mixes of naval, air, and missile forces. And, they can be limited to Gulf waters or extended in to the Indian Ocean, Red Sea or even beyond.

Figure 3: The Geography and Vulnerability of Iranian Oil and Gas Exports
Oil



Gas



Source: EIA, "Iran," July 22, 2014, 13, 22, <http://www.eia.gov/countries/analysisbriefs/Iran/iran.pdf>.

II. The Strengths and Weaknesses of Iran's Naval Forces

The broad statistic on Iran's seapower and the naval balance in the Gulf are shown in **Figures 4 to Figure 8**. These **Figures** only provide a rough idea of naval capability, and do not include US seapower because US deployments are constantly changing and can rapidly be increased using a global US pool of resources.

The regular Iranian Navy (IRIN) has serious limitations, both because it has not been able to fully modernize since the fall of the Shah in 1979, and because of losses during the Iran-Iraq War. It had some 18,000 men in 2012. According to IISS, this total included two marine brigades of some 2,600 men and a 2,000-man naval aviation force. It had bases at Abu Musa, Bandar Abbas, Bandar Anzali, Bander-e Khomeini, Bander-e Mahshahr, Bushehr, Chah Bahar, Farsi, Jask, Kharg Island, and Siri, while the IRGC's naval branch (IRGCN) operates from Abu Musa, Bandar Abbas, Farsi, Halileh, Khorramshahr, and Larak.

The Range of Maritime Threats

Iran learned during the "Tanker War" in 1987-1988 that it cannot compete with the US in conventional naval warfare, and now faces an added threat from far more serious Southern Gulf naval forces. Iran's sea-air-missile forces are, however, still an important part of its capabilities to fight an air sea battle in the Gulf, if they are made part of a broader campaign of naval asymmetric warfare. As the following sections of this report show, Iran has built up substantial capabilities for asymmetric warfare in the Gulf and the Arabian Sea, including submarines and submersibles, mine warfare capabilities, anti-ship missiles, marines and special forces, and a wide variety of smaller craft that can be used to swarm targets in the Gulf or in a battle of attrition.

Experts see a variety of Iranian sea-air-missile threats in the Gulf – many of which go beyond the capabilities of the Iranian Navy per se and involve the Naval Branch of the IRGC. These "stacked threats" include:

- A mine warfare threat with Iranian stocks of 6,000+ mines, pre-staged mine deployments that can be rapidly dispersed, a wide range of platforms and the ability to deploy a low-cost, low tech, high impact forces that could be anonymous if mines were laid covertly or using commercial ships and small craft.
- An expanding inventory of coastal defense anti-ship missiles like the C-802 with steadily improving capabilities and ranges. Examples include the Hendijan PGG with C-802s and Peykapp III WPTG with C-704s – possibly supported by F-4Es with some variant of the C-700 or C-800 series – and Iran's new domestically produced *Khalij Fars*, stacked to overwhelm anti-missile systems.
- Submarines with 3 Kilo-class conventional submarines, and Yono-class midget submarines.
- A wide range of fast attack with a wide range of platforms, some with modern Chinese anti-ship missiles and wake homing torpedoes, steadily improving weaponry,
- New very high speed (70 knot), low observable boats like the Bladerunner 35 that carry high payloads of explosives and are designed for suicide missions.
- Groups or "clusters" of such smaller surface ships that can be quickly dispersed throughout the Iranian coast and can be used in groups to attack military or commercial surface vessels.
- Special forces, marines, and naval guards units that can be used to attack or raid offshore facilities and coastal targets, although Iran's set of 13 landing ships restricts its amphibious reach.

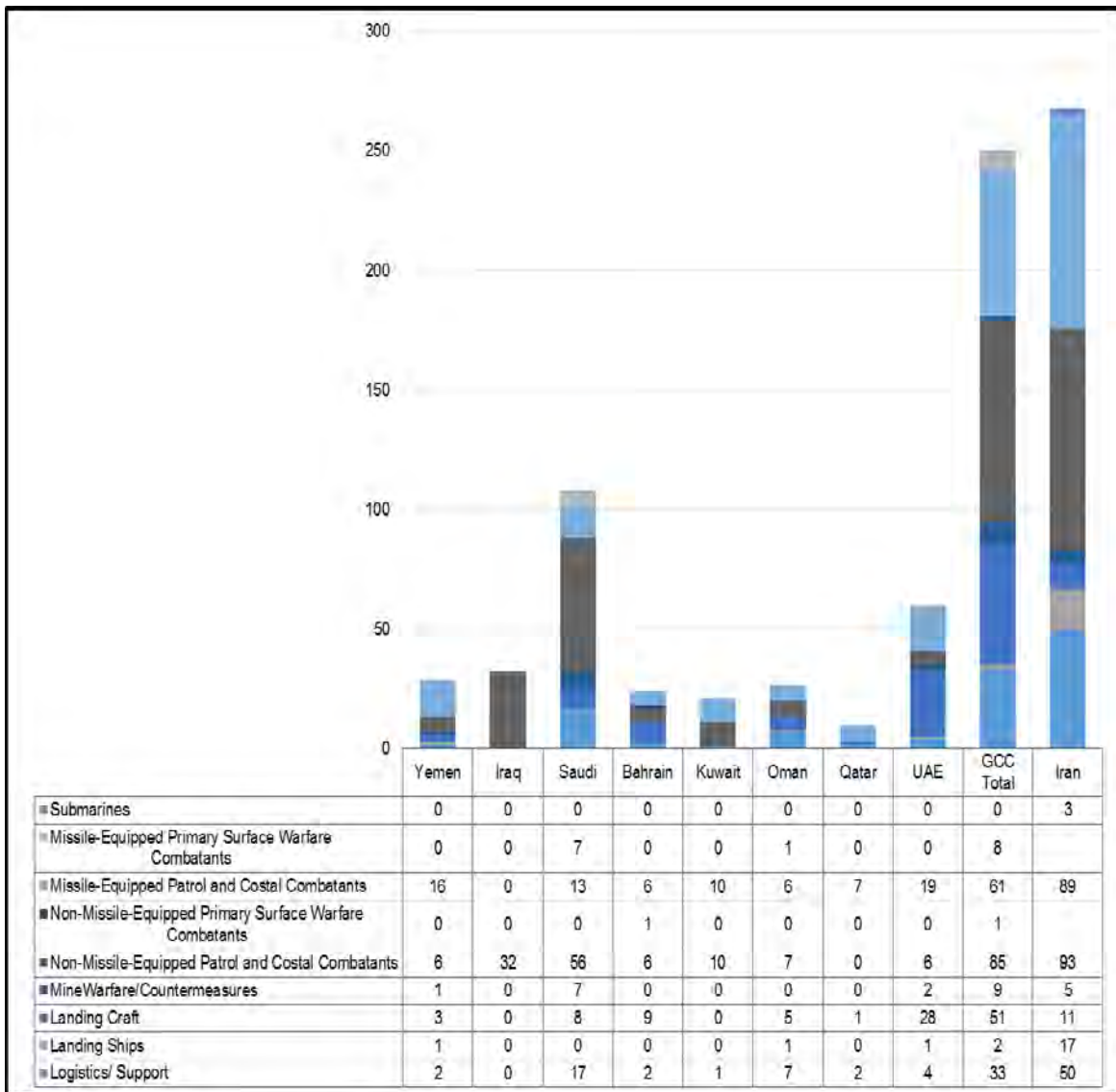
- Covert forces like the Al Quds force that can be used to develop local forces and extremists for sabotage attacks on naval or other facilities.
- Efforts to develop rockets and ballistic missiles capable of homing on ships at much longer ranges like the *Khalij Fars*.
- Lack of over-the-horizon and general-purpose sensors, reducing range of fast-attack craft to visual range strikes coordinated by weakly networked land-based C⁴ISR, compensated for by new domestically produced radars and expanding HUMINT network within the Gulf.

Although Iran's mix of corvettes, missile boats, and diesel-electric submarines is large enough to present a challenge during the initial phase of any major clash, Iran's conventional fleet and air force are better suited to supporting its IRGC forces in asymmetric warfare. Iran probably does have some weapons systems or tactics the USN is not expecting, but its ability to surprise US forces is hindered by pervasive intelligence efforts.

Its piecemeal modernization will enable its larger surface ships to perform in a conventional contest, but its improved missiles and torpedoes will not offset outdated guidance, battlefield awareness, and defensive systems – and nor does Iran appear to expect them to. Experts feel Iran has no desire for a force-on-force engagement against the US Navy – the disparities between Iranian and US ships have only sharpened since the Tanker War – but do feel Iran sees a role for larger ships as a form of deterrence and intimidation, and as useful in a localized conflict.

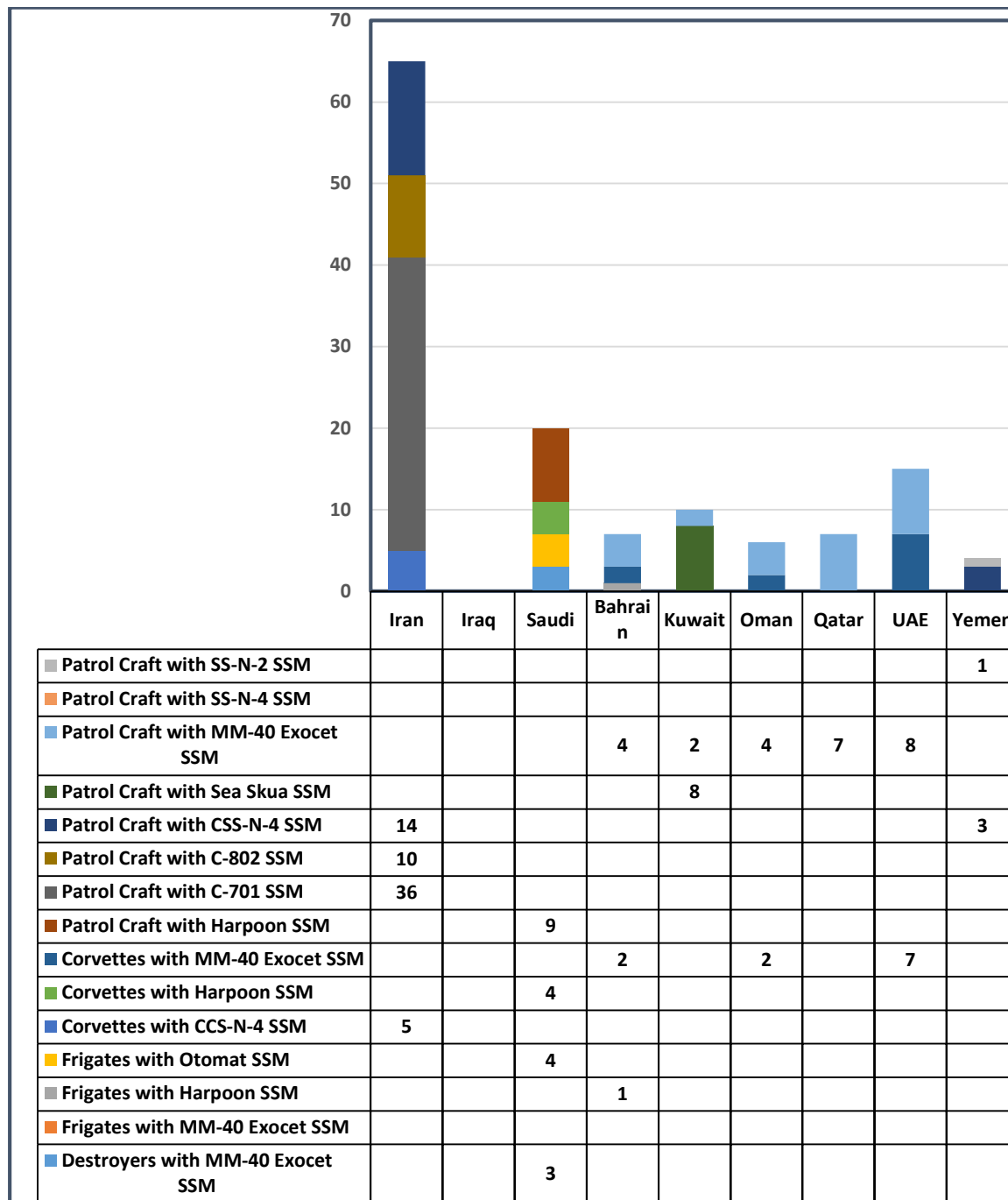
Iran has also developed a different type of naval rearmament encompassing midget submarines and patrol boats suited to hit-and-run raids to frigates and other major combatants. The smaller ships appear designed for an unconventional campaign against the US Navy; the larger vessels, however, are better suited for intimidating Gulf neighbors and projecting Iranian influence against the comparatively weak GCC navies.

Figure 4: Comparative Combat Ship Strength without US and Other Allied Forces



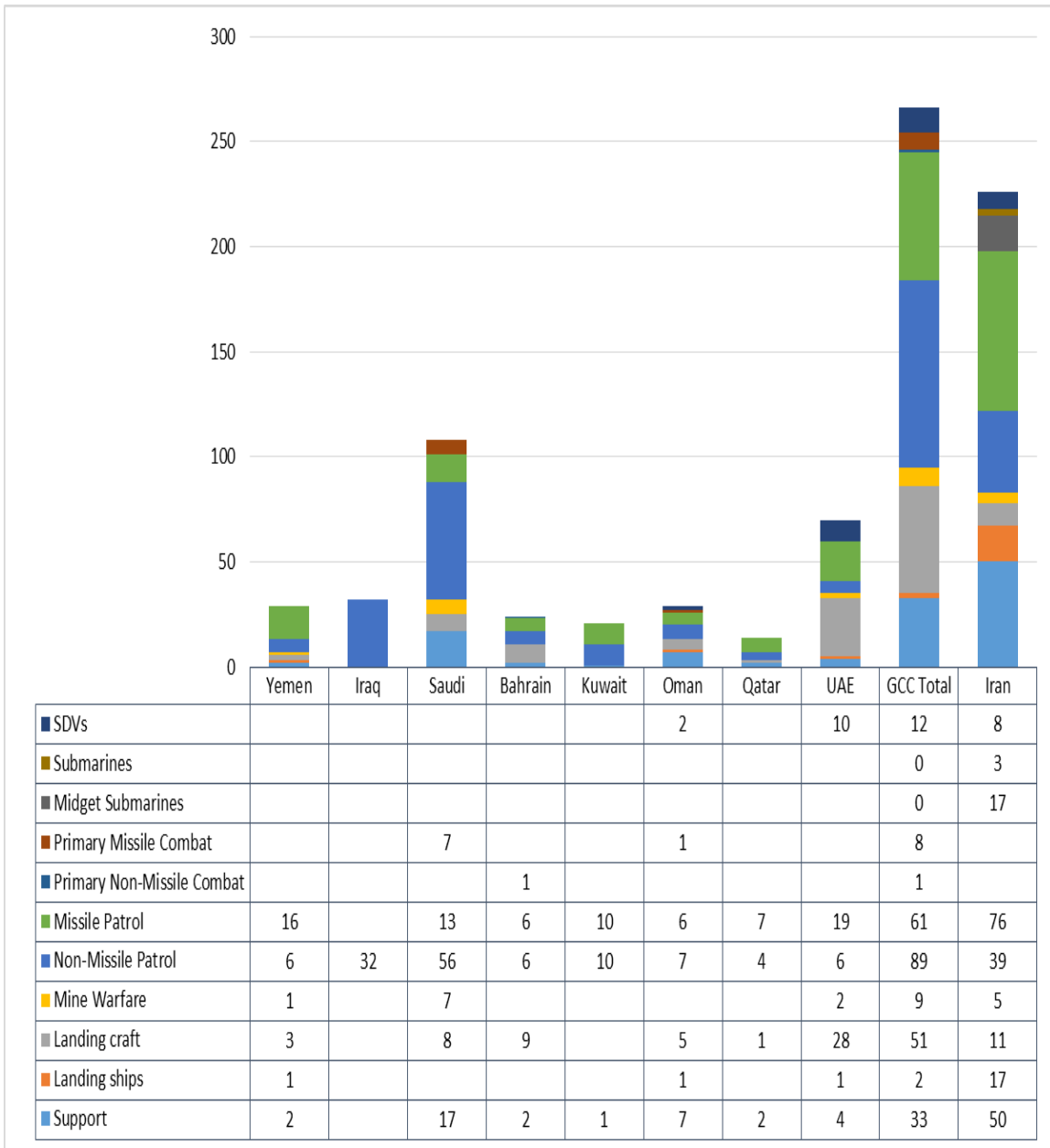
Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance*, 2014, and IHS Jane's Sentinel series.

Figure 5: Missile-Armed Combat Warships



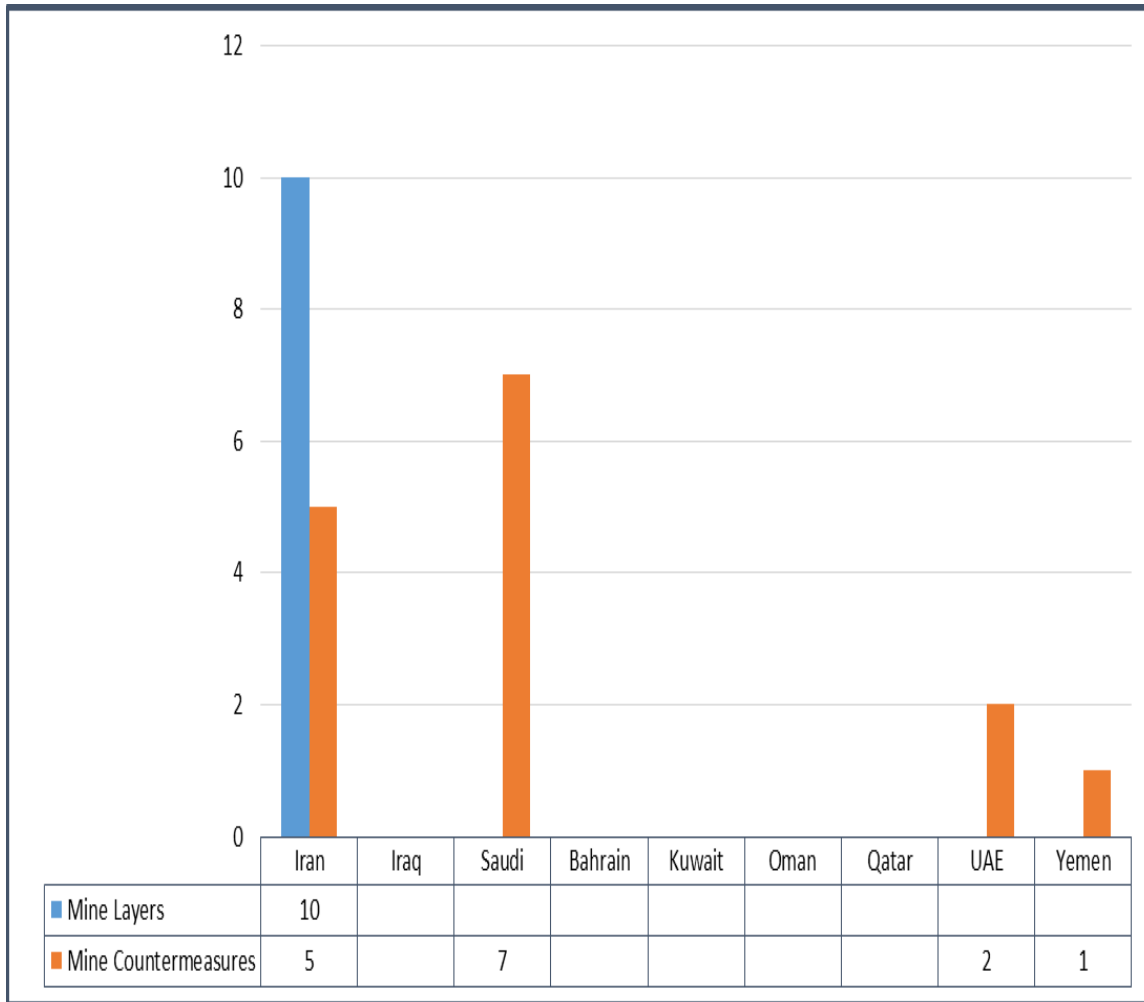
Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance*, 2014, and IHS Jane's Sentinel series.

Figure 6: Comparative Asymmetric Ship and Boat Strength without US and Other Allied Forces



Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance*, 2014, and IHS Jane's Sentinel series.

Figure 7: Mine Warfare Craft and Ships



Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance*, 2014, and IHS Jane's Sentinel series.

Figure 8A: Iranian Reliance on Aging/Obsolescent Systems

FSGM

1 *Jamaran* (UK Vosper Mk 5 – 1 more under construction at Bandar-e Abbas, expected ISD 2013) with 2 twin Inchr with CSS-N-4 *Sardine* AShM, 2 Inchr with SM-1 SAM, 2 triple 324mm ASTT, 1 76mm gun, 1 hel landing platform

FSG 4

3 *Alvand* (UK Vosper Mk 5) with 2 twin Inchr with CSS-N-4 *Sardine* AShM, 2 triple 324mm ASTT, 1 114mm gun
1 *Bayandor* (US PF-103) with 2 twin Inchr with C-802 AShM, 2 triple 324mm ASTT, 2 76mm gun

FS

1 *Bayandor* (US PF-103) with 2 76mm gun

PCFG

13 *Kaman* (FRA *Combattante II*) with 1–2 twin Inchr with CSS-N-4 *Sardine* AShM

MSI

2 *Riazi* (US *Cape*)

LSM

3 *Farsi* (ROK) (capacity 9 tanks; 140 troops)

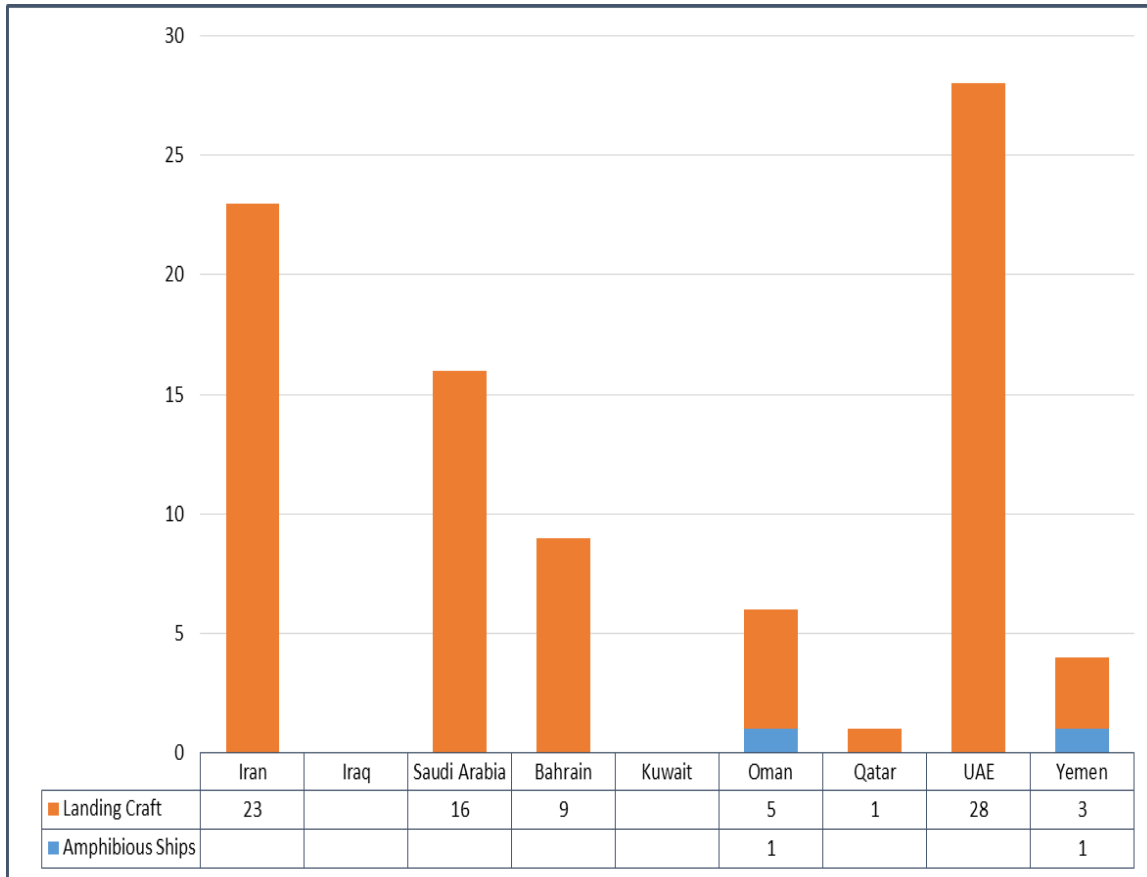
LST

4 *Hengam* each with up to 1 hel (capacity 9 tanks; 225 troops)

LSL 6 Fouque

Source: IISS, *Military Balance*, 2014, and IHS Jane's Sentinel series.

Figure 8B: Amphibious Ships and Landing Craft Less Ferries



Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance, 2014*, and IHS Jane's Sentinel series.

Submarines

Iran has three *Kilo*-class submarines bought from Russia in the 1990s, and is building two small submarines on its own. Its *Kilo*-class submarines can fire long-range homing torpedoes and lay smart and conventional mines. It acquired its first *Ghadir*-class 120-150-ton midget submarine in 2007 and now has up to 17. It also has at least one 90-ton midget submarine, and eight small submersibles for inserting Special Forces and minelaying.

Iran's three Type 877EKM *Kilo*-class submarines and other submarines offset some of the weaknesses of its major surface forces. The *Kilo* is a relatively modern and quiet submarine that first became operational in 1980. Iran has completed a refit of one of its *Kilos*, and will likely begin modernizing the second if it believes the submarine will not be needed in the near future.

Iran does, however, have serious problems in maintaining its submarines much less refit them, and it has not provided realistic training. Its submarines rarely submerge in training or exercises, and many of Iran's drill claims are little more than propaganda. This leads some experts to feel that they would only pose a relatively limited and short-lived threat if they were actually deployed and used in combat.

This does not mean they can be ignored. Each *Kilo* has six 530-mm torpedo tubes, including two wire-guided torpedo tubes. Only one torpedo can be wire guided at a time. The *Kilo* can carry a mix of 18 homing and wire-guided torpedoes or 24 mines. Russian torpedoes have guidance systems including active sonar homing, passive homing, and wire guidance, but experts believe Iran may only have shorter range, wake-homing torpedoes. Some reports indicate that Iran bought over 1,000 modern Soviet mines along with the *Kilos* and that the mines were equipped with modern magnetic, acoustic, and pressure sensors.

Iran's ability to use its submarines to deliver mines and fire wake-homing torpedoes at ranges of up to 4,000-6,000 meters gives it a potential capability to strike in ways that are difficult to detect or deter. Its submarines can fire long-range homing torpedoes that can be used against tanker-sized targets and to attack slow-moving combat ships that are not on alert and/or lack sonars and countermeasures.

At the same time, many areas of the Gulf do not favor submarine operations. As is discussed in more detail later in this analysis, the Gulf is about 241,000 square kilometers in area and stretches 990 kilometers from the Shatt al-Arab to the Strait of Hormuz. It is about 340 kilometers wide at its maximum width and about 225 kilometers wide for most of its length. While heat patterns disturb surface sonars, they also disturb submarine sonars, and the advantage seems to be slightly in favor of sophisticated surface ships and maritime patrol aircraft; while submarines are forced to rely on only a single suite of sensors, their hunters have a wide range of detection systems and will likely suffer less from the chaotic conditions.

The Strait of Hormuz is about 180 kilometers long at the entrance to the Gulf, but has a minimum width of 39 kilometers, and only the two deep-water channels are suitable for major surface ship or submarine operations. Further, a limited flow of fresh water and high evaporation makes the Gulf extremely salty. This creates complex underwater currents in the main channels at the Strait of Hormuz and complicates both submarine operations and submarine detection.

The deeper parts of the Gulf are noisy enough to make ASW operations difficult, but large parts of the Gulf – including much of the southern Gulf on a line from Al Jubail across the tip of Qatar to about half way up the United Arab Emirates – are less than 20 meters deep. The water is deeper on the Iranian side, but the maximum depth of the Gulf – located about 30 kilometers south of Qeys Island – is still only 88 meters. This means that no point in the Gulf is deeper than the length of an SN-688 nuclear submarine. The keel to tower height of such a submarine alone is 16 meters. Even smaller coastal submarines have maneuver and bottom suction problems, cannot hide in thermoclines, or take advantage of diving for concealment or self-protection. This may explain why Iran is planning to relocate its Kilo submarines from Bandar Abbas, inside the Gulf, to Chah Bahar in the Gulf of Oman and is deepening the navy facility at Chah Bahar.¹⁴

There are some areas with considerable noise, but not of a type that masks submarine noise from sophisticated ASW detection systems of the kind operated by the United States and the United Kingdom. Further, the minimum operating depth of the Kilo is 45 meters, and the limited depth of the area around the Straits can make submarine operations difficult. Submarines are easier to operate in the Gulf of Oman, which is noisy enough to make ASW operations difficult, but such deployments would expose the Kilos to operations by US and British nuclear attack submarines. It is unlikely that Iran's Kilos could survive for any length of time if hunted by a US or British Navy air-surface-SSN (nuclear submarine) hunter-killer team.¹⁵ Iranian submarines – particularly its midget vessels – also face a limited combat radius. Even if they are capable of effective submerged operations, submarines cannot carry enough food, water, or weaponry to strike at commerce for an extended period of time; once in dock, they are vulnerable to air strikes or ASW forces deployed near harbors.

In any case, the effectiveness of Iran's Kilo-class submarines is likely to depend heavily on the degree of Western involvement in any ASW operation. If the Kilos do not face the US or British ASW forces, they could operate in or near the Gulf with considerable impunity. If they did face US and British forces, they might be able to attack a few tankers or conduct mining efforts, but are unlikely to survive extended combat. This makes the Kilos a weapon that may be more effective in threatening Gulf shipping, or as a remote minelayer, than in naval combat. Certainly, Iran's purchase of the Kilos has already received close attention from the southern Gulf States and convinced them that they must take Iran more seriously.

The data on IRIN midget submarine development and deployment are uncertain, and it is unclear exactly what submerged systems Iran is currently constructing. Nonetheless, IRIN appears to have imported the North Korean 130 ton *Yono* (*Yeono* or *Yugo*)-class submarine and begun to produce variants. It is a three man submarine with speeds of 10-11 knots surfaced and 4-8 knots submerged, a range of 550 nm surface and 55 nm submerged, and two 533 mm torpedo tubes. According to some reports, it can be packed with six to seven special forces personnel if the crew is reduced to two.¹⁶

The head of the UAE Navy, Rear Admiral Ibrahim al Musharrakh, stated that in the long term, Gulf navies will procure their own submarines to counter those of Iran, particularly Iranian midget submarines. However, this does not deal with Iranian submarines in the short term, no satisfactory short-term solution has not been found, and buying submarines does not provide Gulf navies with effective capabilities against Iranian submarine or submersibles, and creates a forces that would probably not have an Iranian target if shipping was already halted by the Iranian threat to other Gulf shipping. .

Iran currently operates between 10 and 20 Ghadir midget submarines, one Nahang midget submarine, and approximately eight submerged diver delivery craft. Some reports indicate Iran has received the Hoot supercavitating rocket torpedo and modified some of its submarines to fire this high-speed torpedo.¹⁷

Iranian officers have mentioned three new classes of submarine in development, the *Fateh*, *Besat*, and *Qaaem* classes. One of these classes, the 500 ton *Fateh* class was seen on satellite imagery at an Iranian shipyard in October 2013, as well as Iranian TV. The submarine was launched in October of 2013.¹⁸ Iranian TV also showed the construction of what was allegedly the 1000-ton *Besat* class. The *Qaaem* class, which is in a similar weight class as the *Besat*, has not been mentioned since the 2012 statement on the development of *Besat*. It is unclear whether the *Qaaem* class project still exists or if it has become the *Besat* project.¹⁹ It is not expected that Iran will actually develop all three – as medium weight submarines with Kilo-class capabilities for green-water operations.²⁰

Iranian midget submarines may provide a more serious threat within the Gulf than its Kilos. The Ghadirs and other Iranian midget submarines do drill more regularly than its Kilos and submerge more often in exercises. Rumors of serious losses in exercises are not confirmed by experts. Iranian midget submarines possess both torpedo-firing and mine-laying capabilities, and their small size may enable them to operate more effectively in the Strait or the Gulf. However, the capabilities of these boats are still unknown; much depends on their sensors and ability to hide from dedicated ASW platforms. If they are unable to mask propulsion noises, even the cluttered environment of the Gulf will not protect them from Western or even Gulf ASW assets.

Iran's Kilo force has faced similar problems to those encountered by the Iranian Air Force – years of stress and a high operational tempo combined with an industrial base and engineers unfamiliar with the original platform. These vessels require regular refurbishments and time in dry dock, in addition to a regular supply of spare parts. While Iran has mastered the construction techniques for building midget submarines, it still has not developed the industrial capacity or expertise to refit its larger Kilos.

As a result, the Kilos have been restricted in their exercises, often training on the surface and rarely with other naval vessels. While Iran has sufficient stocks of mines and torpedoes to fully supply its Kilos for a war of attrition in the Arabian Sea, the relaxed training schedule and logistical failures suggest that the Kilos will be unable to play a major role in naval combat.

Iran's midget submarines, however, are believed to be better prepared and suited for the style of combat that Iran is preparing for. These weapons, with their smaller payload of mines and torpedoes, train more often and in more realistic drills than the Kilos. They exercise near – but not in – the Strait, avoiding both the tricky currents and risk of international confrontation attendant upon military maneuvers in the restricted zone.

These systems would be effective in a prolonged war of attrition against both commercial and military vessels. While their smaller weapons load would probably restrict them to one attack per sortie, they would be able to use torpedoes or lay mines unpredictably across major tanker routes, target civilian vessels without sonar, and potentially threaten sonar-equipped warships in unfamiliar waters. In coordination with packs of fast-attack craft, surface-to-surface missiles, or other surface threats – although it is unclear if Iran has practiced such maneuvers

– the midget submarines represent an effective component of Iran’s broader overall asymmetric naval strategy.

Corvettes and Major Surface Ships

Iran still has a large Navy by the standards of the developing world. Sources differ over how many of Iran’s older western-supplied ships like its one *Damavand*-class and two *Babr*-class destroyers -- should be still be counted as active, and how other Iranian ships should be classed.

Iran still has two Bayandor (PF103) class corvettes launched in 1963 and commissioned in 1964. Their weapons control, search/track radars, and sonars have not been fully modernized since the mid-1960s, although some aspects of the electronic warfare capabilities, communications, and battle management systems in the *Bayandor* seem to have been upgraded during 2001-2013.²¹ Iran reportedly began modernizing these vessels with 76 mm deck guns, C-802 (C-803?) missiles, and torpedo tubes in 2007. The C-802 is a sea-skimming missile with a range of 120 kilometers, a 165-kilogram warhead, and a maximum speed of Mach 0.9. While they must still be far below the quality of American frigates or corvettes, their weapons systems (if not sensors and electronic warfare systems) may now approach Southern Gulf standards.²²

Source the IISS and Jane’s also differ over the number and status of Iran’s other ships and boats. The IISS estimate in the 2013 edition of its *Military Balance* was that Iran had six active corvettes. These include one 1,500-ton Iranian-built *Jamaran* or *Moudge*-class missile corvette (or light frigate) launched in 2010 with two more completing construction in 2013. (Other sources indicate one version called the *Moudge* entered service as early as 2005, and a second called the *Damavand* is already operating in the Caspian). These are armed with CSS-N-4 or C-802 anti-ship missiles, Fajr (reverse engineered SM-1 air defense missiles), regular and long-range homing torpedoes, and Sikorsky SH-3 Sea King ASW helicopters. According to other sources, a 2,000-ton corvette or frigate called the *Sahan* is nearly completion.

Iran has three modern operational *Alvand* (Vosper Mark 5) class frigates: the *Alvand*, the *Alborz*, and the *Sabalan*. They were launched during 1967-1968 and commissioned during 1968-1969. Two have been upgraded to carry four Chinese C-802 anti-ship missiles each on twin launchers. The C-802 is a sea-skimming missile with a range of 120 kilometers, a 165-kilogram warhead, and a maximum speed of Mach 0.9. Iran has also indigenously produced three frigates modeled on the *Alvand* – *Jamaran*, *Damavand* and *Sahand* – armed with C-802 missiles and surface-to-air missiles, as well as deck guns. The *Jamaran* has undertaken limited open-water activities, while the *Sahand* is still in dry dock awaiting completion. The *Damavand* has been assigned to the Caspian Sea. The sonar, radar, electronic warfare, and weapons-guidance systems of these ships are still unknown.²³

Missile Patrol Boats

The Iranian Navy still has three British supplied Vosper Mark 5 class corvettes it first received in 1971 and calls the *Alvand* class. These are 1,540-ton ships that have been refitted with C-802 anti-ship missiles. Iran also has two US-supplied 1,130-ton *Bayandor*-class frigates, one of was being refitted and reentered service in the June 2013.²⁴ These date back to 1964, but have been refitted with C-802 anti-ship missiles and a 76mm gun. Iran also has a small, US-supplied 580 ton corvette (missile patrol boat) refitted with C-802 missiles.

There also seems to be agreement that Iran has 14 active 275-ton *Kaman* class coastal missile patrol boats armed which date back to the late 1970s and early 1980s, but have been refitted with two to four C-802 missiles, and three of which have been heavily updated (Sometimes called the *Sina* class).

Other Patrol Boats and Smaller Vessels

The Iranian Navy also has four 70-ton *Zafar* patrol boats armed with either MLRS rocket launchers or C-701 anti-ship missiles, and four Chinese Cat-14 20-ton missile patrol boats armed with C-701 anti-ship missiles. In addition, the IISS estimates that Iran had 16 *Kashdom*, 3 *Kayvan*, 16 MkII, and 10 MkIII and 3 *Parvin* patrol boats ranging from 13 to 80-tons and armed with a mix of torpedoes, guns, and MLRS systems.

The IISS reports that Iran's Navy had three *Kajami* semi-submersible patrol boats, 14 aging hovercraft dating back to the Shah (some not operational), and some *Peykapp* fast attack boats.

Mine Warfare

The Iranian Navy has adapted two *Hejaz* class LSTs for minelaying. It has two *Riazi*-class mine countermeasures boats, one *Shahroch* class minesweeper as a training ship in the Caspian, and two aging US-supplied MS-292-class minesweepers. Iran can, however, use virtually any surface ship for minelaying, including the dhows that cross the Gulf as trading vessels. Iranian forces have even been reported disguising mines as tree branches, shipping boxes, or trash.²⁵

Iran can use its regular navy, naval guards, and any civilian ship to lay a variety of mines. It has invested in both its own mine development and Chinese mines, with an estimated stockpile of over 3,000 devices.²⁶ Its older mines are effective systems and at some \$6,000 a mine, are easy to disperse in large numbers with potentially devastating effective consequences for far most costly combat and commercial ships. According to various experts it has also acquired, reverse engineered, developed, and improved a range of "smart mines," including bottom mines. It is preparing to lay them on both sides of the Strait, creating safe passages close to Iran's shoreline through which its own and neutral (i.e. any Gulf state Iran chooses not to antagonize) tankers could sail.

The potential effectiveness of these mines was driven home by the September 2012 IMCMEX. In many ways, this exercise was a model of the kind of cooperation needed in the Gulf, and one that illustrated that a major exercise can be held at low cost if each participating nation pays its own way. The exercise was held during September 16-27 2012. It involved 33 countries, 2,730 personnel, 24 ships from six countries, 116 divers from eight countries, and 12 unmanned underwater vehicles from six countries. It used integrated C2, and tested Afloat Forward Staging Bases from three different countries deployed over an area of some 1,000 NM.

The course of the exercise is something of a case study in what needs to be done to improve the integration and effectiveness of US and GCC forces. It involved three days of analysis of the threat, planning, and technical analysis with officials, military, and contractors from the GCC, NATO countries and Asian countries. There was then a seven day at-sea phase – sometimes involving the first multilateral exercise for a given country. Seventeen trial MH-53 minesweeping (MSW) helicopter missions were flown, and 91 mine countermeasure (MCM) missions under both day and night conditions were simulated. An integrated situational

awareness was preserved through the CENTRIXS system, and for the first time, a single Mine Warfare Commander operated the exercise.

While the results of this exercise have not been published, reports²⁷ suggest that the allied minesweeping forces from some 30 countries performed well in terms of coordination and gained a great deal of experience, but encountered serious problems because of different national caveats over how their forces could be used and commanded, and initial problems in working together because of a lack of prior experience. The iron law of war that no force can really do in combat what it does not do in practice seems to have been validated yet again.

There also were significant problems in removing the simulated mines from the seabed. A PBS report quotes a consultant and former Navy officer in claiming that the participants found only half their targets. The US Navy disputes the use of “percent of mines found” as a suitable metric, with Navy spokesmen highlighting the efficient way navies from 30 nations cooperated in the exercise. They also point out that it was both an experiment and a learning process, and that in the real world the US would have mapped the bottom of many key areas to enable it to locate any sudden appearance of a new mine, and US doctrine calls for constant surveillance of suspect ships and destroying them the moment they begin mine laying activity.

This result emphasizes the difficulty of tracking and destroying mines even with a large task force under peacetime conditions. Performing this mission while under fire from anti-ship missiles and harassing attacks from Iranian speedboats only amplify the difficulty of mine clearing.²⁸ Mine warfare could give a significant edge to the strategic aggressor, and the US has not yet learned how to negate Iran’s lead. This weakness further underpins the logic of retaliation and escalation, as any American failure to counter Iranian mines in the event of war would force the US to respond with other strikes.

While cooperation will undoubtedly be critical in further counter-mine work, as will the willingness to act decisively the moment Iranian minelaying begins, practical success will be judged by the protection of tankers, other commercial vessels, and combat ships. The key measure of effectiveness will be the number of ships that are hit by mines. Moreover, even the threat of mining could have a major impact on shipping and the cost of imports and energy exports.

More Gulf, British, and French mine hunting and sweeping resources are needed. The US Navy has underfunded mine warfare efforts consistently in the past and has only begun revamping its mine detection capabilities. At present, the US Navy can only deploy eight minesweepers in the Gulf, and only four are currently assigned full time. Helicopter minesweeping using MH-53 helicopters and towed sonar sleds has not proved as effective as previously expected.

The US does, however, already have help from the British and French navies, and Saudi Arabia can deploy up to four British-made minesweepers. The US is also adding crews to allow its minesweepers in the Gulf to deploy longer with less crew strain, and plans to introduce the Littoral Combat Ship’s mine-warfare package in 2014.²⁹

The US is also shifting from hunting to mapping the bottom of the Gulf to detect any change in the array of objects on the bottom. It is deploying new unmanned or robotic mine hunting and killing systems. The US expects to deploy new Mark 18 anti-mine, torpedo-shaped underwater vehicles in January 2013. It is introducing other unmanned submersibles,

including the Sea Fox mine neutralization system, which is a relatively cheap, expendable system that can detonate a mine directly.³⁰

Amphibious Vessels

The Iranian Navy has three *Farsi*-class landing ship-medium (LSMs) with capacity of nine tanks and 140 troops. It has four *Hengam*-class landing ship tank (LSTs) with a capacity nine tanks; 225 troops; and six *Fouque*-class landing ship logistics (LSLs). It has 10 landing craft, and some 47 support and logistics ships. These could move and support an operation of at least brigade size, but Iran does not train for such operations.

Hovercraft

Iran has five to six BH-7 and seven to eight SRN-6 hovercraft. The IISS places these in the Iranian Navy but other sources place them in the naval branch of the IRGC. About half of these hovercrafts may be operational. They are capable of speeds of up to 60–70 knots. They are lightly armed and vulnerable, but their high speed makes them useful for many reconnaissance and unconventional warfare missions. They can rapidly land troops on suitable beaches, but the beaching angle is critical and some beaches are not appropriate.

Naval Aviation

The Iran Navy's 2,600 man naval aviation branch is one of the few air elements in any Gulf navy, with two to three Orion 3PF maritime patrol aircraft (one possibly non-operational plus a possible fourth of uncertain status) Jane's only mentions two Orions, some 16 light transport aircraft, and an inventory of 13 armed helicopters (10 SH-3D and six RH-53D), although their operational status is uncertain. Its war plans include using the SH-3Ds for anti-submarine warfare missions— although experts feel Iran mostly exercises and uses helicopters in resupply and logistic missions to areas like its offshore and island IS&R facilities. In 2010, the IRGC introduced a flying boat, the Bavar-2, into its naval aviation branch. This small aircraft, which Iran claimed is radar evading, will only be suitable for patrol and surveillance missions. Iran has also integrated anti-ship missiles onto its helicopters, the Nasr and Qader being integrated in September of 2013. However it is not known how many helicopters have received this modification or if these missiles have been test-launched from helicopters.

Anti-Ship Missile Forces

Iran's anti-ship missile (AShM) arsenal represents a key part of its asymmetric anti-access/area denial (A2/AD) strategy. An A2/AD strategy is particularly effective in the Persian Gulf, Straits of Hormuz, and Gulf of Oman because of the relatively confined spaces of these bodies of water. The wide variety of platforms from which Iran can launch AShM's presents a "360 degree threat."³¹ In addition to coastal, ship, and fixed wing platforms, Iran recently integrated AShM's onto helicopters and aims to develop submarine launched missiles.

Surface vessels that can fire AShM's are a crucial part of Iran's asymmetric strategy. Part of this strategy calls for swarms of small vessels to attack larger enemy vessels. Although it is difficult to ascertain the current operational readiness of Iran's surface fleet, a 2009 report by the US Office of Naval Intelligence stated that approximately half of the IRIN's missile-armed surface combatants were in "very poor material condition, limiting their readiness and operational endurance."³² To make up for this, coast-launched AShM's can be used in conjunction with small-boat swarm attacks in order to saturate enemy vessel defenses.

AShM's based on coastal platforms are small, mobile, and can be disguised as civilian vehicles, making destruction of these platforms difficult.³³

Iran's AShM's can be put into three broad categories, short range, mid range, and long range. Short range AShM's, like the C-801, Kowsar, and Nasr, are generally rocket powered and are commonly found on small fast attack craft. The Chinese C-701 and C-704 missiles were used to develop the Kowsar and Nasr, respectively. In September 2013, Iran claimed to have produced a helicopter launched version of the Nasr missile and planned to produce a version that could be launched from fighter aircraft. A picture showing a Bell 206 with a modified Nasr missile attached to it was released alongside this statement.³⁴

The C-801 was also imported from China in 1987-88 and is in Iranian service as the Tondar. Mid-range AShM's, which include the C-802, Noor, and Qader, feature small air-breathing engines, making these missiles anti-ship cruise missiles (ASCM's). Noor and Qader are both based on the C-802, which was imported from China. These missiles are found on Iran's frigates, corvettes, and fixed wing aircraft. The Qader was claimed to have been integrated onto helicopters at the same time the same claim was made with Nasr. While the Mi-17 was specified as the platform for the Noor, no specific helicopter was given as the platform for the Qader.³⁵ Considering that the Qader is slightly larger than the Noor but similar in the sense that it is also a C-802 derivative, the Mi-17 is likely the helicopter platform for the Qader. Long-range AShM's, including Ra'ad and Khalij Fars, are currently only found on land based platforms.

The Ra'ad is a modified HY-2, while the Khalij Fars is an anti-ship ballistic missile variant of the Fateh-110 ballistic missile. All of these missiles can be launched from land and coastal platforms. Moreover, "systems mounted on truck trailers "could be easily disguised as civilian vehicles and relocated to make them harder to find and destroy during a conflict."³⁶

Iran depends heavily on its coastal, island, and ship-borne anti-ship missile forces to make up for its lack of airpower and modern major surface vessels. Iran's Western-supplied missiles are now all beyond their shelf life, and their operational status is uncertain. Iranian forces are now equipped largely with land-based Chinese or Iranian made anti-ship missiles like the Ra'ad coastal defense missiles – some deployed near the Strait of Hormuz and some which Iran claims have terminal home capability or could be directed against naval targets by forward deployed aircraft or drones.

Iranian ships made heavy use of the C-700 or C-800 series anti-ship missiles Iran bought from the People's Republic of China (PRC), or now produces indigenously. They have replaced most Western-supplied missiles with Chinese designs.

The Iranian Navy's missile patrol boats include 13 operational 275-ton French-made Combattante II (*Kaman*-class) fast attack boats, with four currently under construction. These boats are reported to be armed with two to four C-802 Sardine anti-ship missiles, one 76-mm gun, and to have maximum speeds of 37.5 knots. According to Jane's Naval Guide, nine of these are from the original French shipment during the early 1980s, while Iran has constructed another four with comparable equipment.

The *Kaman*-class fast attack boats were originally armed with four US Harpoon missiles, but their Harpoons may no longer be operational. At least five had been successfully converted to launchers carrying two to four C-801/C-802s. Iran supplied the C-802s that Hezbollah

successfully used against one of Israel's most modern Sa'ar Class-5 missile ships during the fighting in 2006.

The terminology for the C-801 and C-802 series of missiles in Iranian naval forces is confusing and sources contradict each other as to the variant used on given Iranian platforms. Some sources refer to all of these missiles as part of the CSS-N-4/YJ-1 series.³⁷ Iran now is believed to have at least 100 C-801s and C-802s, and to be able to produce them and the C-700 series.

One source notes that Iran may have imported up to 100 C-801s and eight launchers in 1987-1988 and built its arsenal to 200 by 1994. It since has developed the ability to produce the C-801 indigenously (under the designation "Tondar").³⁸ Another sources notes that Iran may have deployed its C-701 missiles at launching bases under construction at Bandar Abbas, Bandar Lengeh, Bushehr, and Bandar Khomeini.³⁹ It is also clear that Iran has refitted US ships once equipped with Harpoon with the C-800 series.

Iran has sought to buy more advanced anti-ship missiles and anti-ship missile production facilities from Russia, North Korea, and China, and possibly has even attempted to obtain Chinese-made missile armed frigates. Some sources have claimed that Iran has bought eight Soviet-made SS-N-22 "Sunburn" or "Sunburst" anti-ship missile launch units from Ukraine and has deployed them near the Strait of Hormuz. However, US experts have not seen evidence of such a purchase and doubt that Iran has operational holdings of such systems. The "SS-N-22" is also a title that actually applies to two different modern long-range supersonic sea skimming systems – the P-270 Moskit (also called the 3M80) and the P80 or P-100 Zubr/Oniks.

Iran regularly announces that it has deployed new anti-ship missiles or is developing them. For example, it claims to have successfully developed over-the-horizon missile targeting capabilities, building variants of the Fateh-110 and Shahab with homing guidance systems for use in anti-ship warfare. This claim appears to be borne out to some extent by the development of by *Khalij Fars* – an upgraded Fateh-110 with a rudimentary seeking and steering mechanism for targeting ships. While its real-world capabilities are unknown, it would represent a valuable layer of Iran's anti-ship "stack." However, Iran makes so many claims for so many systems, it is impossible to distinguish propaganda from reality.

Naval Guards, Marines, Special Forces, and Marines

The naval branch of the IRGC -- or IRGCN-- continues to grow, and its impact is summarized in **Figure 9**. The IISS estimates that it had more than 20,000 men, including some 5,000 marines in 2013. These estimates do not include elements of the Army's special forces, which have one Special Forces Brigade, a Commando Division with three brigades, and six independent commando brigades as well as an air borne brigade.

Elements of these Army force shown they could play an active combat role in the Gulf during the Iran-Iraq War, and sometimes play a role in exercises involved naval forces or simulated targets in the Gulf. They also do not include the Iranian Al Quds Forces – a separate force within the IRGC that -- along with the MOIS – could infiltrate maritime and port targets and/or indoctrinate and train native saboteurs. It should be stressed that maritime conflict does not have to involve maritime targets. It can involve raids on islands, offshore facilities, and ship seizures using small craft.

As for the IRGCN, it is organized to present asymmetric threats that include capabilities that can support a battle of attrition, and focused, limited clashes throughout the Gulf that would not cripple Iran's own sea lines of communication (SLOCs) or necessarily provoke major US reprisals

Structure and Organization

The IRGC's naval branch has bases in the Gulf, many near key shipping channels and some near the Strait of Hormuz. These include a wide variety of facilities at Al-Farsiya, Halul (an oil platform), Sirri, Abu Musa, Bandar-e Abbas, Khorramshahr, and Larak. It also controls Iran's coastal defense forces, including naval guns. It used to deploy HY-2 Seersucker land-based anti-ship missile unit deployed in five to seven sites along the Gulf coast, but these may seem to either be in the process of being replaced by C-700 or C-800 series missiles and different coastal-surveillance radars.

The IRGCN is operational in the Gulf and the Gulf of Oman (with most of its forces in the former⁴⁰), and could operate elsewhere if given suitable sealift or facilities. It has five different commands within the Gulf, including a new fifth naval command designed to cover Abu Musa and the Tunbs -- the three islands it took from the UAE and which have become the center of several recent air and sea confrontations between Iranian and UAE forces.⁴¹

Mohammad Ali Jafari, the Commander of the IRGC inaugurated the fifth naval command zone of the IRGC in early November 2012. He stated that the IRGC was, "increasing, expanding, and improving the expert capabilities in the naval defense" in all five zones and that, "The fifth zone of the Guards; naval force is one of the naval defense chains which is in particular responsible for the defense of the Iranian islands in the Gulf."⁴²

As of 2011, Iran's navy has sent warships into the Mediterranean and claimed intentions of sending ships into the Atlantic, but such a capability is doubtful.⁴³⁴⁴

Ships and Small Craft

The IRGC naval forces have at least 40 light patrol boats, 10 Houdong guided missile patrol boats armed with C-802 anti-ship missiles, a battery of HY-2 Seersucker land-based anti-ship missiles, up to 20 mini submarines, and swimmer delivery vehicles (SDVs). Some of these systems could be modified to carry a small CBRN weapon, but are hardly optimal delivery platforms because of their limited-range payload and sensor/guidance platforms that are unsuited for delivering such sensitive devices.

Various sources indicate that in 2014, the IRGCN had 10 171-ton Chinese-built *Houdong*-class missile patrol craft with four C-802s each, which were delivered in the mid-1990s -- and three support ships. It had large numbers of additional coastal and inshore patrol craft. Some estimates credited the IRGCN with 5 *China Cats*, 10 *Thondor* with two twin C-802 launchers, 25 *Peykaap II* with two single C-701 launchers, 15 *Peykaap I* fast attack boats potentially armed with twin torpedo tubes, 10 *Tir* class fast patrol boats with twin torpedo tubes and a machine gun, 10 *Pashe* fast patrol boats with twin 23mm ZSU-23 cannon and search radar, and roughly 20 *Ghaem* patrol boats with small arms and an extended duration deployment capability.

Jane's estimates that the IRGCN had 37 coastal patrol boats -- 17 *Peykaap I*, 10 *Pashe*, and 10 *Ghaem* -- along with 150 inshore patrol craft -- 30 *Murce* (one MLR system and machine gun),

100 *Ashura I* (small vessel with one machine gun, center space for a mine or rocket launcher, and small arms), and 20 *Boghammar* (one machine gun and MLR system normally, but wide range of customized units are now believed to be in use).⁴⁵

The *Kayvian*, *Parvin*, MkII, MkIII, and *Ghaem* patrol boats are thought to be inshore boats, lacking both missiles and the ability to operate independently. Most of these craft are operational and can be effective in patrol missions. They lack sophisticated weapon systems or air defenses, other than machine guns and SA-7s and SA-14s. The IRGCN also seems to have four landing ships. The IISS estimates it has 2 *Hejaz* with mine-laying capacity and 2 MIG-S-5000s.

Probable Effectiveness

Unlike IRGC ground forces, which have seen limited deployment in Iraq and Afghanistan, IRGCN has not had significant combat experience with asymmetric warfare since the late 1980s, except for efforts limited to the occasional harassment of British and American naval vessels in the Gulf. The IRGCN does, however, carry out large-scale exercises and demonstrates capabilities that it might be able to deliver conventional weapons, bombs, mines, and CBRN weapons into ports and other logistics centers as well as critical infrastructure including oil and desalination facilities.

The IRGCN has also stressed its mine warfare capability. The Iranian government sponsored Iran Daily Brief noted on November 23, 2012 that,⁴⁶

Rear Admiral Ali Fadavi, Commander of the Iranian Revolutionary Guard Corps Navy (IRGCN), underlined Iran's powerful presence in the waters of the Persian Gulf as the main deterrent to potential enemy aggression. He said that the US forces are afraid of the IRGC mines floating in parts of the region.

After showing Iran's power during the Iran-Iraq War, "Our mines have made such an impact on the Americans that they are still living in fear of them." Fadavi added, "Today, with the powerful and mighty Iranian presence, the US is no more posing for aggression (in the region) and is now feeling rather paralyzed and helpless." Fadavi called dominance over the Persian Gulf and destabilizing it a US tool for controlling the world. He noted that Washington aims to continue its presence in the region and by doing so threatens the energy security of the oil-dependent countries.

Fars News Agency added a short summary to its report, underlying that "Asymmetric warfare is especially appropriate for the Persian Gulf and the Strait of Hormuz, which are too narrow for the huge US warships to maneuver. That means mines, anti-ship missiles and swarm attacks by small heavily armed boats. Fars News Agency also hailed Iran's mine capability, "Iran is believed to have as many as 3,000 sea mines. Some estimates go as high as 5,000... It's the fourth largest sea mine arsenal in the world after the United States, Russia and China (more details regarding the types of mines).

There is no way to reliably assess current training levels and readiness of every element of the Naval Branch of the Guards. Outside observers do not feel their exercises are particularly sophisticated, however, that they reflect a high degree of training and coordination, effective use of communications or communications discipline, or much real-world exercise cooperation with the Navy and Air Force. They feel overall proficiency is low in the level of wartime C⁴IS&R capability, how consistent given units are in their effectiveness, ability to operate in combined arms and joint warfare, quality of training and planning for different types of hybrid and asymmetric warfare, and ability to carry out complex operations in the face of active US and Arab Gulf military opposition.

The IRGC's naval branch is more active than many other elements of Iran's forces, but there is little meaningful data on its real world capabilities. Like all the elements of the IRGC and other Iranian military forces, it does seem heavily dependent on conscripts (albeit less so than the IRGC's land forces), and to have encountered problems in terms of its military politics and leadership.

Its forces can carry out extensive raids against Gulf shipping, amphibious assaults with the land branch of the IRGC against objectives like the islands in the Gulf, and raids against Saudi Arabia or other countries on the southern Gulf coast. They give Iran a major capability for asymmetric warfare. The Guards appear to be represented unofficially in some embassies, Iranian businesses and purchasing offices, and other foreign fronts as part of the broader Iranian intelligence network, as well as for their own military intelligence and purchasing needs.

This is why naval warfare experts stress that decisive efforts should be made to destroy Naval Guards forces the moment they clear more towards combat, arm for mine warfare, and begin to close within range of their anti-ship missiles and torpedoes. The consensus seems to be that the sooner such forces are destroyed, the shorter and more effective the campaign against them should be, and that once combat starts or seems inevitable, the US and its allies should act.

Figure 9: The Impact of the IRGC Naval Guards: Force Strength, Roles, and Missions

- The IRGC 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; Yono (Qadir)-class midget submarines; and a number of swimmer delivery vehicles.
- The IRGC naval forces have at least 40 light patrol boats and 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.
- IRGC was 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.
- Additional numbers fast mine-laying platforms; during Tanker War, modified commercial vessels for this purpose as well, complicating intelligence efforts.
- Enhanced subsurface warfare capability with various types of submarines and sensors.
- Small, mobile, hard-to-detect platforms, such as semi-submersibles and unmanned aerial vehicles.

- Specialized training.
- Customized or purpose-built high-tech equipment.
- Better communications and coordination between fighting units than IRIN fleet.
- Timely and potentially well-integrated intelligence and effective counterintelligence/deception.
- Enhanced ability to disrupt enemies' command, control, communications, and intelligence capability.
- Doctrinal focus on 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 throughout Iran's south coast near key shipping channels and Strait of Hormuz and organized Basij militia among the local inhabitants to undertake support operations.
- Facilities include Al-Farsiya, Halul (an oil platform), Sirri, Abu Musa, Bandar-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 Gulf oil.

The Naval Side of the Shift to Asymmetric Warfare

This complex mix of shifts in the forces of Iran's Navy and Naval Guards explains why Iranian naval doctrine and exercises now emphasize asymmetric tactics. Iran emphasizes a mix of smaller systems that can target either expensive, vulnerable merchant traffic – essentially an improved version of the 1984-1988 Tanker War – or conventional US naval vessels attempting to operate in the Strait of Hormuz or the Gulf.

Iran also recognizes the vulnerabilities created by operating with two different navies – the IRIN and IRGCN occasionally traded fire during the Iran-Iraq War. According to sources like *Jane's Defense Weekly*, the regular and IRGC fleets have divided geographic responsibility, with the latter taking control of the Gulf and Strait of Hormuz, and the former responsible for everything else. This permits the IRIN to deploy its conventional forces in the open water – which they are designed for – while giving the IRGCN control in the Gulf.

The IRGCN now operates four naval defense zones in the Gulf, and its commander – Mohammad Ali Jafari – announced a fifth zone at the port of Bandar Lengeh in November 2012. Jafari stated that, "The fifth zone of the Guard's naval force is one of the naval defense chains which is in particular responsible for the defense of the Iranian islands in the Gulf." This reflects both the vulnerability of the surface Navy and a growing IRGCN emphasis on "clustering" small groups of forces that can be easily dispersed throughout the Gulf and used with limited command and control and coordination.

Iran learned in 1987-1988, and in years of exercises that followed, that it cannot concentrate large numbers of small forces for "swarming" and exercise effective command and control. It must be able to disperse them as much as possible, and may have to keep larger conventional naval surface forces in port or outside any combat action to avoid having them destroyed. Recent accounts suggest Iran has encountered difficulties coordinating more than ten boats at

a time. These packs would be capable of targeting tankers or isolated military vessels, or harassing multiple warships in hit-and-run strikes. By focusing on smaller fleets, Iran is able both to preserve its forces for a war of attrition and retain the command and control necessary to target individual ships, potentially avoiding the random strikes that led the Tanker War to escalate.

Since the end of the Iran-Iraq War, Iran has attempted to compensate for the weaknesses of its surface fleet by obtaining new anti-ship missiles and missile patrol craft from China, and developing its own long-range anti-ship missiles and a ballistic missile with anti-ship capabilities. It acquired and then cloned midget submarines from North Korea, and bought three *Kilo*-class submarines from Russia. It bought and reverse-engineered more modern “smart” mines, and also purchased wake-homing torpedoes.

Iran has simultaneously expanded the capabilities of the naval branch of the IRGC, developed its fast attack craft, and upgraded some of its older surface ships. Iran’s exercises have also included a growing number of joint and combined arms exercises with the land forces and the air force – although such jointness is limited and Iran still has problems in coordinating the elements of its individual services.

Iran has improved its ports and strengthened its air defenses, while obtaining some logistic and technical support from nations like India and Pakistan. It has attempted to participate in joint exercises, joining the Indian Navy and Pakistani Navy for small-scale training. The IRIN has also deployed off the coast of Africa for anti-piracy operations, giving the navy experience with extended blue water deployments.⁴⁷ Furthermore, it has engaged in supporting Russian deployments to Bandar Abbas and port visits as far afield as Sri Lanka.⁴⁸

Iranian Officers and Officials on Iran’s Naval Posture in the Gulf

Iranian officials and senior officers have made broad claims about Iran’s capabilities for naval warfare, and that Iran is buying new systems that are altering the naval balance in the Gulf. These claims often differ sharply from the previous analysis, and while many are propaganda, they still need to be considered:

- "The Iranian Navy protects the country's vessels in the international waters and is present in the Indian Ocean, Bab al-Mandab Strait, the Red Sea, the Gulf of Aden and even in the waters South of India and the Strait of Malacca to provide secure passage for Iranian cargo ships and oil tankers."—Rear Admiral Habibollah Sayyari, Commander of the Iranian Navy, July 20, 2014
<http://english.farsnews.com/newstext.aspx?nn=13930429001011>
- “The Islamic Republic's Navy pursues a general goal which is presence in the world free waters to protect the resources and meet the interests of the Islamic Republic...We hope that we can extend our presence in free waters this year and take longer strides to protect the country’s interests.”—Rear Admiral Habibollah Sayyari, Commander of the Iranian Navy, July 13, 2014
<http://english.farsnews.com/newstext.aspx?nn=13930422000446>
- “The control of the Persian Gulf and the Sea of Oman as the world’s main thorough fare and bottleneck is in the hands of the Islamic Republic of Iran’s brave border guards.”—Rear Admiral Habibollah Sayyari, Commander of the Iranian Navy, May 1, 2014
<http://www.presstv.ir/detail/2014/05/01/360824/persian-gulf-under-irans-control/>
- “Today, under the guise of safeguarding regional and energy security, the Americans have a [military] presence in the Persian Gulf; but, history has shown that not only don’t they have the power to do so but

they are themselves an element of insecurity.”—Rear Admiral Ali Fadavi, Commander of the IRGC Navy, April 29, 2014

<http://www.presstv.ir/detail/2014/04/29/360555/us-source-of-insecurity-in-persian-gulf/>

- “The IRGC Navy, the Second Naval Zone in particular, fully monitors all moves in the region, and will not be indifferent about any aggressive movement.”—Rear Admiral Ali Razmjou, Commander of the IRGC Second Naval Zone, April 24, 2014

<http://www.presstv.ir/detail/2014/04/24/359890/irgc-closely-monitoring-enemy-moves/>

- “Yet, we warn that if an attack is launched on our troops from any territory, we will invade all the possessions of the enemy. We do not feel any hostility for any of the regional states, but if we are targeted from the US bases in the region, we will hit those bases.”—General Hassan Firouzabadi, Chief of Staff of the Iranian Armed Forces, February 12, 2014

<http://english.farsnews.com/newstext.aspx?nn=13921123000477>

- “As a strategic force, the Islamic Republic of Iran’s Navy maintains its presence beyond sea borders.”—Rear Admiral Habibollah Sayyari, Commander of the Iranian Navy, October 12, 2013

<http://www.presstv.ir/detail/2013/10/12/329002/iran-navy-to-repel-any-aggression/>

- Deputy Chairman of Iran’s Armed Forces, Gholam Ali Rashid, said at a conference of Iranian naval commanders, “The increase in the level of strategic confrontation between Iran and the United States over the past decade, coupled with recent developments in the regions that are attributed to the Islamic Awakening, have presented Iran with numerous threats and opportunities. The type and nature of the threats against Iran change based on the organized and long-term presence of the US in the region. In a war, Iran will be the country to determine the enemy’s fate in the battle arena, and Iran’s armed forces, particularly the navy, will suppress any attack by the enemy. Should Iran’s enemies make this type of mistake, their fate will be that of Saddam Hussein and his regime.” October 29, 2012.

- “Our missiles can be launched from boats with speeds of over 30 knots, and these missiles include Zafar, Nasr, Nour and Qader.” He added that Qadir missiles will also be added to the list in near future. He underlined Iran’s growing missile capability as well as the special capabilities of Iran’s cruise and coast-to-sea missiles, and underlined high flexibility in the tactical use and missions of these missiles. “The tactical use (and goals) of these missiles can vary in accordance with the type of threat.”—Deputy Defense Minister General Mehdi Farah, October 15, 2012

<http://english.farsnews.com/newstext.php?nn=9107112870>

- “Since the IRGC has been deployed in the Strait of Hormuz and assumed the full responsibility for (security) in the Persian Gulf waters, the (US) warships and vessels which were passing through the strait have changed their route towards the Southern coasts of the Persian Gulf after they pass through the strait in a way that every military vessel that intends to enter the Persian Gulf keeps close to the Southern coasts of the Persian Gulf and enters the region.”—Alireza Tangsiri, Lieutenant Commander of the IRGC Navy, July 23, 2012

<http://english.farsnews.com/newstext.php?nn=9104251118>

- “If the sanctions continue, the countries that have imposed sanctions have no right to cross the Strait of Hormuz without harm.”—Javad Karimi Qodoosi, Majlis Member, July 21, 2012

<http://english.farsnews.com/newstext.php?nn=9104250818>

- “Today over 3,000 boats are in the Persian Gulf and involved in commerce, constantly passing by America’s naval ships... The question is how can America engage us in war not knowing how it will get hit next? If they dare to take up arms, they will see how they will regret their act.”—Morteza Mirban, Deputy Commander of the IRGC’s Ground Forces, July 02, 2012

<http://www.rt.com/news/iran-us-military-strike-254/>

- “If for any reason the Americans decide to attack Iran and we go to war, the fate of the war will be decided at this [naval] arena, as American capacities are based on naval force, and due to the far distance of their lands from our country, all American ground and air forces are located on their ships.” “All throughout the world, Iran is the only country which has speed vessels with the ability of firing (rockets and missiles) at high speed...We now have speedboats which can launch missiles as they traverse at a speed over 60 knots...Speedboats equipped with torpedoes and electronic systems that exist nowhere in the world except in Iran... Many countries have not entered this field, and some countries like the US abandoned their attempt after a short time.”—IRGC Navy Commander, Ali Fadavi, May 13, 2012
<http://english.farsnews.com/newstext.php?nn=9102111883>
- “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>
- “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, 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.”—Rear Admiral Ali Fadavi, Commander IRGC, January 6, 2012

<http://english.farsnews.com/newstext.php?nn=9007270592>
- “Iran has total control over the strategic waterway. Closing the Strait of Hormuz is very easy for Iranian naval forces.”—Rear Admiral Habibollah Sayyari, Iranian Navy, 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
- “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, 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 lawmaker, December 18, 2011

<http://english.farsnews.com/newstext.php?nn=9007277872>
- “The new equipment (submarines) are smaller and faster under water and operate similar to our small speedboats, which terrify our enemies on the surface.

We are trying to increase our operational range and reach enemy vessels there [in the Indian Ocean].”—Major General Mohammed Ali Jafari, Commander of the IRGC, April 11, 2011
- “Underwater is a good area (of activity) that is used by our forces but in an asymmetric and small-scale form, meaning that we are not seeking to build large and giant submarines since they are vulnerable.

These new high-speed small-sized equipments [sic] (vessels) will have an underwater function similar to the performance of small speedboats in seas, an ability that has worried the enemy.

Accordingly, we must use the same asymmetric approaches in building tools and equipments and even in defining our tactics.

In addition to rapid transfer of forces and detection of the enemy’s surface and subsurface vessels, these submarines can identify military targets and carry special forces, while they also enjoy rapid swamp power and have radar (sonar) evading capability.

The system enjoys high-precision in targeting.”—Major General Mohammed Ali Jafari, Commander IRGC, April 24, 2011.
- “And now the Navy plans to widen its presence in the high seas in a bid to protect the country’s interests and provide security for the country’s shipping lines.

In case of a final approval, the Army’s naval fleet will be dispatched to the Atlantic Ocean.”—Rear Admiral Habibollah Sayyari, Commander of Iran’s Navy, September 21, 2011
- “Missile frigates and destroyers have been equipped with these missiles since long time ago and the surface-to-surface missiles of the logistic vessels were successfully tested and assessed during the recent naval war games, dubbed as Joushan.

Right now we are mounting air-defense missile systems onto a number of surface vessels. Other units will also be equipped with these systems after final tests.”—Rear Admiral Seyed Mahmoud Mousavi, Deputy Commander for Operations of Iran’s Navy, July 20, 2011

- “The Navy is in a good status in terms of training and equipments [sic], and the Navy is equipped with new weapons and systems every year.

The range of the Navy’s missiles and its coastal defense power are increasing on a daily basis.”—Rear Admiral Habibollah Sayyari, Commander of Iran’s Navy, April 26, 2011

- “By dispatching the Iranian navy ships to the Mediterranean Sea and through the Suez Canal, the Iranian Navy has increased the radius of its operations to 7,000 kilometers.”—Commander Fariborz Ghaderpanah, Commander of Iran’s First Naval Zone, March 23, 2011

- “The Islamic Republic of Iran’s Jammaraan destroyer, Sina missile frigate and different submarines are examples of the products that have already been manufactured (domestically) shown powerful in accomplishing missions in the sea.”—Rear Admiral Habibollah Sayyari, Commander of Iran’s Navy, December 7, 2010⁴⁹

III. The Iranian Air Force: A Weak and Aging Force

Naval forces are only part of the Iranian maritime threat. The most likely forms of asymmetric and conventional maritime conflict in the Gulf, nearby waters in the Indian Ocean and Red Sea – and the key measures of containment and deterrence – are determined largely by the overall mix of naval, air, and missile power on each side. Ground forces could be used in small raids against offshore and coastal facilities, and Iran could theoretically move some three land force brigades using its amphibious lift and ferries if it were unopposed. Iran also possesses a land force that can threaten Iraq and potentially Kuwait. In practice, however, it is Iranian threats to use air, missile, and sea power which have been the focus on most US and Southern Gulf attention, and it is US and Southern Gulf air and sea power that form the most direct asymmetric and conventional deterrent and threat to Iran.

As **Figures 10 to Figure 16** show, the air balance in the decisively favors the US and Southern Gulf states. The US can rapidly deploy a massive superiority in every aspect of air and cruise missile power including stealth aircraft, carrier and land-based forces, IS&R and C4I/battle management systems. While Southern Gulf air forces have limits, the Iranian air force (IRIAF) still lags far behind the capabilities of the GCC air forces and even further behind the combined capabilities of the GCC and US air forces. Iran lags badly behind the Gulf states in modernizing its air forces. Iran's most advanced fighters consist of a small number of export versions of the Su-24 and MiG-29, whose avionics lag far behind their Russian counterparts and date back to the early 1990s .

Iran's aircraft also suffer from limited access to required spare parts and upgrades, reducing Iran's effective airpower to roughly sixty percent of its existing planes; furthermore, while information on training is classified, Iran has made public far fewer air force exercises than missile and naval drills.

These limits to Iran's air force are particularly important as Iran has air bases that are only a few minutes flight time from critical targets in the Gulf and the coastal areas of the southern Gulf states. They are also important because Iran's weaknesses in air-to-air combat, and its weaknesses in surface-to-air missile defense which are described below, leave it highly vulnerable to any US or US and Gulf attack and vulnerable to a major preventive strike by Israel.

As for its structure and strength, the IRIAF is divided into three commands – Eastern, Southern, and Western, with the latter having the majority of active squadrons – with most of the advanced aircraft home-based in the interior of the country. Air command is split between the Iranian air force and the IRGC air force, with the former primarily controlling aircraft and the latter the caretakers of the strategic missile forces.

The Uncertainties Affecting Iran's Aircraft and Modernization

Taken at face value, much of Iran's air force is something of a military museum. It is a tribute to Iran that it can keep so many of its US-supplied and older Russian and Chinese aircraft flying, but none of the Western-supplied aircraft in Iran's inventory have been modernized by the US since the fall of the Shah. Experts suggest, however, Iran has been relatively

successful in maintenance, material and management -- enabling the IRIAF to continue flying despite an almost complete blockade on new parts.

Maintenance has been aided by the fact that Iran developed extensive illegal purchasing networks during the Iran-Iraq War and has maintained them ever since. It has kept many of its aircraft flying, although it is unclear that it can fly more than 60% of its 297-312 remaining combat aircraft at any given time.⁵⁰ There is no way on the basis of unclassified data to estimate its sortie generation rate over time, and it is unclear that Iran has ever stressed its air force to find out the answer. It does seem likely that its sortie generation rate over time would be a fraction of the rate that the US and better Southern Gulf air forces could generate.

A combination of cannibalization and re-engineered similar parts also enables Iran to maintain its systems. These efforts have been particularly successful with the F-4 and C-130, while the F-14 – which proved to be a maintenance problem for the US as well – remains far below operational capacity. Iran has been trying to get the SU-22, -24, and -25's that it obtained from Iraq in 1991 to full effectiveness. Experts claim this effort has been supported by parts and advice from Russian and Ukrainian companies, but such this aid is believed to have been sporadic and of limited utility.

Experts feel that Iran has proven unable to reverse-engineer the more advanced elements of American and Soviet aircraft, although Iran's reverse engineering skills have improved. Iran has made efforts to update many of its aircraft, but the needed to reverse engineer and improvise is a critical shortcoming since their US-flown counterparts – especially the 44 F-14s and 65 F-4D aircraft still in Iranian service – aircraft that never went through the long series of US Multi-Stage Improvement Programs (MSIPs) to that corrected design problems, improved flight performance and sortie generation capability, and modernized their avionics and radars for air-to-air and air-to-ground/sea operations after 1979.

Iran has both obsolescent and modern air-to-air, air-to-ground, and air-to-ship weapons. Iran claims to have adapted its Hawk missiles to replace the Phoenix missiles on its F-14s and has aging AIM-9 Sidewinders and AIM-7 Sparrows. It also has more modern Russian made air-to-air missiles: The AA-8, AA-9, AA-10, and AA-11.⁵¹

Jane's-HIS reports that the air-to-surface precision weapons in active inventory that might be used against ships or targets affecting maritime exports include the Iranian made Satter 1 and Satter 2 air-to-ground missiles, aging or failed AGM-65 Mavericks, and Russian-made AS-10 "Karen" (Zvezda), AS-11 "Kilter" (Raduga), AS-12 "Kegler" (Zvezda), AS-14 "Kedge" (Vympel), and AS-16 "Kickback" (Radua). Iran also has a limited inventory of air-launch, anti-ship missiles: YJ-6 (CAS 1) CPMIEC, C-801C "Sardine" CPMIEC, Fajr-e-Darya (Iranian copy of CPMIEC C-802K), and possible some active RIM-66 Standard made by Raytheon.

It is unclear, however, that Iran has the avionics and mix of capabilities to begin to compete with the modern combat aircraft in Southern Gulf forces and US fighters. Iran also has only limited airborne air control and warning assets that would probably not survive long in combat. As noted above, Iran does claim to have modernized the avionics on some of its aircraft, and to have adapted its F-14s to carry the Hawk surface-to-air missile as a long-range air-to-air missile to compensate for the sabotage of the F-14s' capability to fire the Phoenix and conduct beyond-visual-range air-to-air combat during the fall of the Shah. Iran also

claims to have modified its F-4Ds to fire the C-700 or C-800 series anti-ship missiles as well as the systems listed earlier.

It is unclear, however, whether its aging US systems are really functional and how well they perform – if at all. It is also unclear how well Iran can target, manage precision strike operations, and maintain real or near-real time maritime surveillance/IS&R/C4 and battle management capabilities for managing complex anti-ship air strikes. Comparable questions surround Iran's efforts to mount C-700 or C-800 missiles on its helicopters; although such efforts are believed to be more successful than their fixed-wing counterparts, it is unclear whether Iran in the short run will have a rotary-wing missile capability. There are reports that Iran has acquired FL-10 missiles – a cheaper version of the C-701 – and has been developing that as an air-launched cruise missile.

Similarly, it is doubtful Russia systematically modernized Iran's early export versions of the 30 Su-24 and 35 MiG-29 – which lack the radar and avionics performance of their counterparts in Russian service. More broadly, Iran's air forces rely heavily on conventional bombs in an era dominated by precision-guided attack weapons with considerable stand-off capability. It is unclear whether this is a matter of weapons supply, avionics, doctrine, or training, but it does reflect a serious limit to Iran's offensive capabilities.

Iran has developed significant software skills and does produce some competent electronic warfare equipment. It is highly uncertain, however, that Iran can produce anything like the integrated capabilities necessary to systematically modernize its aircraft and make them competitive in either munitions delivery or electronic warfare. Iranian weapons modifications have likely produced incremental improvements in its weapons systems – for aircraft as well as other naval and land weapons – but there is a limit to how much piecemeal change will enable Iran to offset weapons platforms' old age. It is also unclear that Iran has anything like the test facilities to determine how effective its modifications would be against US air forces and ships, or against a properly trained modern Southern Gulf air force. There is no way to make such estimates without access to classified electronic order of battle and exercise data.

More broadly, Iran only has limited airborne AC&W and IS&R capability in peacetime, although it has an extensive network of land-based radars and an increasing number of short-to-long range unmanned aerial vehicles to provide airborne targeting, surveillance, and attack capability against maritime targets. It lacks the level of AC&W and IS&R capability it needs to sustain and protect its systems in the event of a significant attack.

Iran claims to have created electronic warfare aircraft by upgrading Ukrainian Antonov AN-140s and to have modernized the avionics on its 3 PF-3 Orion maritime patrol aircraft in its Naval Aviation forces. If Iran has been successful, its aging AN-140s could function as mini-AWACs in a crisis, and provide airborne radar for one coast. If Iran also made use of the relatively advanced radar in its F-14s, it could provide limited but functional airborne radar coverage in peacetime. Iran also has improved its land-based radar coverage, and claims to have a mix of unmanned combat aerial vehicles (UCAVs and UAVs) it can use to make up for some of the limitation in its aircraft – likely visual surveillance and reconnaissance.

The success of its AN-140 upgrade program is in doubt, however, after the 2006 crash of an Iran-140 that killed the Ukrainian and Russian scientists on board, along with the Iranian managers who ran the program. Combined with Iran's ongoing difficulties in producing its

own engines, this event also raised questions about Iran's indigenous airplane manufacturing capability.

Iran's Naval Aviation Branch

As has been noted earlier, Iran still has significant naval aviation forces, although their readiness and operational capabilities are limited by the age of many of its systems. According to the IISS, these 3 combat capable ASW 3 P-3F Orion MPA aircraft in 2013. Its fixed wing transport assets included 5 Do-228; 4 F-27 Friendship; 4 Turbo and Commander 680. It had 3 Falcon 20 ELINT aircraft. Its helicopter assets included m 10 SH-3D Sea King ASW aircraft, three RH-53D Sea Stallion mine warfare aircraft, and a large mix of transport aircraft included 5 Bell 205A (AB-205A); 2 Bell 206 Jet Ranger (AB-206); and 10 Bell 212 (AB-212)

Iranian Claims to Air Modernization and Combat Capability

Iran's officers have made ambitious claims about Iranian capabilities. Moreover, Iran has sought more modern fighters from Russia, but past reports of sales have never materialized. As a result, Iran has sought to develop its own fighters, the most notable of which are the Saeqeh ("Thunderbolt") and the Azarakhsh ("Lightning"), both of which are based on the Northrop F-5. Iran also has made many claims to have modernized its fighters and their systems and munitions, although many such claims are clearly exaggerated:

- "A radar system special to detecting stealth aircraft, which has been developed by young and specialist (Iranian) forces despite conditions caused by (US-engineered) sanctions, will be used to counter stealth aircraft."—Brigadier General Farzad Esmayeeli, commander of Khatam ol-Anbia Air Defense Base, May 18, 2014
<http://english.farsnews.com/newstext.aspx?nn=13930228000319>
- "It is obvious that future wars will be in the sky with massive air and missile raids; therefore, the Air Force has adopted a new approach and focused all its internal power on building fighter jets in a self-driven, but organized way,"—Brigadier General Hassan Shah Safi, Commander of the Iranian Air Force, February 10, 2014
<http://english.farsnews.com/newstext.aspx?nn=13921121001075>
- "Manufacturing this military aircraft will make us fully needless of purchasing jet fighters from abroad, specially for training purposes...We have taken very good measures in producing aircraft ammunition, long-range ammunition and smart missiles."—Brigadier General Aziz Nasirzadeh, Islamic Republic Air Force Chief Liaison Officer, February 3, 2014
<http://english.farsnews.com/newstext.aspx?nn=13921114000429>
- "An important feature of these drills was the deployment and test-firing of Qader and Nasr air-based cruise missiles that have recently been supplied to the Air Force."—Brigadier General Hossein Chitforoush, Spokesman of Mesbah Al-Hoda air drills, January 28, 2014
<http://english.farsnews.com/newstext.aspx?nn=13921108000902>
- "all flights by the jet fighters, jet bombers, heavy and semi-heavy cargo planes, tactical sea patrol and reconnaissance missions were conducted according to the schedule and timeline and all the missions for targeting and destroying moving objects in the air and also the ground targets on islands in the Southern parts of the Persian Gulf and the general combat zone have been accomplished successfully"—Brigadier General Hossein Chitforoush, Spokesman of Mesbah Al-Hoda air drills, January 28, 2014
<http://english.farsnews.com/newstext.aspx?nn=13921108000902>

- “Any violation against Iran’s airspace, territorial waters, and land will receive a strong response by the Islamic Republic of Iran.”—Mohammad Saleh Jokar, Security and Foreign Policy Committee, Majlis, November 8, 2012⁵²
- “Defenders of the Islamic republic of Iran will receive a strong response by the Iranian Republic of Iran,”—Massoud Jazayeri, Deputy Commander of Iran’s Armed Forces, November 8, 2012⁵³
- “Despite Western sanctions, Iran is not having problems procuring training jets. Kowsar 88 and Azarakhsh training jets are among the projects that are underway... and the blueprints have been prepared, and we are witnessing very good progress in this field... Like the Saeqeh (Thunderbolt), these jets will come into operation soon.”—General Manouchehr Yazdani, Commander of the Islamic Republic of Iran Air Force for Training, October 26, 2012
<http://english.farsnews.com/newstext.php?nn=9107113742>
- “Zionists must expect hundreds of other drones in 25 different models with new flying systems that they won’t know how to confront. He added that the infiltration of the UAV exposed only the smallest part of Hezbollah’s power.”—Brigadier General Mohammad Reza Naqdi, October 22, 2012
- “We can simultaneously fire numerous and countless missiles from different spots at one or several targets, which indicates our capability to perform convergent and parallel operations.”—Brigadier General Hossein Salami, Lieutenant Commander of the Islamic Revolution Guards Corps, September 27, 2012
<http://english.farsnews.com/newstext.php?nn=9106242598>
- “Sukhoi fighter jet has been optimized by the Army Air Force experts and now has the capability to hit and destroy targets with high precision in absolute darkness.”—General Seyed Mohammed Alavi, Lieutenant Commander of the Iranian Air Force for Operations, April 25, 2011
- “The production of hi-tech and advanced military tools, weapons and equipments [sic] displays Iran’s might and power and proves that sanctions against the country have been futile.
Iran has recently made good progress in the air industry and has succeeded in gaining the technical know-how for producing stealth aircraft and drones.”—Brigadier General Ahmad Vahidi, Iranian Minister of Defense, October 7, 2011
- “Now the Islamic Republic of Iran is not only independent in the area of defense industries production, but also exports strategic defensive items.”—General Mostafa Mohammad Najjar, Iranian Defense Minister Brigadier, February 6, 2006
- “One of the most important actions taken in these drills was increasing the range of the anti-radar missiles mounted on Sukhoi-24 fighters... they hit the specified targets successfully.
The missiles enjoy a 100-percent precision capability, meaning that they can hit any target with a zero margin of error.”—Brigadier General Hossein Chitforoush, Iranian Air Force Lieutenant Commander, September 15, 2011
- “The squadron is the first fighter squadron equipped with fighters [Saeqeh] and equipments made inside the country.
The squadron is capable of detecting and confronting aggressive aircraft and enemy fighters.”—General Seyed Mohammad Allavi, Lieutenant Commander of Army’s Air Force for Operations, February 25, 2011
- “By mass-production of home-made Saeqeh fighters, we move past all the gorges of designing and building of this fighter and we will strive to use more high-tech and updated models in our fleet in the future.”—Brigadier General Hassan Shahsafi, Iranian Air Force Commander, September 9, 2009⁵⁴

There are obvious problems in taking such claims seriously. For example, Mohammad Saleh Jokar, a member of the Security and Foreign Policy Committee of Majlis, joined Iran’s senior commanders in claiming in early November that the IIRAF had driven a US Predator UAV out

of Iranian air space and that, “Any violation against Iran’s airspace, territorial waters, and land will receive a strong response by the Islamic Republic of Iran.”⁵⁵

The facts illustrate the degree to which Iranian claims can be unreal. In practice, it was two Su-25s in the IRGC air units that attempted to shoot down the predator over international waters, and failed. The slow flying Predator did not “escape;” the Su-25s failed to hit it.⁵⁶ It is unclear whether the Su-25 pilots – flying an aircraft is designed as a tank killer and for land combat – knew it was still outside Iran’s air space or were provoking an incident. What is clear is Iran makes many claims about its air, naval, land, and missile forces that are exaggerated or nothing more than propaganda and does so to cover up known problems and weaknesses.

More generally, the IISS Military Balance for 2014 indicates that Iran has a total of 334 combat aircraft in inventory.⁵⁷ These include more than 75 F-5s and F-5IIs, 43 F-14s, 65 F-4D/Es, more than 6 RF-F-E, and 5 P-3MP Orions. This is a total of at least 194 aging US aircraft supplied more than 30 years ago when the Shah was still in power – some 58% of Iran’s air force. Iraq has 24 low quality F-7Ms and 10 Mirage F-1Es it got from Iraq in 1991. This raises the total of aging, obsolete aircraft to 228 or 68%.

So far Iran has only deployed six of its Azarakhsh (a design that seems to have been derived by reverse engineering the US fighters in Iranian service), and up to six Saegheh Iranian made-fighters (a design Iran claims is superior to the F-18 but seems to be an upgraded version of the F-5F.)

Iran’s combat aircraft imports since the fall of the Shah consist of 36 early export versions of the MiG-29 fighter, 30 early export versions of the SU-24MK, and 7 Su-25 anti-tank attack aircraft. None compare to first line US, British, or French combat aircraft. None compare to Saudi holdings like 81 F-15C/Ds, 71 F-15S, 80 Tornados, and 24 Typhoons – a total of 256 more capable aircraft than any in the Iranian inventory. None compare to a smaller Gulf air force like the UAE, which has 139 modern fighters: 54 F-16E Block 60, 25 F-16F Block 60, 16 *Mirage* 2000-9DAD; 44 *Mirage* 2000-9EAD, and 7 *Mirage* 2000 RAD.

Iran’s Strengths and Weaknesses in Fighting a Significant Air War

Given this background, it should be clear why it is easier to analyze Iran’s air order of battle than its warfighting capabilities. There are few meaningful data on IRIAF’s real world warfighting capabilities. Like all the elements of the IRGC and other Iranian military forces, the Iranian Air Force does seem heavily dependent on conscripts and short-service personnel, and to have encountered problems in terms of its military politics and leadership.

Iran did a consistently poor job of managing large-scale air operations in the Iran-Iraq War. It has since done much to improve its training and exercise, joint warfare capability, readiness, sustainability, IS&R, and overall command structure. Like the other elements of Iran’s forces, however, it would now have to go to war with forces that have not had any real military combat experience since the end of the Iran-Iraq War in 1988 – a period of nearly a quarter of a century.

While the IRIAF has focused on improving its training regime and making simulations more realistic, nevertheless it lacks the material, number of experienced trainers, and, above all, accurate training equipment and drills to prepare its pilots for high-speed and large-scale combat operations.⁵⁸

The regional tendency to emphasize aircraft numbers over sustainability is an issue. One reason that Arab air forces lost so decisively to Israel in past wars is that they could not generate anything like the surge sortie numbers – or sustained sortie numbers – that Israel could. Numbers of aircraft are never the critical measure of air strength. The issue is how many are operational at the start of a conflict, how well aircraft can be repaired or made ready in combat, and how many sorties can be generated over time (estimates suggest that Iran would have difficulty generating even one sortie every two days for its F-14s, while US aircraft are expected to undertake 2-3 sorties per day during intense air operations)⁵⁹.

Current Iranian exercises, command and control, technology, and vulnerabilities to outside attack or suppression do indicate Iran might still have critical problems in managing large air operations. Iran's lack of modern technology for integrating operations and creating the most advanced situational awareness possible could be critical. Iran's newer defense concept – relying on decentralized forces that are relatively unaffected by command and control strikes – is likely to be far less effective in aerial warfare, where small forces have a much harder time hiding and launching irregular attacks without warning. Iran's air force also conducts few joint exercises with its Army, IRGC, or Navy and those it does conduct are fixed set piece exercises with guaranteed success – a form of exercise training that can do more harm than good.

Basic pilot skills seem good, but this is not the same as having had advanced combat training – particularly using the kind of large-scale air operations training used by the US and some of its Gulf allies. Nevertheless, Iran's pilots do seem to be relatively well trained subject to the limitations of their aircraft and flying hours. In past Middle East wars that pitted Western against Soviet and/or indigenous aircraft, the Israeli and Western pilots possessed a marked edge in their individual and group training as well as in technology and C⁴ISR. While Iran does not appear to have conducted mass drills with its fighters and strike aircraft, its personnel are generally believed to be competent individual pilots, suggesting that despite inferior equipment they may inflict serious casualties on Arab air forces.

The Iranian air force does, however, still seem to face a wide range of operational limits and problems and many could affect its performance in an a sea-air-missile conflict affecting some aspect of maritime time traffic in the Gulf-Indian Ocean-red Sea area.

- Iran would need weeks of strategic warning to surge its air force to maximum defensive readiness and/or conduct a major combat operation.
- The level of real world capability Iran's air force has developed for attacks on shipping, opposing naval forces, precision attacks on ports and offshore facilities, and key export facilities and critical infrastructure is unclear.
- The operational effectiveness of Iran's ability to use precision guided air-to-ground and air-to ship missiles is limited by the age and avionics capability of many of its aircraft and the effectiveness of its efforts to modernize its aircraft and adapt them to new missiles is unclear.
- The full state of the operational effectiveness of its maritime surveillance aircraft and UAVs is unclear. The real-world operational ability to use them to remotely target longer-range anti-ship missiles is also unclear.
- Iran's joint warfare capabilities seem to be limited in spite of exercises and training designed to improve them.
- Iran's gaining fighter and surface-to-air missile force make it vulnerable to outside air attack and limits its capability in air-to-air combat.

- Even if Iran's air force does not come under large-scale attack, Iran's sortie rate could drop precipitously as it did at the beginning of the Iran-Iraq War – a factor that crippled it in competing with an incompetent and terribly led Iraqi Air Force.
- Iran could carry out a series of surprise strikes against Southern Gulf and Iraq targets, but not sustain either a long, intense air offensive or a long, intense air defense screen.
- Iran lacks the air strength to defend the entire country, although enough warning capability will probably survive attack and suppression to provide some coverage of its coast and western border, and its defense capabilities will improve with the depth of enemy penetration into Iranian air space.
- Iran will face serious limits in electronic warfare and countering jamming and electronic intelligence (ELINT) operations from any US or US-led force.
- Iran's limited air control and warning environment will be vulnerable to jamming, spoofing, and a variety of anti-radiation weapons.
- Iran's land and air-based IS&R systems are of limited capabilities, vulnerable, and sometimes relatively easy to suppress.
- Iran will have a major disadvantage in air-to-air missile combat and especially in beyond visual range air-to-air combat.
- Iran will not be able to penetrate into a properly maintain US or Southern Gulf air defense net in which anything like an AWACs-controlled air defense screen is present.
- Iran will be vulnerable to stealth systems like the B-2 and F-22, as well as the F-35 as it deploys. It will have very limited air to air defense capability against well-planned, well flown low altitude missions flown by cruise missiles, the B-1, and modern US and Southern Gulf strike fighters – with the possible exception of point defenses using its Russian supplied short-range TOR-M1 surface-to-air missiles.
- Iran will have problems in using its anti-ship and any other cruise missiles requiring a remote target system or airborne radar, and UCAVs/UAVs if US forces are present with modern electronic warfare and jamming capabilities, and in operating its maritime and intelligence aircraft both in the face of jamming and the threat from fighters.
- Iran would have serious problems in screening its critical targets. These not only include its nuclear facilities, but its missile facilities, major production facilities, refineries and fuel storage and distribution system, electrical grid, water purification facilities, and other key targets. A precision strategic bombing campaign could cripple much of Iran's economy and military production capability in a matter of days.
- Iran could engage in raids and limited air efforts, but would probably lose the ability to operate aircraft in numbers over the Gulf and southern Iran in a matter of days. It could not use its air force in numbers in sustained, survivable sorties to defend its ports, larger surface ships, or southern bases.
- Iran has so far been unable to construct precision munitions, weakening the IRIAF's ability to effectively target GCC forces or infrastructure.
- Limited tanker and air refueling assets that restrict Iran to maintaining continuous combat air patrols over only a small number of sites – key areas like Tehran.

It should be stressed that these comments apply to sustained levels of combat over time where the US is present or Southern Gulf air forces are prepared, properly trained, and made interoperable by either US support or reforms that are still very much a matter of discussion rather than implementation. Iran could pose an important surge threat to maritime traffic or conduct sporadic raids and attacks that used airpower – alone or in combination with naval/marine/missile/IRGC forces – in a war of attrition that affected maritime traffic throughout the Gulf and the region but was so low in intensity and so sporadic that it did not produce escalation to the kind of major conflict that would defeat Iran.

Experts indicate that Iran's military literature and training methods show that Iran is aware of the deficiencies in its air force, and has been seeking to remedy them through a combination of technological and doctrinal adjustments. With an eye for the ability of Western and Israeli forces to conduct devastating first strikes, the Iranian air force has sought to disperse its aircraft and provide independent command control systems, allowing small units to continue to fight even if a first strike badly damages the C⁴I system. Recognizing its own aircraft have limited ranges and effectiveness, newer training exercises have stressed in-flight refueling, strike missions at critical infrastructure, deployment of air-to-ground missiles, and advanced air-to-air combat.

Experts also confirm that Iran has carefully studied the tactics, technology, and the high tempo of US operations – including the Gulf wars, campaigns in the Balkans, and Operation Enduring Freedom – and carefully observes US air power tactics and management. These observations not only provide Iran with a blueprint for how a US/GCC air campaign against it might play out, but may have enabled more realistic and effective drills for its own air force.

There are only limited unclassified data on the quality of the enablers Iran needs -- its real world IS&R, C⁴I, electronic warfare, and refueling capabilities. Experts do report Iran has sought to upgrade its radar systems with technology that has a higher chance of detecting stealth aircraft, potentially enabling it to diminish one of the US's primary advantages. Iran has also reportedly acquired an older F-16 fighter from Venezuela; while a single model is unlikely to allow it to produce its own advanced fighter aircraft, the transfer would enable Iran to better understand the avionics and capabilities of its potential foes.

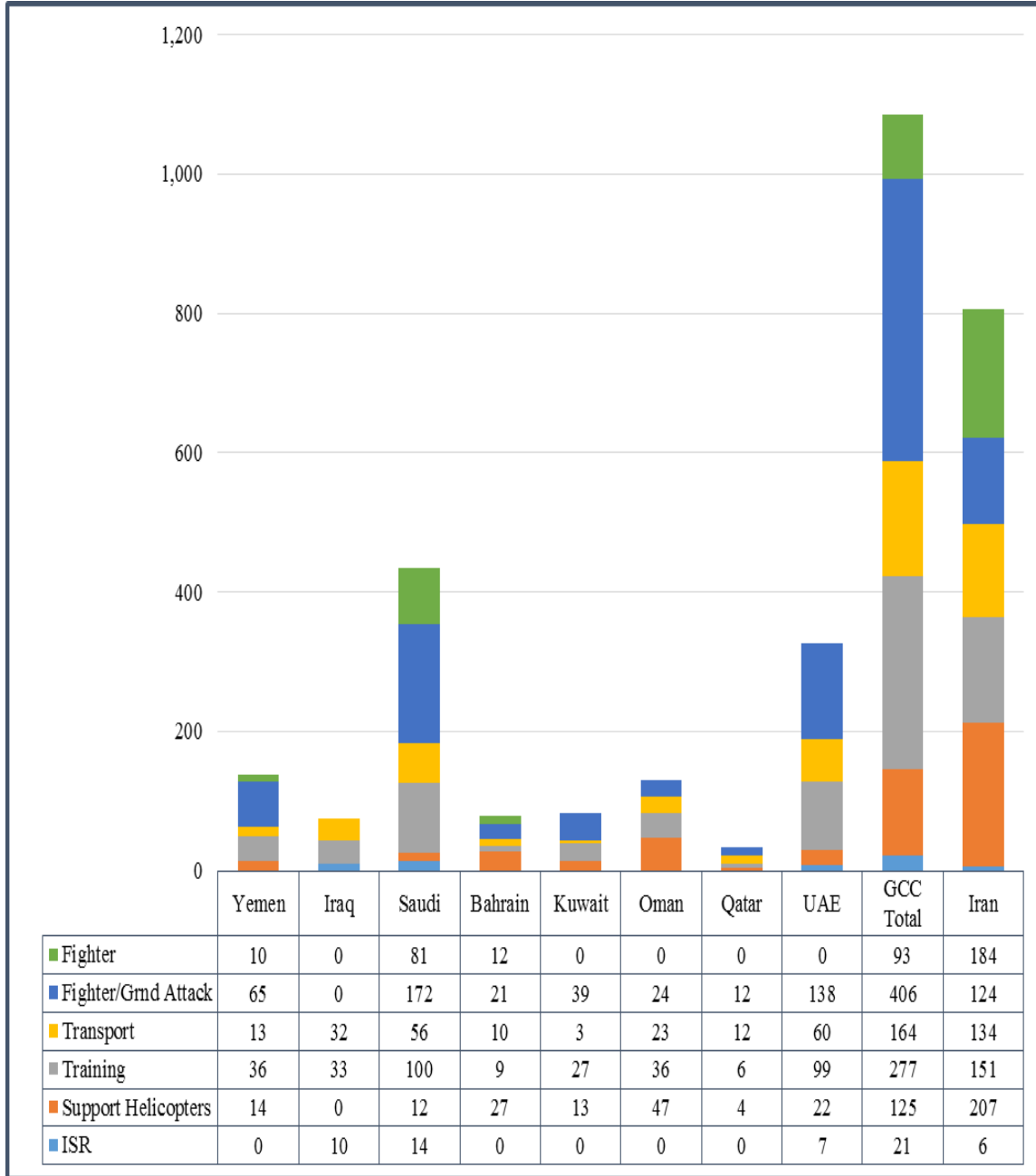
Experts also feel, however, that such Iranian systems are only likely to be effective in peacetime and could be quickly suppressed or destroyed in combat. Iran lacks survivable IS&R capability to support air operations, has only two to three fully operational P-3s whose lack of full-scale modernization limits their wartime capability. It relies on aging Russian aircraft for much of its AC&W capability, relies largely on modified Cessnas and other small aircraft for maritime surveillance, but has no survivable "enablers" for air warfare. It is gradually developing a family of UAVs and UCAVs to provide better IS&R/battle management/targeting capability but these now are limited in capability and poorly netted, and lack effective over-the-horizon targeting capability.

Experts also report that Iran has been developing its own human-centric data gathering system that is designed to operate in the face of overwhelming US electronic superiority. Iran uses manned stations and small ships like the dhows that ply the Gulf and Strait to watch commercial and military traffic in the region, and try to create an intelligence network that could provide targeting data during a war. This passive network, while slower and less accurate than modern digital (or even analog) systems, may prove resilient enough to help support the style of warfare Iran expects the US to wage. Iran has also made efforts to blend its human assets and analog electronic systems, creating a hybrid command and control design that can coordinate stacks of missiles and packs of fast missile boats, theoretically even in the face of decapitating air strikes.

In short, the Iranian Air force has serious limits in carrying out or supporting attacks that affect the flow of maritime traffic, but should be not discounted. An untested capability does not necessarily equal a lack of capability. The Iranian Air Force is operational in the Gulf and

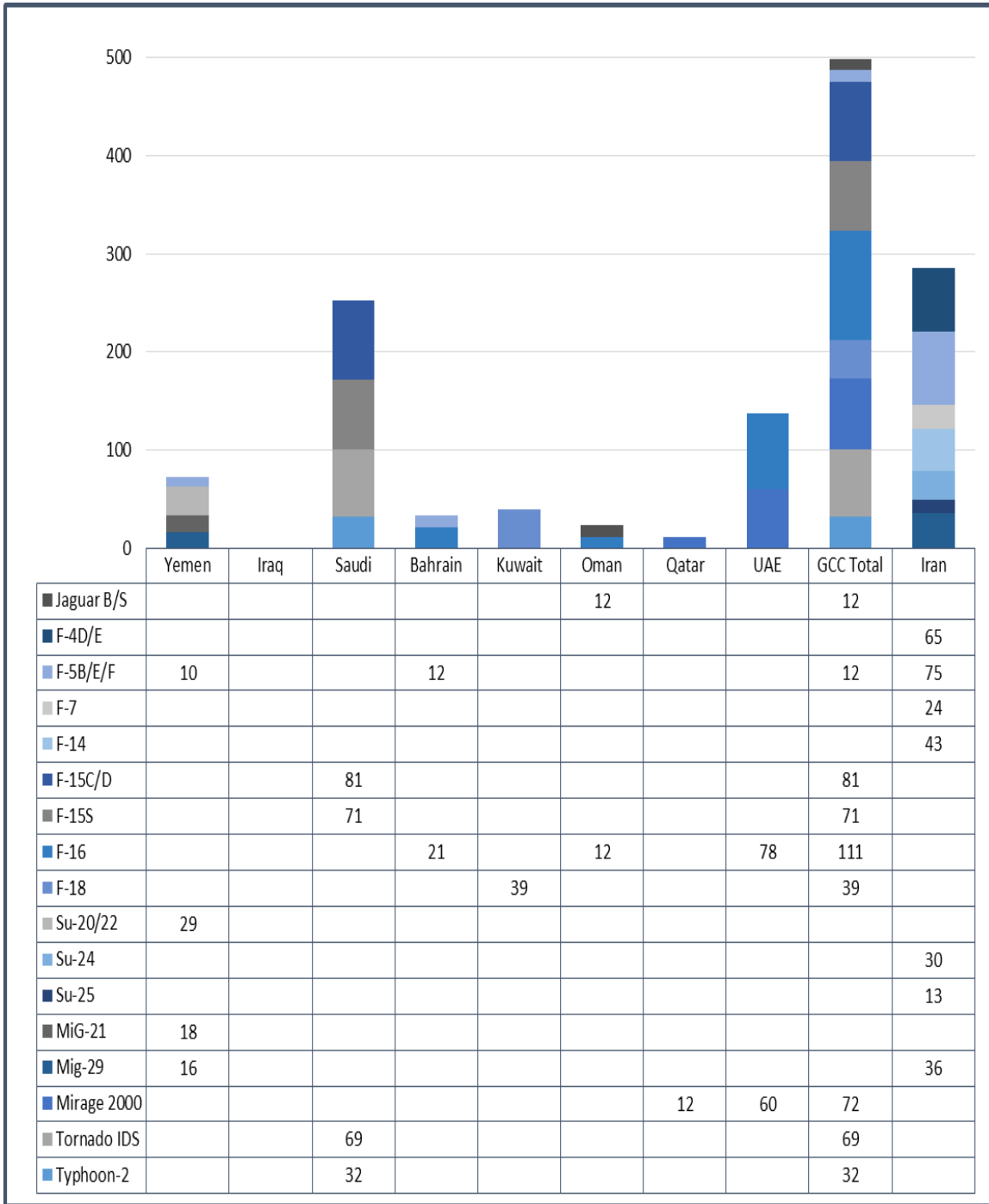
the Gulf of Oman, and no one can predict the way in which any air combat might emerge between Iran, its Arab neighbors, and the US.

Figure 10: Total Combat Air Strength without US and Other Allied Aircraft



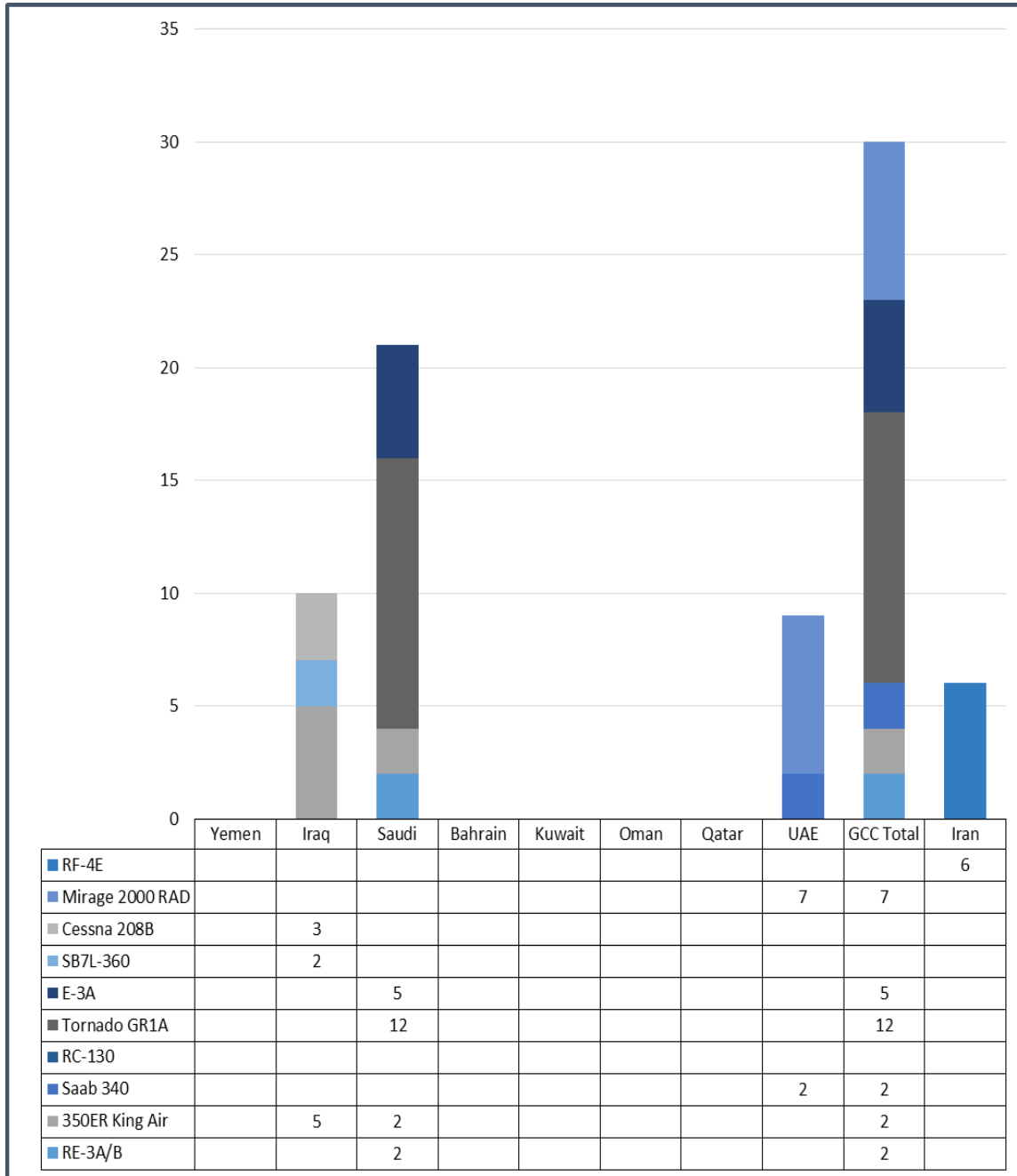
Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance*, 2014, and IHS Jane's Sentinel series.

Figure 11: Comparative “Modern” Fighter Strength without US and Other Allied Aircraft



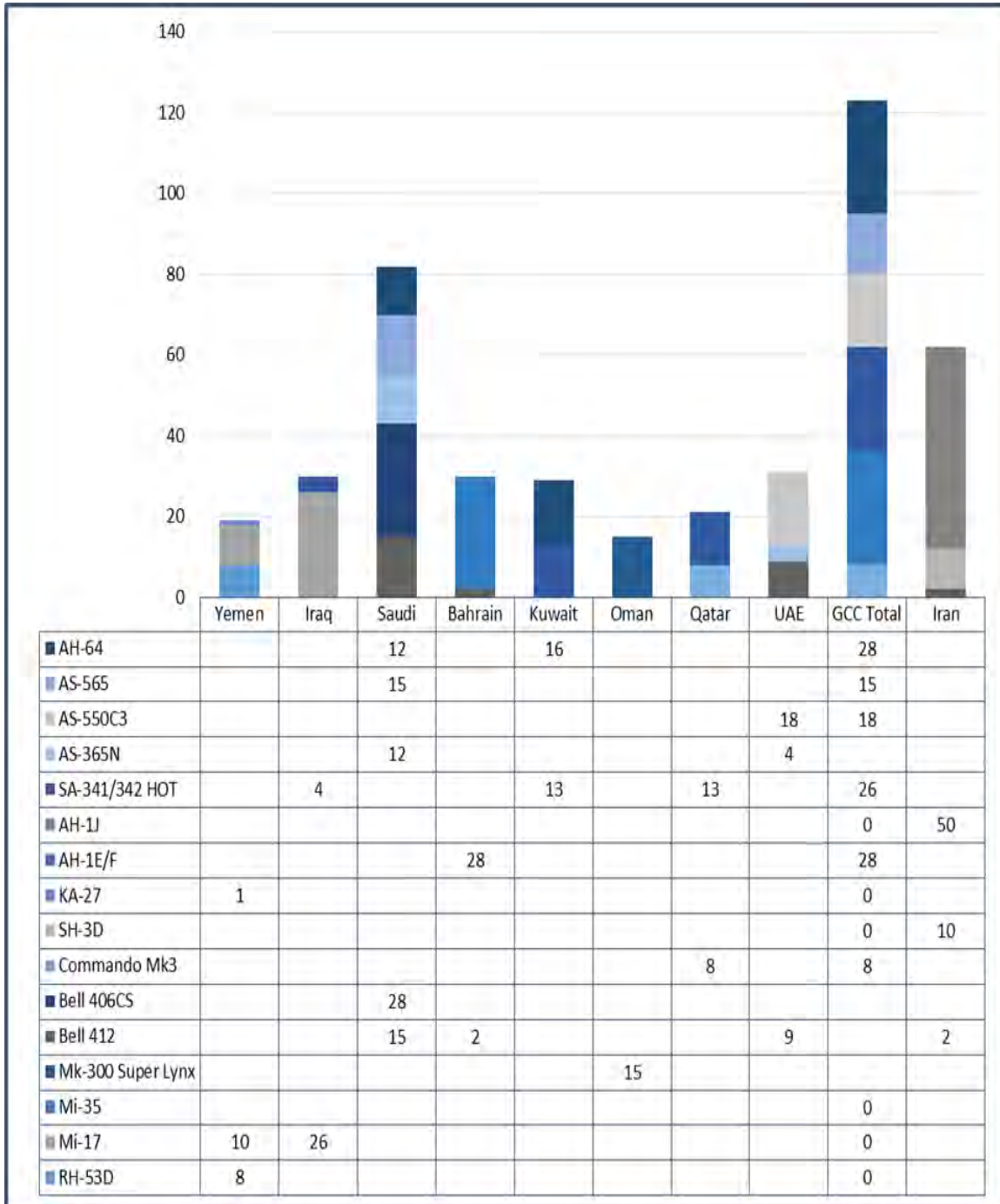
Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance*, 2014, and IHS Jane’s Sentinel series.

Figure 12: Comparative Reconnaissance, Major Intelligence, & Air Control and Warning (AEW/ AWACS) Aircraft Strength without US and Other Allied Aircraft



Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance*, 2014, and IHS Jane's Sentinel series.

Figure 13: Comparative Attack, Armed, and Naval Combat Helicopter Strength without US and Other Allied Aircraft



Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance*, 2014, and IHS Jane's Sentinel series.

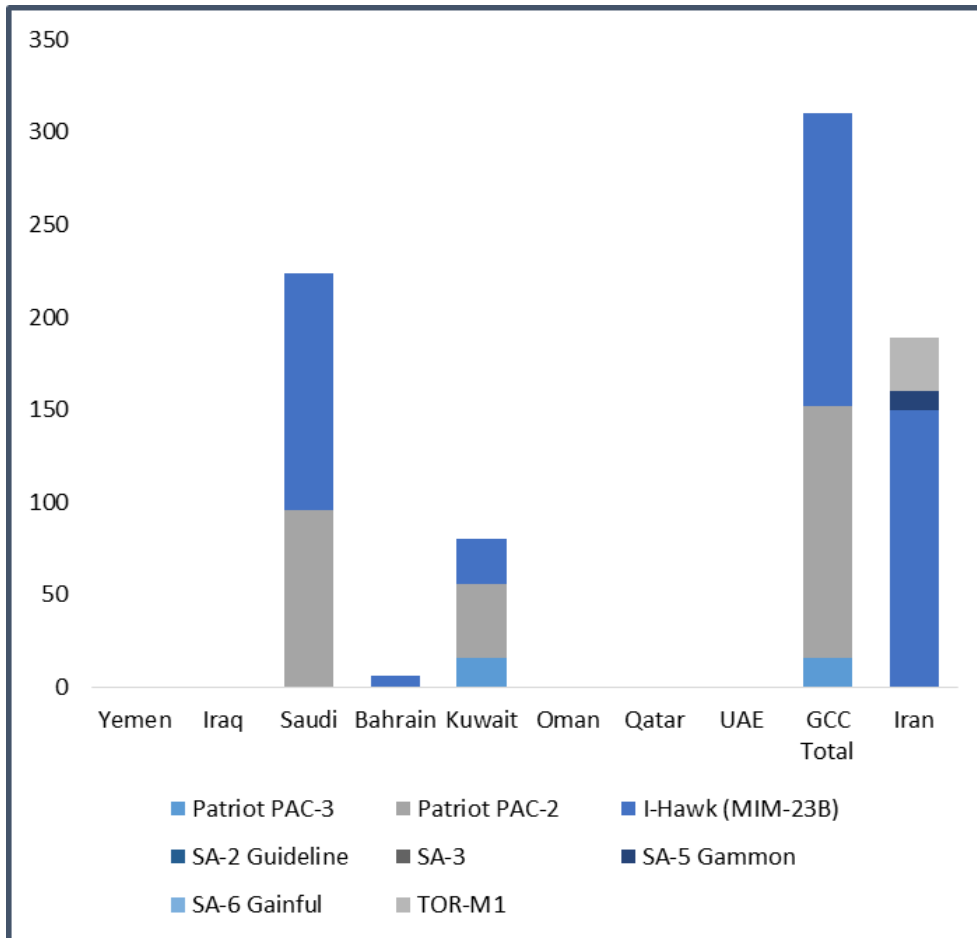
Figure 14: Illustrative Iranian UAV Projects /Assets

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

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

Source: Adapted by Adam C. Seitz from AIAA Aerospace 9 Worldwide UAV Roundup, http://www.aiaa.org/Aerospace/images/articleimages/pdf/UAVs_APR2009.pdf.

Figure 15: Comparative Major Surface-to-Air and Ballistic Missile Defense Launcher Strength without US and Other Allied Forces



	Yemen	Iraq	Saudi	Bahrain	Kuwait	Oman	Qatar	UAE	GCC Total	Iran
Patriot PAC-3					16			some	16	
Patriot PAC-2			96		40				136	
I-Hawk (MIM-23B)			128	6	24			some	158	150
SA-2 Guideline										
SA-3	some									
SA-5 Gammon										10
SA-6 Gainful	some									
TOR-M1										29

Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance*, 2014, and IHS Jane's Sentinel series.

Figure 16: Iranian Reliance on Aging/Mediocre Systems

Air Forces

FTR 184+: 20 F-5B *Freedom Fighter*; 55+ F-5E *Tiger II*/F-5F *Tiger II*; 24 F-7M *Airguard*; 43 F-14 *Tomcat*; 36 MiG-29A/U/UB *Fulcrum*; up to 6 *Azaraksh* reported

FGA 111: 65 F-4D/E *Phantom II*; 10 *Mirage* F-1E; 30 Su-24MK *Fencer D*; up to 6 *Saegheh* reported

ATK 13: 7 Su-25K *Frogfoot*; 3 Su-25T *Frogfoot*; 3 Su-25UBK *Frogfoot*

ASW 5 P-3MP *Orion*

ISR: 6+ RF-4E *Phantom II*

TKR/TPT B-707; ε2 B-747

TPT 117: Medium ε19 C-130E/H

Hercules; Light 10 F-27 *Friendship*; 1 L-1329 *Jetstar*; 10 PC-6B *Turbo Porter*; 8 TB-21 *Trinidad*; 4 TB-200 *Tobago*; 3 *Turbo Commander* 680; 14 Y-7; 9 Y-12; PAX 11: 2 B-707; 1 B-747; 4 B-747F; 1 *Falcon 20*; 3 *Falcon 50*

HELICOPTERS

MRH 32: 30 Bell 214C (AB-214C); 2 Bell 412

TPT 4+: Heavy 2+ CH-47 *Chinook*; Light 2+: 2 Bell 206A *Jet Ranger* (AB-206A)

Land Based Air Defenses

Air Defense Force

SAM 529+: 250 FM-80 (*Crotale*); 30 *Rapier*; 15 *Tigercat*; 150+ MIM-23B I-HAWK/*Shahin*; 45 S-75 *Dvina* (SA-2 *Guideline*); 10 S-200 *Angara* (SA-5 *Gammon*); 29 9K331 *Tor-M1* (SA-15 *Gauntlet*) (reported)

MANPAD FIM-92A *Stinger*; 9K32 *Strela-2* (SA-7 *Grail*)‡

Army

SP 10+: HQ-7 (reported); 10 *Pantsyr* S-1E (SA-22 *Greyhound*)

MANPAD 9K36 *Strela-3* (SA-14 *Gremlin*); 9K32 *Strela-2* (SA-7 *Grail*)‡; *Misaq 1* (QW-1 *Vanguard*); *Misaq 2* (QW-11); *Igla-S* (SA-24 *Grinch* - reported); HN-54

Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance*, 2014, and IHS Jane's Sentinel series.

The Impact of the Air Balance: The US, the Southern Gulf Problem, and Iran's Capability for Air Combat

While **Figure 17** shows that Iran's air force does have the range to strike maritime traffic, ports, offshore facilities, and petroleum export targets in the Gulf, its offensive capability is unlikely to survive in any protracted air battle. The Iranian air force will also be limited by its inexperience with large-scale operations and the actual use of many of its upgrades and munitions in combat. Iran's aircraft will also be range-limited in penetrating deep into Saudi Arabia. Iran is unable to strike targets all across the Gulf without secure refueling, while all of Iran is vulnerable to tanker-supported Arab or US strike aircraft. While Iranian air forces could conceivably benefit by launching a surprise attack or the elimination of Arab radar by their own missile forces, advanced radar systems and long-range missiles (IHAWK and Patriots) would still probably seriously degrade any Iranian operation.

These limits to Iran's capabilities must, however, be kept in perspective. Although Iran's air assets fall far short in quality relative to those of its steadily modernizing Gulf neighbors, the Southern Gulf states do have some special vulnerabilities which could be exploited if the US does not provide overall battle management and IS&R capability. The Southern Gulf states have talked for years about interoperability and integrated air operations and air defense systems, but made far too little progress. There are many areas where their systems and stocks are not interoperable, readiness and training levels vary sharply by country, and so do preparedness and reliability.

The air forces of the Southern Gulf states need improved interoperability, specialization, and orientation around key missions. They need far more focus on unity of effort in war fighting, deterrence, and development terms. The Gulf Cooperation Council recognized the need for improvements in these areas during their December 2011 Ministerial meeting and has made improvements a key priority. It has, however, made little real progress in 2012, and it will take at least several years for the GCC to act – and it has issued the right words before. If rhetoric were reality, virtually every nation in the world would be a superpower.

The Southern Gulf states also face the problem that their willingness to export and face an Iranian sea-air-missile threat is affected by the fact the smaller Gulf states and key cities lack strategic depth, and are dependent on highly vulnerable critical infrastructure facilities such as desalination facilities that lie close to Iran. Most Southern Gulf states are comparatively small countries; they are vulnerable to Iran's large force holdings and selective attacks that aim to cripple their critical infrastructure and coastal facilities, and lack the resources for a war of attrition. This gives even more importance to the fact they have failed to effectively integrate their IS&R and air war battle management capabilities on GCC basis

As is the case with naval attacks, shipping firms and ship captains and crews are likely to be even more cautious. So are maritime insurers. Their willingness to take risks may be very limited indeed, and the Iranian threat to maritime traffic may only have to consist of a threat or token military action to have a major impact.

Furthermore, Iran has improved the "passive defense" of its air and surface-to-air missile units – camouflage, aircraft dispersal, and hardened shelters – in an effort to reduce losses from American and Arab Gulf attacks. While American and GCC forces have only a limited number of launching points, Iranian aircraft, due to the size and variety of large airports in

Iran, will face a much simpler time in surviving on the ground; degradation of airfields will hinder the GCC and American sortie rate much more than the Iranian rate.

Much now depends on the extent to which the Southern Gulf states cooperate effectively with the US. The Southern Gulf states need the US and the US needs them. The US cannot fight large-scale air war in the Gulf using carriers and ship-based cruise missile alone – although these provide extremely powerful strike and defense capabilities for more limited engagements. It needs effective support from its Gulf allies who now must be trained and equipped to advantage of the full range of US-enablers like the E-3C AWACs, electronic intelligence and warfare aircraft – and ideally create integration battler management. IS&R, training, and support facilities and capabilities of their own. The US also needs protection from local land-based air defense and fighters, and access to Gulf air bases for support/arming/recovery to efficiently fight a major air or air/sea conflict.

Finally, -- as is described later in this the sections of this report dealing with Iran’s short and medium range rockets and missiles, and dealing with Iran’s longer-range missile systems -- air power cannot be separated from missile power. Iran’s longer-range missile forces are limited today in terms of range, payload lethality and accuracy. They are more useful in terms of posing political threats and as tools of intimidation than as effective warfighting forces.

Even today, however, Iran can volley enough shorter-range systems on ports and petroleum facilities to have a serious potential impact on Iraq and Kuwait’s export and maritime shipping capacity, and Iran’s capabilities to volley continue to grow. Its capabilities will also change vastly in the future if Iran can deploy nuclear-armed medium to long-range missiles or even missiles with conventional precision and terminal homing warheads. Iran is seeking such systems and – is discussed in the next section – this not only affects the balance or airpower but balance in terms of surface-to-air and missile defenses.

Figure 17: Range of Iranian Airpower



Source: Abdullah Toukan, April 29, 2014.

IV. Linkages to Iran's Ballistic Missile and Nuclear Programs

As the analysis of air forces shows, the threat to maritime traffic must never be confused with the capabilities of naval forces. The Iranian threat and the regional balance of capabilities to pose a maritime threat are a mix of the joint warfare capabilities of at least sea-air-missile forces and would broaden to include land forces in a major regional conflict.

From a strategic perspective, Iran's asymmetric capabilities interact with its nuclear weapons development efforts to compensate for the limitations to its conventional forces. "Going nuclear" provides a level of intimidation that Iran can use both to heighten the power and deterrent capabilities of its asymmetric forces and to deter conventional responses to its use of asymmetric warfare:

- Even the search for nuclear power is enough to have a major effect on regional military competition and perceptions.
- Development of long-range missiles adds to Iran's credibility and pressures Iran's competitors – potentially posing a threat to all major energy infrastructure and port facilities.
- Crossing the nuclear threshold in terms of acquiring a "bomb in the basement" option, creating ambiguity and hence a form of deterrence.
- Threats to Israel legitimize the capabilities that tacitly threaten Arab states. Support of Hamas and Hezbollah increases legitimacy in Arab eyes – at least Arab publics.
- Many future options: stockpile low enriched material and disperse centrifuges, plutonium reactors, underground tests, actual production, arm missiles, breakout arming of missiles.
- Declared forces, undeclared forces, leverage Israeli/US/Arab fears.

Accuracy, Reliability, and Nuclear Forces

Iran has built up massive stocks of artillery rockets and has large numbers of ballistic missiles that can attack maritime and other targets across the Gulf – especially in the upper Gulf near Kuwait and Iraq. At present, Iran's rockets and missiles lack the combination of accuracy and lethality to pose a major threat to coastal ports and critical energy facilities.⁶⁰

Unclassified reports on the nature, holdings, and deployments of these weapons are uncertain, but reports by the IISS, Jane's/HIS and other sources indicate that Iran's shorter range rockets and missiles include the FROG 7 (70 kilometers? 250 rockets?), Oghab rockets (35-40 kilometers?, 175-250 rockets?), Nazeat/Iran 130 missiles (100-130 kilometers? 500-650 missiles?), and Zelzal 1 (150 kilometers?), 1B (150 kilometers?), 2 (210 kilometers?), and 3 (200 kilometers?).

They also include more advanced solid-fuel Fateh 110 and A-1105450), the Tondar 69 (200 missiles?), systems with a 210 kilometer range, the Chinese-made CCS-8 (M7/Project 8610) with a range of 150 kilometers and a 190 kilogram warhead, and a newer Qiam-1 tactical ballistic missile. Jane's reports that the Qaim missile is a finless systems with a 700-850 kilometer range and warheads of 500 to 650 kilograms. Some sources indicate that these systems have some form of GPS guidance. Variants have been reported with names like the MDC-300 and MDC-600.

Sources are highly conflicting in reporting on Iran's medium range ballistic missiles, with different listings of types, age, test data, range, accuracy, and warheads. They also differ on how much technology Iran has gotten from North Korea and the current level of cooperation. It is clear, however, that Iran has move far beyond the point where it dependent on imports or its own production of systems with ranges of around 300 kilometers or less like the Scud B SS-1c (Iranian Shahab-1, 300-350 kilometers, 25-300 missiles?) and Scud C SS-1d (Iranian Shahab-2 (750 kilometers? 50-100 missiles?).

More capable systems that are deployed or have reached final development include the storable liquid fueled Shahab 3 (1,300 kilometers?), Shahab 3A (1,500-1,800 kilometers?), Ghadr-1 (1,800 kilometers?), Shahab 3B (2,000-2,500 kilometers), and possible development/deployment of some form of Pakistan's solid-fueled Shahin-2 (200-250 missiles, 2,500 kilometers?).

These data on range -- along with far more speculative warhead and CEP data that are not shown -- seem to be based on nominal engineering models and estimates rather than actual test data, and CEP data apply only to 50% of the force assuming the missile is perfectly reliable and function and targeting is perfect within a few meters. In the past, such data have been notoriously unreliable compared to data based on proven operational tests and used of the derived aim point method.

It has tested a slid fueled rocket called the Siji-2 which Jane's indicates may have a range of some 2,000 kilometers with a 1,000 kilogram warhead. Jane's and the WikiLeaks website also indicate that Iran may have acquired 19 North Korean Musudan IRBMs (aka Mirim, No-Dong, BM-25) based on the Russian R-27 (SS-N-6 Serb). IISS reporting doubts this, but such a system could have a range of up 2,500-4,000 kilometers.

Given the real world operation accuracy of such systems, and the lethality of unitary or even advanced cluster conventional warheads, most or all cannot be used against any point target, even a very large building, and would have limited lethality if fired in to any area target unless they hit a critical point out of sheer chance.

As **Figure 18 to Figure 22** show, however, some estimates warn that Iran has large enough forces to potentially fire volleys at coastal targets in the Southern Gulf, and it is clear that it is steadily improving the accuracy of some missiles by using strap-on GPS guidance systems. Iran would also pose a potentially devastating threat to other Gulf states if it could equip its missile forces with nuclear warheads

As the fighting that began between Israel and Gaza in July 2014 has shown, it is also extremely difficult to use airpower to suppresses a missile and rocket threat, missiles and rocket do get through even if Israel is equipped with specialized defenses like Iron Dome, and even the threat of a successful random hit can lead to an interruption in commercial air traffic and have major political impact.

The US and the Gulf states are responding by increasing their air and cruise missile strike capabilities, Saudi Arabia has acquired Chinese-made ballistic missiles with conventional warheads, and the United States and the Gulf Cooperation Council (GCC) states are steadily improving their missile defenses – the US has deployed advanced anti-missile defense ships with wide area missile defenses, many Gulf countries have bought PAC-3 systems, and Qatar and the UAE have expressed an interest buying THAAD or an advanced version of Standard.

Asymmetric Warfare and Wars of Intimidation

The fact remains, however, that Iran's future missile capabilities may pose a far more critical threat to the Gulf – as well as US and allied naval and air bases. Missiles also illustrate the most serious example of Iran acquiring forces that pose a constant tacit threat of escalation and strikes on key enemy and port facilities – as well as associate civilian populations. Iran can also escalate to open or quiet warnings to the Gulf states that it might or would escalate if they oppose its policies, using their air and naval forces, or support the US.

While the next chapter describes more direct forms of Iranian military action, it is important to note that the maritime threat does not have to involve the active use of force or higher levels of escalation. From an Iranian viewpoint, the best possible way to use military force is in “wars of intimidation.” These do not involve Iranian losses in combat, the military risks inherent in Iran's actually attacking at any level of force, and allow Iran to manipulate its range of threats from very low-level action like using its Quds force to try to destabilize the internal situation in Gulf states to threats on critical energy export facilities like Rad Tanura or infrastructure facilities like desalination plants.

Iran does face serious risks, however, even in this form of warfare, as the following potential list of Iranian targets shows:

- Critical dependence on refineries with high cost, long lead facilities and on imports of product.
- Minimal power grid that can be crippled or destroyed selectively on a regional or national basis.
- Gas production and distribution facilities needed by Iran's domestic economy.
- Key bridges, tunnels, overpasses and mountain routes for road and rail traffic.
- Gulf tanker loading facilities, oil storage and tanker terminals – for mining or direct attack.
- Key military production facilities
- Command and control centers.
- Communications grids.
- Airfield and air bases.
- IRGC land, air, and naval facilities.
- Coastal naval bases and port facilities.

The US and Arab Gulf states can do far more damage to Iran by escalating than Iran can do to them. At a political level, threats can simply provoke counter-threats or lead to threatened states seeing Iran as more of a threat and mobilizing their own populations against Iran. At a military level, they can lead to an accelerated military build-up by other regional states, US deployment of additional forces, US commitments to extended deterrence, and Arab Gulf states acquiring more of their own missiles and even nuclear weapons.

Anti-Ship Ballistic Missile: The *Khalij Fars*

Iran is also seeking to acquire and deploy far more advanced anti-ship missiles, although some of its claims seem exaggerated. For example, the commander of the IRGC, Brigadier General Mohammed Ali Jafari, announced the deployment of a “smart” anti-ship ballistic missile, the *Khalij Fars*, in a February 8, 2011 press conference. According to Iranian press reports, the *Khalij Fars* is allegedly capable of striking at moving ships in the Gulf at ranges of up to 150 km.⁶¹

- Khalij Fars
 - Number in Service: Unknown
 - Warhead: 650 kg
 - Speed (terminal): Mach 3 (est.)
 - An arms exhibition held on May 11, 2013 unveiled an upgraded version of the Khalij Fars called the Hormuz. The Hormuz 1 was stated as an “anti-radar ballistic missile” that could hit radar sites on warships or land. The Hormuz 2 was stated as an anti-ship missile.⁶²

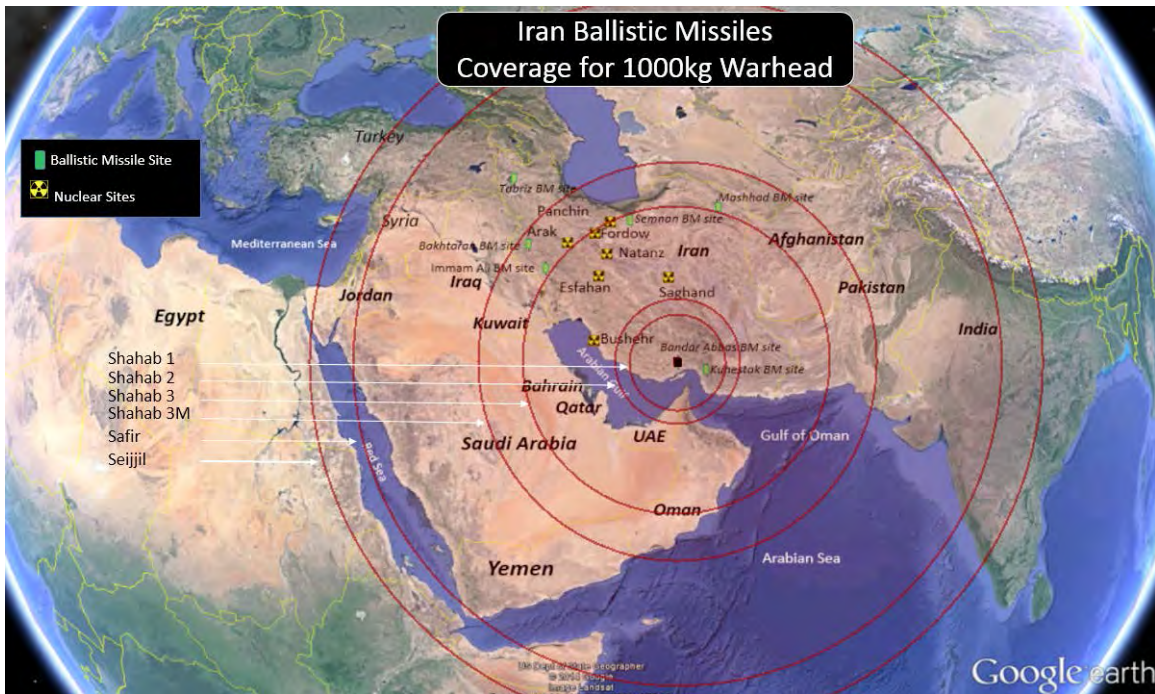
An upgrade of the *Khalij Fars*, called the *Hormuz*, was unveiled at an IRGC arms expo on May 11, 2014. This missile has two variants, Hormuz 1 being an anti-radiation ballistic missile (radars can be land or sea based), and Hormuz 2 being an anti-ship ballistic missile.⁶³ While the real-world capabilities of both the *Khalij Fars* and *Hormuz* are unknown, they would represent a valuable layer of Iran’s anti-ship “stack.” However, Iran makes so many claims for so many systems, it is impossible to distinguish propaganda from reality.

The *Tehran Times* has reported that Jafari also claimed that Iran had developed “supersonic” smart ballistic missiles that “cannot be tracked and can hit targets with high precision” as well as “coastal radars with a range of 300 km.”⁶⁴ General Jafari also stated that the IRGC had recently completed studies on two mobile radars with a range of 60 km, which could be attached to small destroyers. Similarly, the Islamic Republic News Agency quoted General Jafari as stating that, “Iran is mass producing a smart ballistic missile for sea targets with a speed three times more than the speed of sound.” The Iranian Students News Agency quoted General Jafari as stating the following regarding the new weapon:

“As the enemy’s threats will likely come from the sea, air, and by missiles, the Revolutionary Guard has been equipped with capabilities to neutralize the enemy’s advanced technology.”⁶⁵

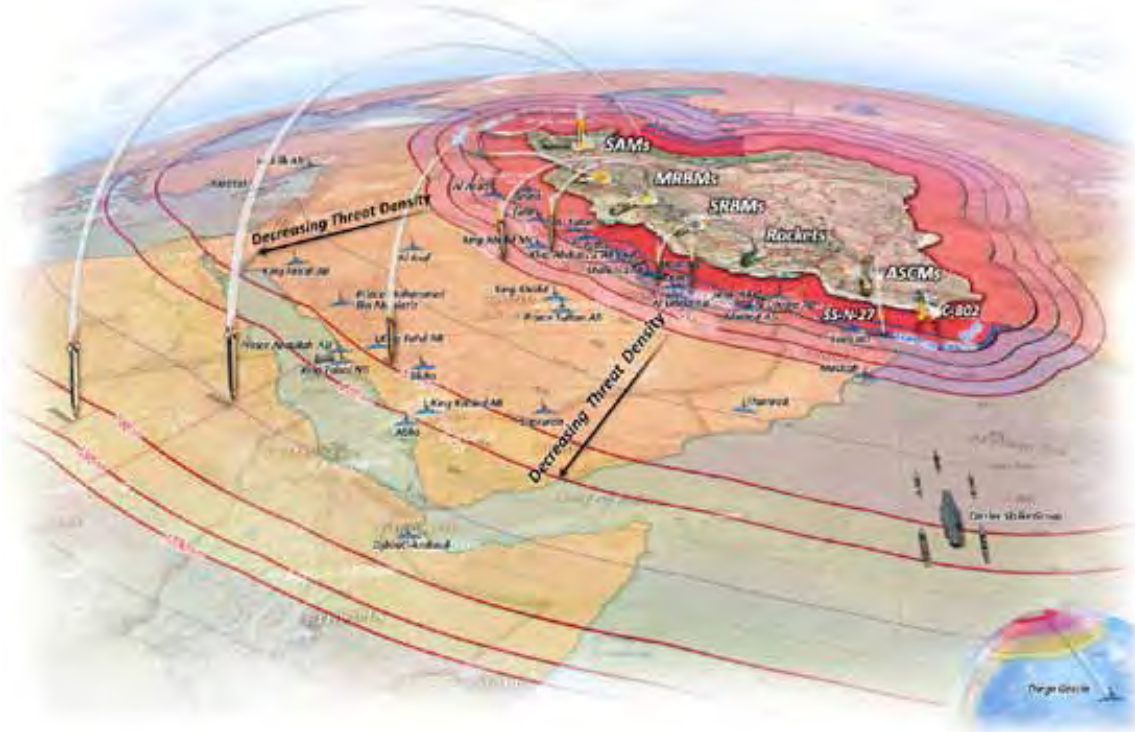
While experts feel these claims are sharply exaggerated and Iran has little or no operational capability to use the Khalij Fars, Hormuz, or any ballistic missile or long range rocket in the anti-ship more -- as well as has no meaningful over-the-horizon targeting capability -- Iran potentially could alter the regional sea-air-missile balance if it ever did reach such a level of sophistication in guidance, range, reliability, and operational accuracy. It not only would threaten the sea-air-missile balance, but also potentially allow Iran to develop conventionally armed missiles that could strike at high-value targets such as desalination plants, power plants, oil platforms, and military installations with precision. A credible anti-radiation/radar capability based off a ballistic missile system, such as the Hormuz 1, would enable Iran to degrade regional air and ballistic missile defenses. This would allow Iranian missiles and aircraft to more readily conduct strikes on the above infrastructure and military targets.

Figure 18: Range of Iran's Major Ballistic Missiles



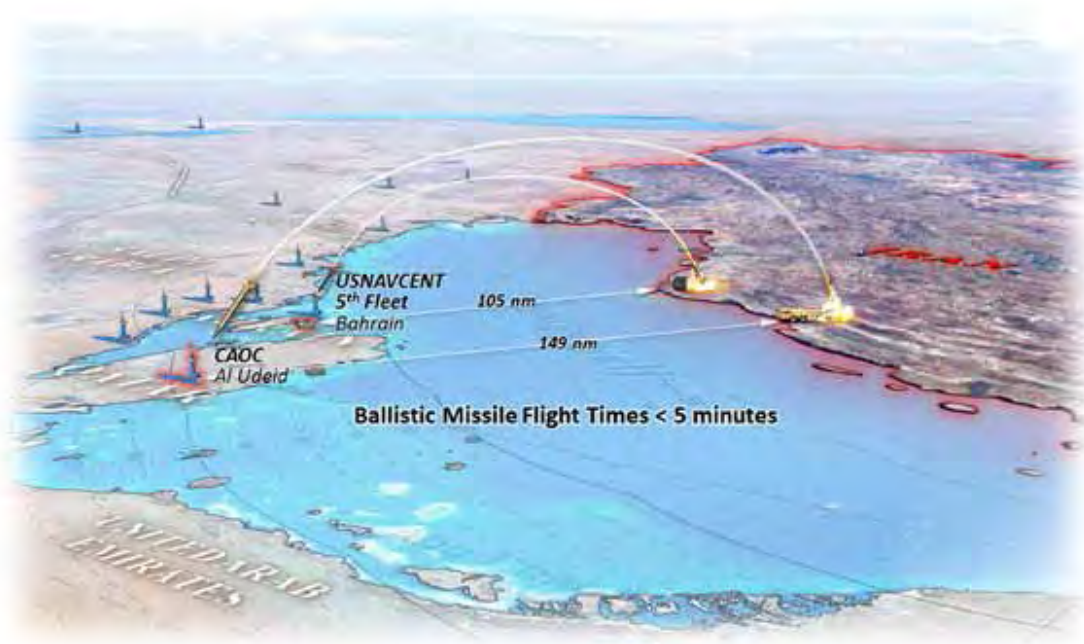
Source: Abdullah Toukan, April 29, 2014.

Figure 19: Combined Threat from Iran's Rockets and Missiles: Attack Range and Density



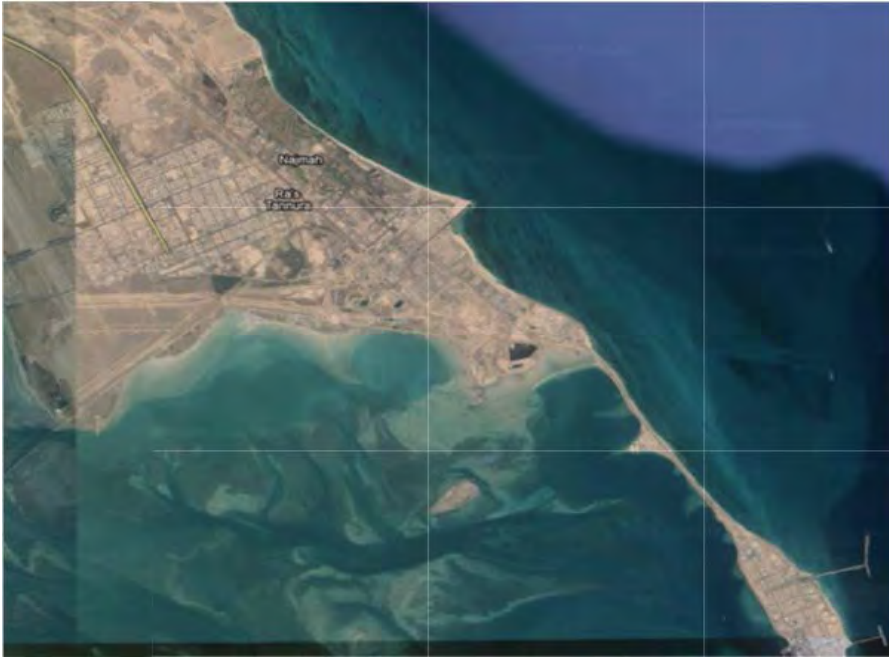
Source: Adapted from Mark Gunzinger and Christopher Dougherty, *Outside-In Operating from Range to Defeat Iran's Anti-Access and Area-Denial Threats*, CBSA, Washington DC, 2011.

Figure 20: Critical Nature of Attack Timing



Source: Adapted from Mark Gunzinger and Christopher Dougherty, *Outside-In Operating from Range to Defeat Iran's Anti-Access and Area-Denial Threats*, CBSA, Washington DC, 2011.

Figure 21: Key Target Examples: Ras Tanura



Source: Google Maps, Wikipedia, and http://seaport.homestead.com/files/Ras_Tanura.html.

Figure 22: Key Target Examples: Gulf Desalination Plant



Source: Google Maps.

V. Focusing on the Broader Threat from Asymmetric Forces

If Iran does go beyond “wars of intimidation” and deliberately becomes involved in a conflict that affects shipping and land targets that affect maritime shipping, the conflict is most likely to be asymmetric, fought on improved condition shaped by a specific contingency, and where Iran attempts to innovate and achieve some level of surprise to compensate for the limits to the size and capability of its forces. The weaknesses in Iran’s conventional forces help explain why Iran is so active in seeking to compensate for its inability to modernize its conventional forces, the delays in its military production efforts, and the limits on its arms by building up different kinds of military forces called “asymmetric” or “irregular” forces.

Iran’s military doctrine places heavy emphasis on asymmetric warfare, and Iran has sent military signals that the US and Iran’s neighbors cannot ignore:

- Threats to close the Gulf, extend sea-air-missile operations steadily deeper into the Gulf of Oman and Arabia Sea, and attacks US naval forces.
- Simulated attacks on offshore and island facilities by marines, special forces, and IRGC Naval Guards.
- Simulated submarine and midget submarine attacks, attacks with clusters of anti-ship missile equipped patrol boats, smart mine attacks, use of dhow and commercial vessel to lay or float ordinary mines,
- Claims to long-range missile capabilities to attack maritime targets with air-to-sea missiles, drones, and guided ballistic missiles.
- Military parades and exercises not only show its capability, but highlight the intent of Iranian armed forces and the supposed national support for this attrition-based policy.
- The IRGC often claims to conduct very large exercises, sometimes with 100,000 men or more. The exact size of such exercises is unclear, but they are often a fraction of IRGC claims.
- By displaying both its real and virtual military (e.g. naval) fighting capabilities through electronic, printed and network media and through official statements, Iran seeks to achieve the following politico-diplomatic and propaganda ends (4Ds):
 - o Defiance (to maintain a course of resistance, targeting primarily the Western political will and system).
 - o Deception (on the real state of Iranian warfighting capabilities, targeting the Western military establishments).
 - o Deterrence (with the IRI military “might”, targeting Western public opinion).
 - o Demonstration (of the outreach of its own power, targeting the Iranian people and the Muslim world).

Iran’s efforts include a mix of weapons and other military technologies to allow its conventional forces to try to exploit the weakness in US, allied, and Arab Gulf conventional forces. They include a wide range of steadily growing land, air, missile, and naval capabilities in its Islamic Revolutionary Guard Corps in ways that can increase its maritime threat. These include small, hard to detect, elements for naval mine and missile warfare in the Gulf, training hostile and extremist elements in other countries, and steadily expanding long missile forces controlled by the IRGC that can already strike at targets anywhere in the region and are the logical delivery systems if Iran produces nuclear weapons.

Moreover, Iran is increasingly focusing on using its Al Quds force and other elements of its covert operations structure to arms or support extremist elements in the Southern Gulf, Lebanon, Gaza, and Yemen; and use Sunni and Shi'ite tensions in Bahrain, Iraq, Kuwait, Saudi Arabia, and Yemen. This gives Iran the potential capability to wage low-level proxy or indirect wars, and pressure regional states by threatening them with providing money, arms trainer's training and support to dissidents – as well as using them for sabotage, suicide attacks, and other bombing and IED attacks.

While any use of such forces would have less serious effects than an Iranian acquisition of nuclear weapons, the events of the last year have shown they pose steadily growing risks and they are far more likely to lead to actual conflict. Iran has made more dramatic threats in response to ever more serious US and EU sanctions and US and Israeli military warnings. Since the use of such weapons systems would be far less provocative than missile or nuclear strikes, they lessen the chance of major American escalation, decreasing the costs to Iran of military action and making it more probable. This makes the small-scale conventional forces capable of countering asymmetric warfare aspect of military competition critical to the Arab Gulf states, the secure flow of world energy exports, and the stability of the global economy.

Iranian Views of Iran's Asymmetric Forces

Iran's leaders and senior officers have provided a wide range of descriptions of the reasons for this focus on asymmetric forces, and have made steadily more dramatic claims about their progress in building up its asymmetric forces and about the role they might play in the sea-air-missile aspects of maritime warfare and US and Iranian military competition. Mohammad Ali Jafari, the commander in chief of the IRGC, has made numerous statements regarding Iran's growing emphasis on asymmetric or irregular warfare, and the role it plays in US and Iranian military competition. One such statement notes that,

“Asymmetrical warfare... is [our] strategy for dealing with the considerable capabilities of the enemy. A prominent example of this kind of warfare was [the tactics employed by Hezbollah during] the Lebanon war in 2006... Since the enemy has considerable technological abilities, and since we are still at a disadvantage in comparison, despite the progress we have made in the area of equipment, [our only] way to confront [the enemy] successfully is to adopt the strategy [of asymmetric warfare] and to employ various methods of this kind.”—General Mohammad Ali Jafari, Commander of the IRGC

Other Iranian leaders and officials have both echoed these themes and provided more detail:

- “Today the US feels insecure due to the IRGC's speedboats. Our enemies believe that our country and the Islamic Iran has acquired deterrence power and it is due to this capability that no move has been made against our country ever since the end of the Iraqi imposed war (on Iran 1980-88).”—Rear Admiral Ali Fadavi, Commander of the IRGC Navy, September 24, 2013

<http://english.farsnews.com/newstext.aspx?nn=13920702001515>

- “We have today built highly advanced hulls which are appropriate for high speed and raging seas, state-of-the-art propulsion systems and advanced nano-coverings for the speed vessels.”—Rear Admiral Majid Zamani, Lieutenant Commander of the IRGC Navy, May 7, 2014

<http://www.almanar.com.lb/english/adetails.php?eid=150390&cid=19&fromval=1>

- “...compensates for its technological inferiority to the United States with a strategy of asymmetrical warfare, including suicide attacks and the use of speedboat and its missile capability...these weapons [American weapons] are ineffective against a new [Iranian] strategy relying on faith, on a desire for

martyrdom, and on [Iran's] unique speedboats.”—Rear Admiral Ali Fadavi, commander of the IRGC Navy, May 16, 2014

<http://freebeacon.com/national-security/iran-threatens-u-s-navy-with-suicide-missions/>

- “This tank has been designed and developed proportionate to battlefield threats and enjoys good telemetry, firepower, weapons and electronic warfare... it will be our main element in the battlefield. Each day we work on a newer version of Zolfaqar tanks so that the tank could maintain its efficiency in the battlefield and ground defense.”—Commander of the Iranian Army Ground Force Brigadier General Ahmad Reza Pourdastan, September 26, 2012

<http://english.farsnews.com/newstext.php?nn=9106242394>

- “If we want to use the normal rules to deal with the sanctions, we will definitely be faced with problems, therefore, like military wars that we have a series of asymmetric tactics, we should start a series of asymmetric economic wars under these sanctions since these embargos are no less than a military war. We have started these asymmetric wars and hold meetings seven days a week and have set up a headquarters in the CBI to this end.”—Mahmoud Bahmani, Governor of the Central Bank of Iran, July 31, 2012

<http://english.farsnews.com/newstext.php?nn=9104252239>

- “Our method (of choice in any possible war) is asymmetric warfare since enemy's systems and military doctrine have been designed based on the classical methods of battling.”—Brigadier General Farzad Esmayeeli, Commander of Khatam ol-Anbia Air Defense Base, August 28, 2011

- “At this stage of the war games, part of the special and professional units of the IRGC ground force successfully displayed asymmetric warfare tactics and techniques with full coordination and preparedness. The IRGC's cavalry units exercised new asymmetric warfare tactics in the initial phase of the drills today. “The armored and mechanized units of the IRGC Ground Force expanded the depth of their operation(al zone) through exercising new asymmetric warfare tactics and relying on mobile firepower, iron-shield and secure and impenetrable communications and then destroyed the hypothetical enemy.”—General Hamid Sarkheili, spokesman of Shohaday-e Vahdat war games, January 8, 2012⁶⁶

- “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>

- “Underwater is a good area (of activity) that is used by our forces but in an asymmetric and small-scale form, meaning that we are not seeking to build large and giant submarines since they are vulnerable.

These new high-speed small-sized equipments [sic] (vessels) will have an underwater function similar to the performance of small speedboats in seas, an ability that has worried the enemy.

Accordingly, we must use the same asymmetric approaches in building tools and equipments and even in defining our tactics.

In addition to rapid transfer of forces and detection of the enemy's surface and subsurface vessels, these submarines can identify military targets and carry special forces, while they also enjoy rapid swamp power and have radar (sonar) evading capability.

The system enjoys high-precision in targeting.”—Major General Mohammed Ali Jafari, April 24, 2011.

- “We should sketch out plans in a bid to resolve problems, and our goal should be winning the upper hand in the balance of powers in asymmetric wars.”—Brigadier General Ahmad Miqani, Commander of Khatam ol-Anbia Air Defense Base, July 6, 2009

- “What makes up for asymmetries in wars against those countries which enjoy technological superiority and hi-tech military tools and equipment is faithful and highly motivated troops.

This faith and motivation can resist against the enemies' superior equipment and make up for a given country's technological lacks and inferiorities. There, Baseej, as a faithful and motivated force, plays a decisive, fundamental and pivotal role in asymmetric battles."—Major General Mohammed Ali Jafari, Commander of the IRGC, December 10, 2007.

- “We can use all the available military equipment and tools in any (possible) asymmetric war through creativity, initiative and employing new methods.
We should redefine methods for utilizing weapons in accordance with the type of the combat.”—Brigadier General Mohammad Pakpour, Commander of the IRGC Ground Force, July 16, 2009
- “The new equipment (submarines) are smaller and faster under water and operate similar to our small speedboats, which terrify our enemies on the surface.
We are trying to increase our operational range and reach enemy vessels there [in the Indian Ocean].”—Major General Mohammed Ali Jafari, Commander of the IRGC, April 25, 2011
- “All divisions of the Islamic Republic’s military pay close attention to events in neighboring states and incorporate these into their asymmetric warfare training. For example, if we train pilots in aerial combat, we actively link those lessons with asymmetric warfare.”—Brigadier General Ataollah Salehi, commander-in-chief of the Iranian army, January 12, 2011
- “The Kaviran meets our needs in asymmetric warfare. Its high rate of fire could enhance our ability to confront helicopters and low-level planes.”—General Ahmad-Reza Purdastan, commander of the Islamic Republic of Iran Army Ground Force regarding the development of the new Kaviran all-terrain vehicle and its 7.62 mm Gatling gun, September 23, 2010
- “The Revolutionary Guards [Corps] will invest efforts in strengthening its asymmetrical warfare capabilities, with the aim of successfully confronting the enemies.”—Major General Mohammed Ali Jafari, Commander of the IRGC
- “After September 11, [2001], all [IRGC] forces changed their [mode of] operation, placing emphasis on attaining combat readiness. The first step [towards achieving] this goal was to develop [a strategy] of asymmetrical warfare and to hold maneuvers [in order to practice it].”—Major General Mohammed Ali Jafari, Commander of the IRGC⁶⁷

The Iranian conception of asymmetric warfare is combined with the doctrine of “Ashurai” warfare (a concept drawn from early Islamic history), which “gives priority to the ‘cause’ over the ‘objective.’ In other words, for a military force follow the concept, the mere act of fighting and fulfilling its duty to the fullest – including martyrdom- is an end in itself; the military outcome is of secondary importance.” A force with this kind of ideology will be highly motivated, so much so that the IRGC has even threatened to “launch suicide missions in the Strait of Hormuz using young Basijis.”⁶⁸

According to Fariborz Haghshenass, an Iranian military expert with the Washington Institute for Near East Policy,⁶⁹

“Iran’s leadership seeks to imbue its fighters with a belief in their spiritual superiority over their perceived enemies... Therefore, the IRGC’s leadership has chosen to emphasize the spiritual dimension in preparing for asymmetric warfare. To this end, they have launched a program aimed at deepening the revolutionary zeal and religious fervor in the ranks as the IRGC’s ‘center of gravity.’”

Asymmetric Forces and the Art of Limited War

These statements, and others like them, involve exaggerated and politicized rhetoric – some of which is probably part of an ongoing “war of intimidation” designed to pressure and deter Iran’s neighbors and the US, but they still help illustrate the trends in a critical part of Iran’s

military perceptions, actions, and force development, and highlight key exercises and developments in military technology.

“Going asymmetric” allows Iran to substitute asymmetric forces for weak conventional forces:

- Combined nuclear and asymmetric efforts sharply reduce the need for modern conventional forces – which have less practical value.
- Linkages to Syria, Lebanon, other states, and non-state actors like Hamas and Hezbollah add to Iran’s ability to deter and intimidate/leverage.
- Iran can exploit fragility in the Gulf, world dependence on oil exports, and GCC dependence on income and imports.

As the previous analysis shows, open source evidence shows that Iran is building an increasingly capable asymmetric capability, relying on hard factual indicators like Iran’s acquisition of fast-attack watercraft, midget submarines, anti-ship missiles, smart mines, light guided weapons, and UCAVs – all effective asymmetric tools to counter the superior conventional forces of its neighbors.

While the weapons that support the unconventional strategies Iran might use in posing a maritime threat are certainly important, it is also important to understand the concepts that underpin how these weapons will be employed. Two concepts are particularly important, which are passive defense and decentralization.

- Passive defense entails protecting Iran’s military assets from an enemy first strike. Protecting these assets will involve concealment, camouflage, deception, and exploitation of geography in order to ensure that Iranian forces can survive an initial strike. The impetus behind this concept comes from Iran’s observation of Iraq’s wars with the United States in 1991 and 2003, where American forces crippled Iraqi forces and infrastructure early in the campaign.⁷⁰
- Decentralization is another concept that comes out of these observations. Iran employs a “mosaic defense” that decentralizes the command structure to ensure resiliency in the face of degraded command and control capability. If passive defense is successful and Iran is able to protect its forces from an initial strike, these forces will emerge from hiding and carry out “mission-type orders that will not require them to remain in contact with their chain of command.”⁷¹

Ongoing Developments in Iran’s Growing Mix of Asymmetric Warfare Forces

Iran continues to improve the capabilities and training of its conventional forces for asymmetric warfare in recent years and to build up specialized elements within its force structure. As of 2012, some of the key recent developments in Iran’s growing asymmetric capabilities included:

- The development of the *Karrar* and *Ra’ad* UCAVs in early 2010, both of which have a range in excess of 1000 km and can destroy targets with guided munitions.⁷²
- The installation of a “Coastal Defense Missile” system along the country’s 1,500 mile coastline, a move deemed the “appropriate strategy” to protect the country from attack.⁷³
- The development of the *Khalij Fars* (“Persian Gulf”) anti-ship ballistic missile.⁷⁴
- The introduction of new high-speed combat boats armed with guided missiles and torpedoes such as the *Seraj-1* and the *Zalfaqar*.⁷⁵

- The introduction of the Bavar-2 flying boat, which is equipped with night vision and armed with machine guns and rockets.⁷⁶
- The introduction of high mobility all-terrain vehicles such as the ATV-500 Jaguar and the Kaviran.⁷⁷⁸
- Increasing use of SDVs (“Swimmer Delivery Vehicle”), which can be used for inserting special forces elements or laying mines covertly.
- Further development and deployment of midget submarines capable of laying mines and potentially firing torpedos in the shallw, ASW-unfriendly Stratis of Hormuz.

Unlike Iran’s conventional forces and its nuclear and missile efforts, the range of Iranian asymmetric options and forces is too wide to easily charterize or catalog. The core aspects of Iran’s growing capabilities for asymmetric warfare .

A Proven History and Uncertain Future

Iran has proven its capability to use such forces effectively. Iran’s past actions have shown this threat is all too real:

- Iranian tanker war with Iraq.
- Oil spills and floating mines in the Gulf.
- Use of Al Quds Force in Iraq.
- Iranian use of UAVs.
- Border and coastal “incidents.”
- Arms transfers, in cooperation with Syria, to Hezbollah.
- Pilgrimage “incidents” in Mecca.
- Missile and space tests; expanding range of missile programs (future nuclear test?).
- Naval guards’ seizure of British boat, confrontation with US Navy, exercises in Gulf.
- Development of limited “close the Gulf” capability.
- Hamas/PIJ arms transfer and their rocket attacks on Eilat, Aqaba in August 2010.
- Iran regularly practices “swarming” targets in the Gulf with large numbers of small craft, shore-based anti-ship missiles, missile-armed aircraft, and increasing support from UAVs/UCAVs.
- Increasingly arming and supporting insurgents in Afghanistan.

The US and its allies cannot ignore the need to make worst-case assumptions about the skill with which Iran can plan and operate in asymmetric warfare in the kind of medium to large-scale conflicts that it has not yet put into practice.

At the same time, there are few meaningful unclassified data on Iran’s real world capabilities to actually undertake an extended complex asymmetric warfare campaign or “war of attrition.” As is repeatedly stressed throughout this analysis, the IRGC and every other relevant element of Iran’s forces – with the exception of those who gained experience running insurgencies against the US in Iraq and Afghanistan – would have to go to war with forces and leaders that have not had any real military combat experience since the end of the Iran-Iraq War in 1988 – a period of near a quarter of a century.

This not only means Iran has no cadres with serious combat experience beyond the limited number of “advisors” in Iraq and Lebanon, but that it plans to fight a very different kind of

war than Iran has ever fought before. While innovation can be a blessing, a lack of real-world experience can be a major curse.

Despite Iran's lack of experience in actual fighting large-scale wars using such tactics and systems, Iranian doctrine indicates that executing an asymmetric strategy does not always require more than limited training and preparation. While Iran's older vessels certainly do not operate at full readiness because of the lack of maintenance and lack of adequate training, Iran's asymmetric doctrine does not require the kind of operational readiness found in advanced, conventional navies like the US Navy.

This strategy "does not require long-range deployments or complex, simultaneous ship movements at sea. Iranian naval exercises are focused on exercising basic capabilities, ensuring that if the IRIN and IRGCN need to fight, they can execute their short-range, short-duration, and technologically simple asymmetric warfare tactics capably."⁷⁹ The confined nature of the Gulf and Strait of Hormuz, and Iran's long coastline allow Iran to assume that any naval conflict will be close to home. Furthermore, Iran's wide range of small speedboats and fast attack craft, particularly those without anti-ship missiles, are not technologically sophisticated. Maintaining such simple craft is not particularly difficult.

Using Asymmetric Forces to Compensate for Conventional Weakness

These are all reasons to stress that Iran's weaknesses in conventional forces need to be kept in careful perspective. Iran has spent two decades building up capabilities for asymmetric and irregular warfare. The end result is still a mix of Iranian forces the US can counter relatively quickly with the large-scale use of its own forces, combined with a strong ability to escalate against targets within Iran. Still, any such escalation means a major war, and a full-scale use of force by the US would dramatically raise tensions in the Gulf and further poison long-term relations with Iran.

Iran has developed a mix of *conventional* and *asymmetric* land, air, and naval capabilities that can threaten its neighbors, challenge the US, and affect other parts of the Middle East and Asia. Iran may also be able to use state and non-state actors as proxies to threaten and manipulate a range of neighboring states, including Afghanistan, Iraq, and Israel. These forces are the key military elements of Iranian strategic competition and are steadily increasing in size and capability.

Accordingly Iran's asymmetric warfare capabilities may still give it a powerful capability to intimidate its neighbors and pose a higher risk to the US than a similarly sized symmetrically oriented military. It would be far harder for the US to defeat in a limited war of attrition or any other conflict where the US is unable to act decisively, overwhelmingly, and disproportionately in striking Iranian forces and targets (either for political reasons or because of a lack of support from the Arab Gulf state).

VI. “Closing the Gulf”: Iran’s Real World Military Options for Asymmetric Warfare

Iran’s threats to “close the Gulf” provide a tangible illustration of Iran’s asymmetric warfare capabilities – although it must be stressed that “close the Gulf” does not mean a real world focus on the Strait, but rather a wide range of different options for intimidation and conflict along all of Iran’s Gulf coast and outside it in the Gulf of Oman and the Arabian Sea. In fact, Iran places far more emphasis on activities like mine warfare outside the immediate area of the Strait of Hormuz than within it.

Iranian official military statements have both admonished the US and made indirect claims of responsibility for Iran’s capability to secure the Gulf area:

- “Anyone who can establish security in the Strait of Hormuz, can close it in the shortest possible time but, we are not after closing the strait.” —Rear Admiral Habibollah Sayyari, Commander of the Iranian Navy, November 18, 2013.
<http://english.farsnews.com/newstext.aspx?nn=13920827000765>
- “The Armed Forces have their own plans for every subject, but the decision to close the Strait of Hormuz lie on the Commander-in-Chief (Ayatollah Khamenei), who also receives consultations from the Supreme National Security Council (SNSC).” —Major General Hassan Firouzabadi, Chief of Staff of Iran’s Armed Forces, August 6, 2012.
<http://english.farsnews.com/newstext.php?nn=9104253063>
- “Compared with the Strait of Hormuz, the volume of oil transfer through the UAE pipeline is very meager and the pipeline’s capacity is not even one fifteenth of the capacity of oil shipment through the Strait of Hormuz.” —Nasser Sudani, Member of Parliament’s Energy Commission, July 18, 2012.
<http://english.farsnews.com/newstext.php?nn=9104250446>
- “The security of the Persian Gulf and the Strait of Hormuz is among the main priorities of the Islamic Republic of Iran and this security should be durable so that all counties of the region can protect and defend their interests and those of the region. Any factor impairing this security will threaten the national interests of the regional states.” —Ramin Mehman-Parast, Foreign Ministry Spokesman, July 18, 2012.
<http://english.farsnews.com/newstext.php?nn=9104250346>
- “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>

- “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

- “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>

While Iran’s asymmetric assets do not provide it with the ability to win a major direct conflict with US forces, the coordinated, simultaneous use of Iran’s submarines, anti-ship cruise missiles (ASCMs), fast-attack craft, and swarm tactics in a first strike could inflict costly losses on US naval forces and commercial shipping in the Strait. These assets and tactics, in combination with Iran’s large arsenal of naval mines, likely render Iran capable of closing the Gulf for a short while.

Moreover, Iran can retrofit many of the country’s civilian watercraft with rockets, heavy machine guns, and the ability to lay mines. Its IRGCN craft, however, represent Iran’s most modern and potent resources for striking against US forces in the Gulf and rendering the Strait impassable.

Iran does exercise such scenarios as has since the Iran-Iraq War and the mid-1980s. 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’ 5th 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.⁸⁰⁸¹

Strategic, Energy, and Global Economic Impacts

Iran stepped up its threats to “close the Gulf” in late 2011, at a time that illustrates just how the mix of US and Iranian competition interweaves between diplomatic, economic, and military dimensions. Iran backed its threats with a series of major naval exercises inside and outside the Gulf. It acted at a time when its nuclear program was moving steadily closer to the point where Iran would have a “threshold” capability to make nuclear weapons, simultaneously moving its uranium enrichment facilities into a deep mountain shelter near Fordow to protect it from threatened Israeli and US air strikes.

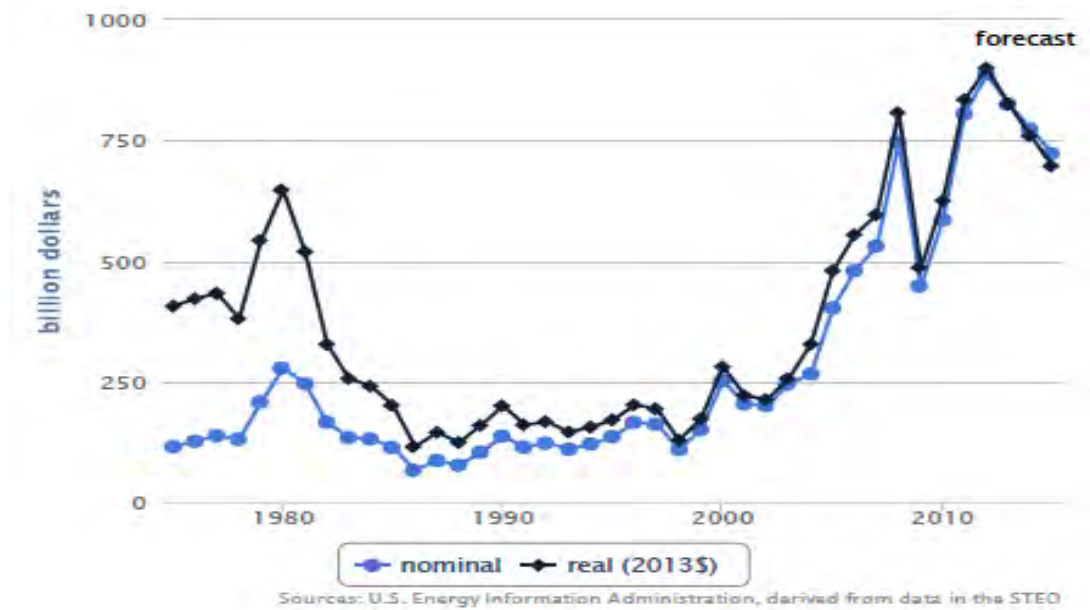
It was also a time when the US and EU had imposed far stronger sanctions that threatened to cripple Iran’s economy by targeting its financial and petroleum sectors. Israel was suspected of assassinating Iranian nuclear scientists, and possibly sabotaging Iranian nuclear and missile sites.

Iran was suspected of plotting to kill the Saudi Ambassador to the US and of bombings aimed at Israeli diplomats. A power struggle was going on over the future of Syria between an Iranian-backed Assad and a Sunni Free Syrian Army with the support of the Arab world and Turkey. The US and Iran were competing for influence over Iraq. Additionally, a new round of public debates was taking place over whether an Israeli might strike Iran to prevent it from acquiring nuclear weapons.

It is important here to understand just how critical threats to the flow of Gulf and Gulf of Oman maritime traffic are to the other Gulf states. The data on ship and tanker traffic vary significantly from source to source – although far more precise data are available at a classified level from observation posts on Goat Island at the Strait. What is clear is that most bulk shipment into the Gulf move by sea, and that the flow of petroleum exports is absolute critical to each Arab Gulf exporting state. This dependence on export income is illustrated in **Figure 23**, and provides a clear picture of the degree to which Iran can put pressure on its neighbors.

Figure 23: Importance of Sustained Oil Exports to Gulf Economies

Trend in total Gulf-OPEC Net Export Revenues



Net Oil Export Revenues

Country	Nominal (billion \$)				Real (billion 2013\$)			
	2013	2014	2015	Jan-Jun 2014	2013	2014	2015	Jan-Jun 2014
Iran	--	--	--	--	--	--	--	--
Iraq	\$86	--	--	\$46	\$86	--	--	\$45
Kuwait	\$92	--	--	\$45	\$92	--	--	\$45
Qatar	\$42	--	--	\$21	\$42	--	--	\$20
Saudi Arabia	\$274	--	--	\$130	\$274	--	--	\$127
UAE	\$53	--	--	\$26	\$53	--	--	\$25

Per Capita Net Oil Export Revenues

Country	Nominal (\$)				Real (2013\$)			
	2013	2014	2015	Jan-Jun 2014	2013	2014	2015	Jan-Jun 2014
Iran	--	--	--	--	--	--	--	--
Iraq	\$2,706	--	--	\$1,405	\$2,706	--	--	\$1,379

Net Oil Export Revenues

Country	Nominal (billion \$)			Real (billion 2013\$)					
	2013	2014	2015	Jan-Jun 2014	2013	2014	2015	Jan-Jun 2014	
Kuwait	\$29,949	--	--	--	\$14,368	\$29,949	--	--	\$14,103
Qatar	\$40,943	--	--	--	\$19,815	\$40,943	--	--	\$19,449
Saudi Arabia	\$8,939	--	--	--	\$4,184	\$8,939	--	--	\$4,107
UAE	\$9,736	--	--	--	\$4,576	\$9,736	--	--	\$4,492

Source: U.S. Energy Information Administration, derived from data in the *STEO*, <http://www.eia.gov/countries/regions-topics.cfm?fips=OPEC>, and http://www.eia.gov/countries/analysisbriefs/OPEC_Revenues/opec.pdf.

Strategic Dependence on the Overall Flow of Gulf Exports

It is important to stress that Iran can threaten the flow of Gulf petroleum exports to the global economy traffic at many points inside the Gulf, throughout the Strait of Hormuz, and in the Gulf of Oman. The geographic range and nature range of such Iranian threat capabilities is illustrated in **Figures 24 to Figure 27**. The Strait, however, does force all shipping activity to move through a very narrow target area both in the Straits and on either side, particularly in the areas where the shipping channels pass by Iranian-held islands to the west of the Strait.

As has been touched upon at the start of this analysis, 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. At its narrowest point, however, 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 Energy Information Agency report notes that,⁸²

Closure of the Strait of Hormuz would require the use of longer alternate routes at increased transportation costs. Alternate routes include the 745 mile long Petroline, also known as the East- West Pipeline, across Saudi Arabia from Abqaiq to the Red Sea. The East-West Pipeline has a nameplate capacity of about 5 million bbl/d. The Abqaiq-Yanbu natural gas liquids pipeline, which runs parallel to the Petroline to the Red Sea, has a 290,000-bbl/d capacity. Additional oil could also be pumped north via the Iraq-Turkey pipeline to the port of Ceyhan on the Mediterranean Sea, but volumes have been limited by the closure of the Strategic pipeline linking north and south Iraq.

It is important to stress, however, that it is not just the security of Strait that is of vital strategic importance to the West, but rather the secure flow of all petroleum exports. As **Figures 24 to Figure 27** show, Iran can attack or impede this flow from anywhere within the Gulf, and can terrify captains and shipping companies with only a few attacks. Moreover, there is little near to mid-term possibility that the world's dependence on the Strait will be reduced to any meaningful sense. Iraq has sought to negotiate an agreement with Turkey to extend the operation of the 1.6 million barrels per day pipeline, as well as to upgrade its capacity by 1 million barrels per day.

Figure 24: Geography of Iranian Air-Sea-Missile Threats



The Arabian Sea's surface area is about 3,862,000 km² (1,491,130 sq. mi). The maximum width of the Sea is approximately 2,400 km (1,490 mi), and its maximum depth is 4,652 meters (15,262 ft.). The biggest river flowing into the Sea is the Indus River.

The Arabian Sea has two important branches — the Gulf of Aden in the southwest, connecting with the Red Sea through the strait of Bab-el-Mandeb; and the Gulf of Oman to the northwest, connecting with the Persian Gulf. There are also the gulfs of Cambay and Kutch on the Indian coast.

Source: Google Maps and Wikipedia, http://en.wikipedia.org/wiki/Arabian_Sea.

Figure 25: Ports vs. Pipelines: Broader Range of Infrastructure Targets

Selected Oil and Gas Pipeline Infrastructure in the Middle East



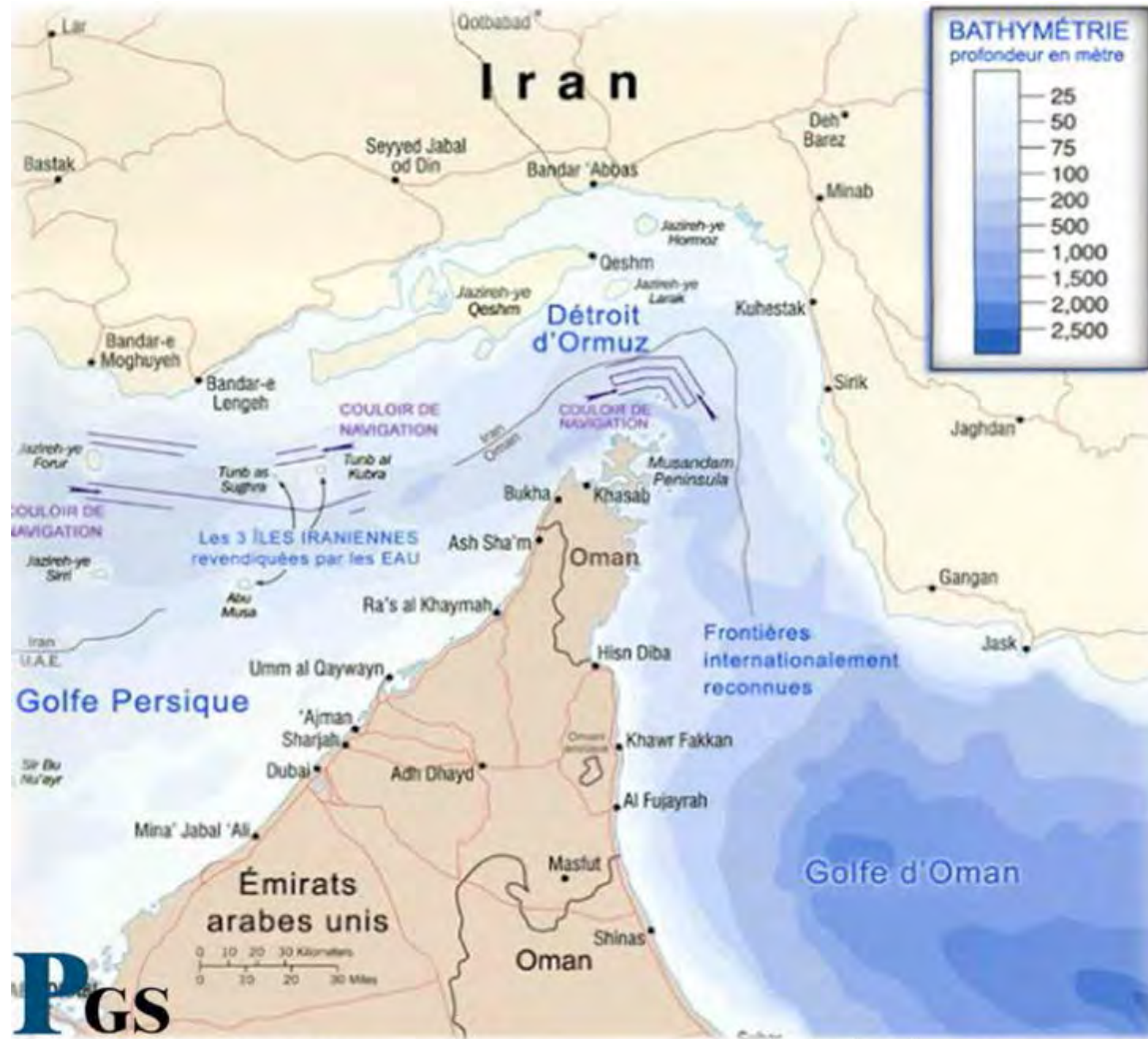
Source: EIA, accessed July 23, 2014.

Figure 26: Key Target Areas in the Gulf: You Don't Have to Break a Bottle at Its Neck



Source: Google Maps and Wikipedia, http://en.wikipedia.org/wiki/Arabian_Sea.

Figure 27: The Broader Strategic Threat to the Strait of Hormuz – Key Iranian Islands Near Shipping Lanes as Well as Strait Chokepoint



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Shifts in Future Global Dependence

These trends highlight the need to think beyond today's limits to Iranian sea-air-missile capabilities. The Arab Gulf states have made efforts to reduce their dependence on shipping through the Gulf and the Strait of Hormuz. Saudi Arabia can export another 4.5 million barrels a day of crude and 2 million barrels a day of natural gas liquids and products through the Yanbu' terminal on the Red Sea, but this pipeline is already in use and does not represent surplus capacity. Iraq has one major crude oil export pipeline, the Kirkuk-Ceyhan (Iraq-Turkey) pipeline, which transports oil from the north of Iraq to the Turkish Mediterranean port of Ceyhan. This pipeline has a capacity of around 300,000 barrels a day, but has been subject to repeated disruptions this decade, limiting exports from the northern fields.

As has been cited earlier, the United Arab Emirates is completing an Abu Dhabi Crude Oil Pipeline with a capacity of the 1.5 million barrels per day that will cross the emirate of Abu Dhabi and end at the port of Fujairah just south of the Strait. Other alternate routes could include the deactivated 1.65 million barrels a day Iraqi Pipeline across Saudi Arabia (IPSA), and the deactivated 0.5 million barrels a day TAPLINE to Lebanon.⁸³

The effect of such changes, however, will be limited even when they are complete and they will be largely offset by future increases in Gulf exports. Both the US EIA and International Energy Agency estimate there will be a steady increase in Gulf production capacity through 2030 – rising from some 25 million barrels a day of capacity in 2008 to some 35 million in 2035. The EIA report on the *International Energy Outlook* for 2010 estimates that Gulf oil production capacity will rise from 28 of the world total today to 31% in 2035 and do so in spite of major increases in production in other areas and in liquids from alternative fuels.⁸⁴

Iraq has signed an agreement with Turkey to extend the operation of the 1.6 million barrels per day pipeline, as well as to upgrade its capacity by 1 million barrels per day. This will add a total additional capacity of over 7 million barrels per day to the flow through the Strait of Hormuz. However, such pipeline expansions take significant time, and construction will likely take years from start to finish even if sanctions do not intervene.

The Critical Impact of Asian Dependence on Maritime Traffic Out of the Gulf

The patterns in direct dependence on Gulf petroleum imports are shown in **Figure 28**. Virtually all forecasts indicate that Asia, and particularly the emerging economies in Non-OECD Asia – such as China and India – will drive the increase in Gulf energy exports over the coming quarter century. The importance of the rise in Asia petroleum demand is clearly illustrated in **Figure 28**. The different charts in this Figure not only shows how much non-OECD Asia will drive the rise in demand and supply, shows that almost all of this rise in demand must be met from outside the region and from the Gulf.⁸⁵

The EIA summarizes the reason for the growing Asian dependence on Gulf petroleum exports as follows:⁸⁶

Non-OECD Asia is the largest source of growth in worldwide liquids consumption in the *IEO2013* Reference case, increasing by 19.3 million barrels per day from 2010 to 2040 (Figure 26). Within non-OECD Asia, China has the largest absolute growth in demand from 2010 to 2040 (10.5 million barrels per day), and India has the second largest (5.0 million barrels per day). India has the fastest regional GDP growth in the *IEO2013* Reference case, which translates into the fastest regional growth in liquids

demand (3.1 percent per year), although the absolute growth in India's liquids consumption is smaller than China's. In 2010, India's liquids fuel use was 35 percent of China's 9.3 million barrels per day; in 2040 India's liquids consumption is 42 percent of China's 19.8 million barrels per day.

As China's economy moves from dependence on energy-intensive industrial manufacturing to a more service-oriented economy, the transportation sector becomes the most important source of growth in liquid fuels use. China more than doubles its liquids consumption compared with the 2010 level, and it supplants the United States as the world's largest consumer of liquid fuels in the Reference case after 2035.

In India, petroleum consumption is heavily oriented toward diesel fuel, which represented about 42 percent of product volume in 2012. Diesel, which is used in transportation, irrigation, manufacturing, and electricity generation, has historically received significant government subsidies. In an effort to reduce budget and trade deficits, the Indian government raised diesel prices by 14 percent in late 2012, its largest price hike ever.

...With liquids consumption growth rapidly outpacing production, non-OECD Asia has increasingly relied on imports from the Persian Gulf. In 1990, 33 percent of non-OECD Asia's oil imports came from the Middle East; in 2010, 48 percent came from the Middle East [27]. This trend will likely continue in the future, with producers in Russia and Central Asia also increasing production in the eastern regions of the two countries to meet new Asian demand. Liquids demand in the Middle East also grows substantially in the *IEO2013* Reference case, increasing by 3.2 million barrels per day from 2010 to 2040 as a result of strong population growth rates, which are second only to Africa, and rising incomes. Liquids-intensive industrial demand also plays a major role in the region, with consumption in the chemical sector leading

Industrial demand growth. Delays in petroleum subsidy reforms outside Iran also support higher regional consumption, coupled with per capita income growth that supports a significant expansion within the transportation sector. In the later years of the projection, it is likely that some subsidy reform will occur and begin to slow the growth in demand for liquids.

The IEA makes similar estimates. The Executive Summary of the IEA report notes that global energy demand for oil exports will rise steadily in spite of any shifts in North American – China will increase its use of oil by as much as 66% between 2011 and 2030 and India will increase dependence by more than 100%. Moreover, the world will become even more dependent on the Gulf after 2020,⁸⁷

Growth in oil consumption in emerging economies, particularly for transport in China, India and the Middle East, more than outweighs reduced demand in the OECD, pushing oil use steadily higher in the New Policies Scenario. Oil demand reaches 99.7 mb/d in 2035, up from 87.4 mb/d in 2011, and the average IEA crude oil import price rises to \$125/barrel (in year-2011 dollars) in 2035 (over \$215/barrel in nominal terms). The transport sector already accounts for over half of global oil consumption, and this share increases as the number of passenger cars doubles to 1.7 billion and demand for road freight rises quickly.

The latter is responsible for almost 40% of the increase in global oil demand: oil use for trucks – predominantly diesel – increases much faster than that for passenger vehicles, in part because fuel-economy standards for trucks are much less widely adopted. Non-OPEC oil output steps up over the current decade, but supply after 2020 depends increasingly on OPEC. A surge in unconventional supplies, mainly from light tight oil in the United States and oil sands in Canada, natural gas liquids, and a jump in deepwater production in Brazil, push non-OPEC production up after 2015 to a plateau above 53 mb/d, from under 49 mb/d in 2011. This is maintained until the mid-2020s, before falling back to 50 mb/d in 2035.

Output from OPEC countries rises, particularly after 2020, bringing the OPEC share in global production from its current 42% up towards 50% by 2035. The net increase in global oil production is driven entirely by unconventional oil, including a contribution from light tight oil that exceeds 4 mb/d for much of the 2020s, and by natural gas liquids. Of the \$15 trillion in upstream oil and gas investment that is required over the period to 2035, almost 30% is in North America.

...Iraq makes the largest contribution by far to global oil supply growth. Iraq's ambition to expand output after decades of conflict and instability is not limited by the size of its resources or by the costs of producing them, but will require coordinated progress all along the energy supply chain, clarity on how Iraq plans to derive long-term value from its hydrocarbon wealth and successful consolidation of a domestic consensus on oil policy. In our projections, oil output in Iraq exceeds 6 mb/d in 2020 and rises to more than 8 mb/d in 2035. Iraq becomes a key supplier to fast-growing Asian markets, mainly China, and the second-largest global exporter by the 2030s, overtaking Russia. Without this supply growth from Iraq, oil markets would be set for difficult times, characterized by prices that are almost \$15/barrel higher than the level in the New Policies Scenario by 2035.

Some other projections indicate that Chinese demand for oil is projected to grow by 3.6% annually between 2012 and 2030, and by 1.29% between 2030 and 2040. Indian demand for oil is expected to grow by 2.6% per annum between 2012 and 2040.

By contrast, Japanese oil demand has been declining since 2005, due to government efficiency targets, movement toward alternative fuel sources, and an ageing population. Although the Fukushima disaster seems poised to move Japan incrementally away from nuclear energy, Japan's oil consumption is still projected to shrink annually by 0.4% between 2012 and 2040.

Virtually all forecasts also indicate that a massive shift will take place in the flow of IOR petroleum exports to meet increasing Asian demand at a time the growth in European demand will be limited and the US and other American states will become far less dependent on exports from outside the America.

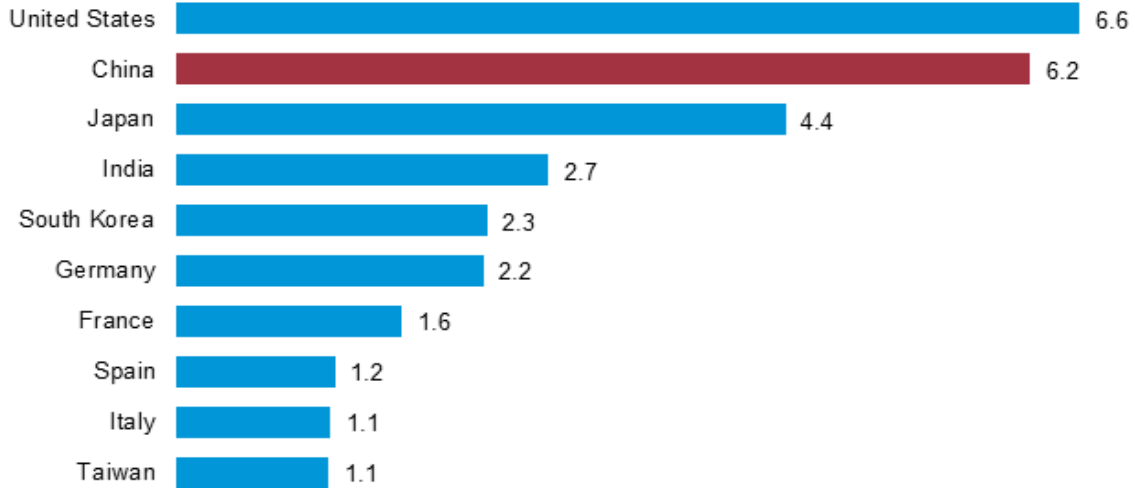
This shift will greatly increase its strategic importance of one sub-region in the IOR to both Asia and the world economy, as well as the importance of the security and stability of maritime traffic in the region. It will reshape Gulf petroleum exports, the flow of tankers from the Gulf to key IOR countries like India and the flow of petroleum to East Asia. At the same time, will reshape the flow of imports to the IOR area, and particularly to the petroleum exporting states – steadily increasing their dependence on the flow of Asia exports.


Equally important, it raises key issues regarding the role of the U.S., China, and East Asian powers like Japan and Australia in provide the air-sea-missile forces that will secure the flow of oil, gas, and petroleum products or potentially compete for influence and military power. Once again, virtually all forecasts now indicate that the US will become far less dependent on Gulf and IOR energy exports through at least 2035 while China and other Asian powers will become far more dependent.

Figure 28: Gulf vs. Other Sources of Petroleum Imports in Key Gulf Countries – Part One

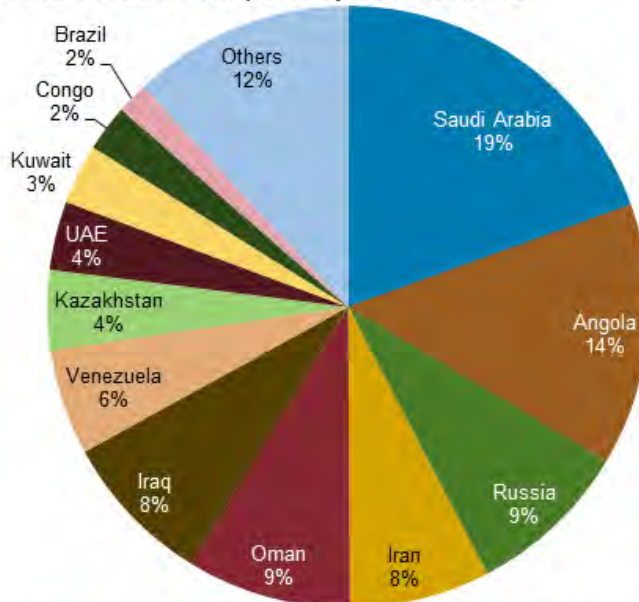
Top ten annual net oil importers, 2013

millions barrels per day



 Note: Estimates of total production less consumption. Does not account for stockbuild.
 Source: U.S. Energy Information Administration, *Short Term Energy Outlook*, January 2014.

China's crude oil imports by source, 2013




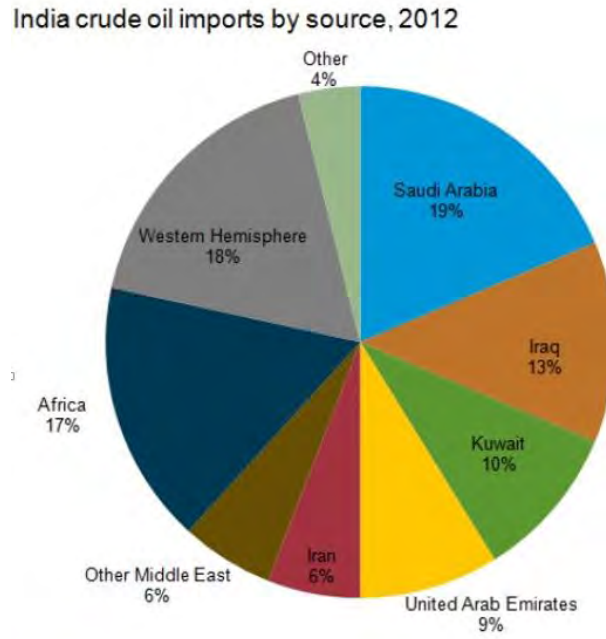
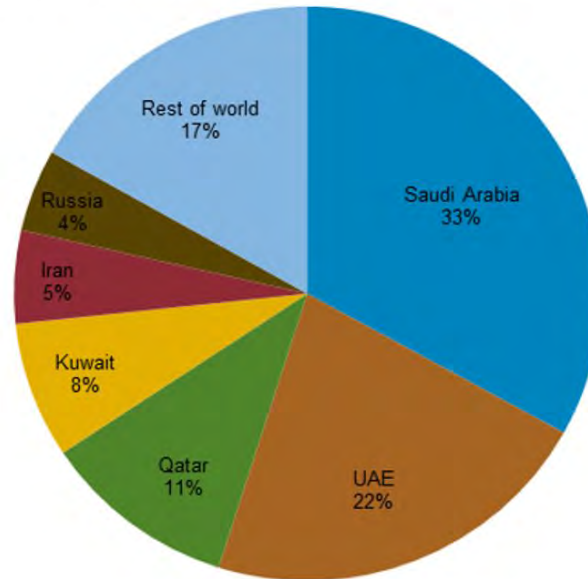
 Source: FACTS Global Energy, Global Trade Information Services.

Figure 28: Gulf vs. Other Sources of Petroleum Imports in Key Gulf Countries – Part Two



 Source: U.S. Energy Information Administration, International Energy Statistics, Lloyd's List Intelligence.

Japan's crude oil imports by source, 2012




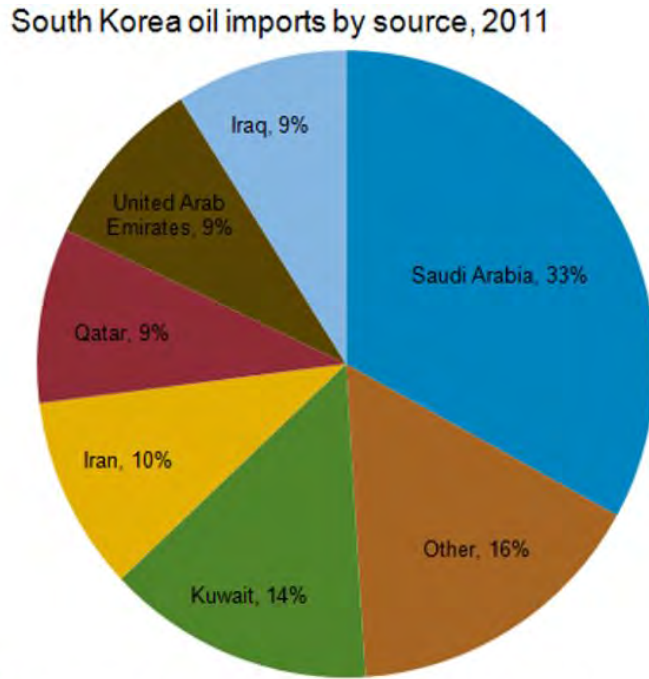
 Sources: Global Trade Atlas, METI

Figure 28: Gulf vs. Other Sources of Petroleum Imports in Key Gulf Countries – Part Two



 Source: U.S. Energy Information Administration, Korea Customs Services

Source: Provided by DOE/EIA, December 2013; and http://www.eia.gov/countries/analysisbriefs/China/images/crude_oil_imports_source.png.

The Uncertainties in US Import Dependence

Even the US – which some experts feel may be able to eliminate its need for direct energy imports in the future -- cannot begin to eliminate the risk inherent in any major cut in Gulf energy exports for the foreseeable future. While there are many estimates of future US import dependence – based on very different models of new oil and gas supplies, unconventional fuels, and changes in demand – the official US estimate by the Energy Information Agency of the Department of the most likely case is shown in **Figure 29**.

The US Department of Energy's latest best-case estimate is that the US will still be at least 32% dependent on imports of total petroleum liquids through 2040 – a dependence that is absolutely critical to the US transportation sector, and therefore to its entire economy. The US *Annual Energy Outlook* for 2014 states that,⁸⁸

With strong growth in domestic crude oil and natural gas production, U.S. use of imported fuels falls sharply. In the AEO2014 Reference case, U.S. domestic energy production increases from 79.1 quadrillion Btu in 2012 to 102.1 quadrillion Btu in 2040, and net use of imported energy sources, which was 30% in 2005, falls from 16% of total consumption in 2012 to 4% in 2040. In the AEO2013 Reference case, domestic energy production reached a total of 98.5 quadrillion Btu, and energy imports is projected to decline as a percentage of consumption to 9% in 2040. The larger increase in domestic energy production in AEO2014 is primarily a result of higher projections of production of natural gas and biomass/other renewables. Crude oil production (including lease condensate) increases from 13.9 quadrillion Btu in 2012 to a peak of 20.5 quadrillion Btu in 2019 before dropping to 16.0 quadrillion Btu in 2040.

With domestic crude oil production rising to 9.5 MMbbl/d in 2016, the import share of U.S. petroleum and other liquids supply falls to about 25%. Domestic production begins to decline after 2019, and the import share of total petroleum and other liquids supply grows to 32% in 2040, still lower than the 2040 level of 37% in the AEO2013 Reference case.

... U.S. use of imported petroleum and other liquid fuels continues to decline in *AEO2014* mainly as a result of increased domestic oil production. Imported petroleum and other liquid fuels as a share of total U.S. use reached 60% in 2005 before dipping below 50% in 2010 and falling further to 40% in 2012. The import share continues to decline to 25% in 2016 and then rises to about 32% in 2040 in the *AEO2014* reference case, as domestic production of tight oil begins to decline in 2022.

Some highly regarded energy experts like Ed Morse challenge the EIA estimates of continued US dependence on petroleum exports in its Reference Case estimates, and make a strong analytic case that the EIA and US government may be lagging behind in estimating the degree of future US and North American energy independence. The data involved are very uncertain and rapidly evolving.⁸⁹ However, even if the optimistic forecasts of cuts in direct US energy imports eventually prove to be correct, this will not affect the critical strategic importance of the Gulf to the US for the foreseeable future.

Long after 2020, US consumers will still have to pay global prices for their energy needs in any energy emergency coming out of a crisis in the Gulf, the US will be bound to share any remain access to exports with its partners in the IEA, and the US economy will be critically dependent on the fact that US trading partners (particularly those in East Asia, according to the IEA) will then be even more dependent on Gulf oil supplies.

While America may not remain a major direct importer of Gulf oil, it will pay the increased world prices for all its oil and other related increase in energy costs that come out of a war or crisis in the Gulf, and any reduction or expected reduction in global supply will increase such costs. Moreover, the US is projected to become even more dependent on a global economy --

and imports of manufactured goods -- that require the secure flow of Gulf energy exports to Europe and Asia

Moreover, direct US dependence on energy imports is only part of the story. The US has to pay world prices for oil in a crisis even if it is domestically produced, and this is true regardless of whether the US is dependent on Gulf oil exports at the time.

Even more importantly, US dependence on total imports of manufactured goods rises every year --particularly from Asia that is the region most dependent on Gulf energy exports.⁹⁰ The CIA estimates that the US had \$2,273 trillion in imports in 2013, out of a GDP of \$16.72 trillion. Some 95.1% were manufactured goods and services in some form and even in 2013 only 8.2% were crude oil. Some 30.4% were capital goods, 31.8% were consumer goods, and 24.7% were industrial goods other than petroleum.

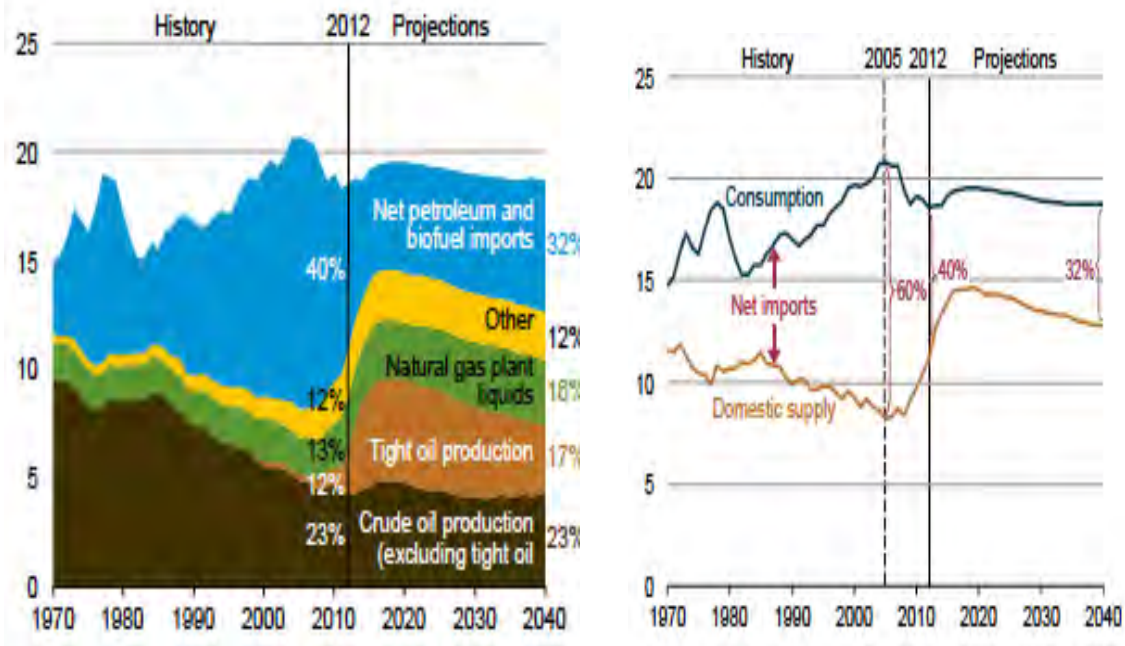
A total of 25.4% of these imports came from just two energy import dependent countries: China and Japan. In short, US dependence on indirect energy imports is far more important than direct imports of petroleum, and the rate of increase in indirect energy import dependence may well offset any reduction in US direct energy imports.⁹¹

The end result is that the US politics of calling for “energy independence” have limited impact on either US threat perceptions or plans for the defense of the Gulf. In practice, US national security planners accept the fact that the Gulf is and will remain is the location of a strategically vital share of the world’s petroleum resources.

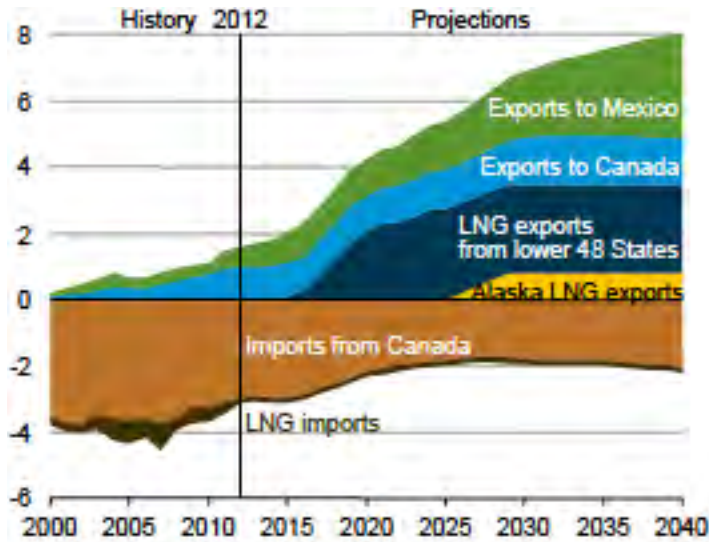
This helps explain why senior US, Israel, Arab, European, and other policymakers share a common perception that the global economy is critically dependent on the stable flow of Gulf oil exports. The politics of calling for “energy independence” have little – if any – impact on either US threat perceptions or plans for the defense of the Gulf. In practice, US national security planners accept the fact that the Gulf is and will remain is the location of a strategically vital share of the world’s petroleum resources.

Figure 29: US Dependence on Petroleum Imports through 2014 (Reference Case)

U.S. petroleum and other liquid fuels supply by source, 1970-2040 (million barrels per day)



U.S. natural gas imports and exports, 2000-2040 (trillion cubic feet)



Source: EIA, *Annual Energy Outlook 2014, Early Release Overview*, 2. 12-13, <http://www.eia.gov/forecasts/aeo/er/pdf/0383er%282014%29.pdf>.

Global Economic Impact of Sustained Interruptions

It is extremely difficult to calculate the economic impact of a successful Iranian effort to halt or severely reduce maritime traffic through the Strait of Hormuz. Much depends on the state of the global economy at a given time, assumptions about alternative sources of supply and substitution effects, and a host of other factors. Moreover, impacts vary sharply by country and assumptions about the psychological impact of a major conflict and interruption versus purely econometric considerations.

A study by CNA, however, illustrates some of the different economic impacts that a major interruption could have. The study was performed by William Komiss and LaVar Huntzinger, and is entitled *The Economic Implications of Disruptions to Maritime Oil Chokepoints*.⁹² As the authors are careful to note, the modeling involved is illustrative rather than predictive, but still helps put the issue in a far better perspective. **Figure 30** shows that it might take a sustained, major disruption to cut the GNP of most economies by one percent in a perfectly rational economic model. At the same time, **Figure 31** shows it might cause drastic levels of inflation in oil prices that had far more practical and immediate impact.

This analysis makes a strong case for additional modeling by the IEA and EIA to further refine the modeling of energy interruptions under both current and future export conditions, and taking full account of different conflict and crisis scenarios.

Figure 30: Durations in Days of Interruptions in Oil Exports through the Strait of Hormuz that Would Have a Major Economic Impact on Key Economies

Durations that cause GDP to drop by 1 percent in one quarter, Strait of Hormuz

Country	20% disruption	50% disruption	100% disruption
Australia		154	76
Belgium			283
China		171	84
Estonia		179	88
Finland			263
Greece		347	171
Hungary		321	158
India	347	139	67
Indonesia	120	48	23
Israel		318	155
Japan		177	87
Netherlands		233	115
Poland			214
Romania		235	116
Singapore	28	11	6
Slovakia		225	111
Slovenia		312	154
South Korea	143	57	28
Spain			318
Turkey			250
United States			350

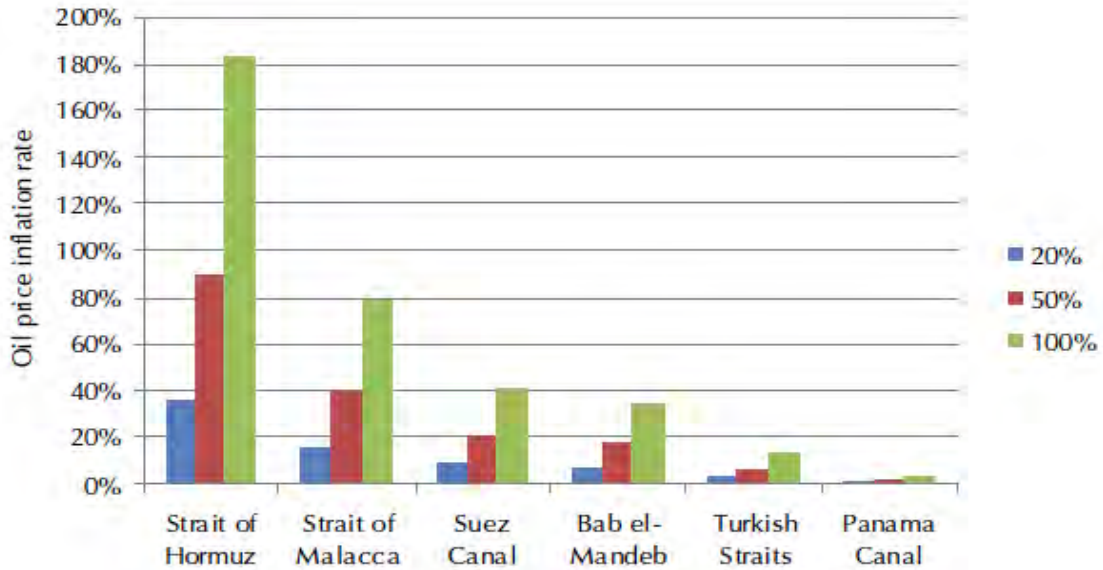
Durations that cause Employment to drop by 1 percent in one quarter, Strait of Hormuz

	20% disruption	50% disruption	100% disruption
<u>Strait of Hormuz (unmitigated)</u>			
Australia			228
China			252
Estonia			264
India			201
Indonesia	360	144	69
Japan			251
Romania			348
Singapore	84	33	18
Slovakia			333
South Korea		171	84
<u>Strait of Malacca (unmitigated)</u>			
Australia			312
China			342
Indonesia		192	96
Japan			357
Singapore	117	45	24
South Korea		228	114
<u>Strait of Hormuz (mitigated)</u>			
India			300
Indonesia			204
Singapore		171	48
South Korea			243

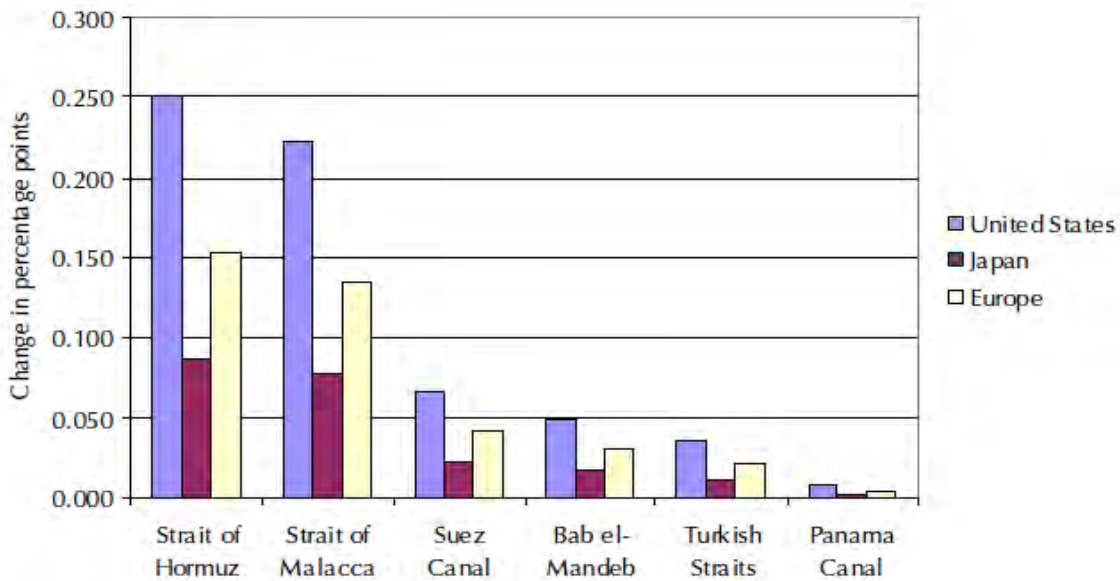
Source: Adapted from William Komiss and LaVar Huntzinger, *The Economic Implications of Disruptions to Maritime Oil Chokepoints*, CRM D0024669.A1/Final, March 2011, 38, 42, <http://www.cna.org/sites/default/files/research/the%20economic%20implications%20of%20disruptions%20to%20maritime%20oil%20chokepoints%20d0024669%20a1.pdf>.

Figure 31: Impact of Interruptions in Oil Exports Through the Strait of Hormuz on World Oil Prices

Increases to the world oil price if unmitigated, by chokepoint and percent disrupted



Inflation growth of United States, Japan, and Europe in response to unmitigated 50-percent disruptions



Source: Adapted from William Komiss and LaVar Huntzinger, *The Economic Implications of Disruptions to Maritime Oil Chokepoints*, CRM D0024669.A1/Final, March 2011, 43-44, <http://www.cna.org/sites/default/files/research/the%20economic%20implications%20of%20disruptions%20to%20maritime%20oil%20chokepoints%20d0024669%20a1.pdf>.

Iran's Military Assets for Such a Mission

As the previous analysis has shown, the Iranian military establishment and the IRGC is steadily acquiring the kind of military assets that can halt or obstruct Gulf shipping and threaten the US's superior conventional naval forces in the region. Although US conventional power would defeat Iranian forces in a protracted conflict, Iran's arsenal of smart munitions, anti-ship cruise missiles (ASCMs), submarines, mines, and fast-attack missile craft potentially could inflict significant losses on US and allied forces and disrupt Gulf shipping in a surprise attack.

There is no one scenario Iran would have to use in "closing the Gulf." Iran might actually try to use all of its assets to close the Gulf, but this would almost force the US, its Southern Gulf allies, Britain, and France into an all-out attack on Iran's conventional and asymmetric forces, and quite probably trigger a much broader set of attacks on Iran's nuclear, missile, and military production facilities. Such a war would also cut Iran off from exporting its own petroleum and from critical imports – including food, refined petroleum products, and manufactured goods. Iran has far smaller economic reserves than the Southern Gulf states and is already vulnerable to being shut out of the world banking system.

In contrast, Iran has a host of different tools it could use to threaten traffic through the Gulf, harass shipping, carry sporadic "anonymous" or semi-deniable attacks, or conduct a careful campaign of attrition designed to keep up constant pressure but remain below the threshold that would provoke or justify a massive US-led campaign.

If Iran stayed away from the Strait, it could also carry out such a campaign without threatening its own ability to export and import, and could seek the "weakest link" in the Southern Gulf to attack. Iran could play both a "short" and a "long" game – peaking its actions when it suits its interest, reducing or halting them if they become too provocative, and constantly changing its approach and tactics. This would also force the US and Southern Gulf states into a constant state of military alert and tension, greatly raising the cost to them in countering Iran.

Iran's Submarines

Iran's most modern assets for challenging US conventional power in the Gulf and closing the Strait include submarines, surface craft, mines, anti-ship missiles, and a number of other systems, with the former potentially the most potent.^{93,94,95}

Iran has attempted to offset some of the weaknesses of its major surface forces by obtaining three Type 877EKM Kilo-class submarines. As has been touched upon earlier, Iran has problems in operating its Kilos, particularly in realistic submerged missions. Overall training is also poor.^{96, 97}

Nevertheless, the Kilo is a relatively modern and quiet submarine that first became operational in 1980. The Iranian Kilos are Type 877EKM export versions that are about 10 meters longer than the original Kilos and are equipped with advanced command and control systems. They have maximum surface speed of 10 knots, a maximum submerged speed of about 17 knots, a minimum submerged operating depth of about 45 meters, an operational diving depth of 240 meters, and a maximum diving depth of 300 meters. The

submarine also has a surface cruise range of 3,000-6,000 nautical miles and a submerged cruise range of 400 nautical miles – depending on speed and combat conditions.

Each Type 877EKM has a teardrop hull coated with anechoic tiles to reduce noise. It displaces approximately 3,076 tons when submerged, and 2,325 tons when surfaced. It is approximately 72.6 meters long, 9.9 meters in beam, has a draught of 6.6 meters, and is powered by three 1,895 horsepower generator sets, one 5,900-shaft horsepower electric motor, and one six-bladed propeller. It has a complement of 52 men and an endurance of 45 days. Its maximum submerged speed is 17 knots, and its maximum surface speed is 10 knots.

Each has six 530-mm torpedo tubes, including two wire-guided torpedo tubes. Only one torpedo can be wire guided at a time. The Kilo can carry a mix of 18 homing and wire-guided torpedoes or 24 mines. Russian torpedoes are available with ranges of 15-19 kilometers, speeds of 29-40 knots, and warheads with 100-, 205-, and 305-kilogram weights. Their guidance systems include active sonar homing, passive homing, wire guidance, and active homing. Some reports indicate that Iran bought over 1,000 modern Soviet mines along with the Kilos and that the mines were equipped with modern magnetic, acoustic, and pressure sensors.

They also have a remote anti-aircraft launcher with one preloaded missile in the sail, and Soviet versions have six SA-N-10 (Igla/SA-16) surface-to-air missiles stored inside. However, Russia supplied Iran only with the SA-14 (Strela). It can be modernized to carry Russian Novator Alfa surface-to-surface missiles, but Iran is not known to have any Novator Alfa's.

Iran could use its submarines to strike against US naval forces, attack commercial vessels, and lay mines. Iran's ability to use its *Kilo*-class submarines to deliver mines and fire long-range wake-homing torpedoes give it a potential capability to strike in ways that make it difficult to detect or attack the submarine. Mines can be laid covertly in critical areas before a conflict, and the mines can be set to active and deactivate at predetermined intervals in ways that make mining difficult to detect and sweep. Long-range homing torpedoes can be used against tanker-sized targets at ranges in excess of 10 kilometers and to attack slow-moving combat ships that are not on alert and/or lack sonars and countermeasures.

- 877EKM “*Kilo*”
 - Number in Service: 3
 - Speed: 17 kts
 - Max Depth: 300 m
 - Armament: 6 x 533 mm torpedo tubes; 18 torpedoes, or 24 mines

Iran does face significant operational problems in using its submarines in local waters, although not in most of the Gulf of Oman, the Arabian Sea, and the Indian Ocean. Many areas of the Gulf do not favor submarine operations. The Gulf is about 241,000 square kilometers in area and stretches 990 kilometers from the Shatt al-Arab to the Strait of Hormuz. It is about 340 kilometers wide at its maximum width and about 225 kilometers wide for most of its length. While heat patterns disturb surface sonars, they also disturb

submarine sonars, and the advantage lies slightly with more sophisticated and more numerous surface ships and maritime patrol craft.

The water is deeper on the Iranian side, but the maximum depth of the Gulf – located about 30 kilometers south of Qeys Island – is still only 88 meters. This means that no point in the Gulf is deeper than the length of an SN-688 nuclear submarine. The keel to tower height of such a submarine alone is 16 meters. Even smaller coastal submarines have maneuver and bottom suction problems, and cannot hide in thermoclines or take advantage of diving for concealment or self-protection. This may explain why Iran is planning to relocate its Kilo submarines from Bandar Abbas inside the Gulf, to Chah Bahar in the Gulf of Oman, and is deepening the naval facility at Chah Bahar.⁹⁸

The Strait of Hormuz at the entrance to the Gulf is about 180 kilometers long, but has a minimum width of 39 kilometers. In many areas, and only the two deep-water channels are suitable for major surface ship or submarine operations. Furthermore, a limited flow of fresh water and high evaporation makes the Gulf extremely salty. This creates complex underwater currents in the main channels at the Strait of Hormuz and complicates both submarine operations and submarine detection.

There are some areas in the Strait and the Gulf with considerable noise, but not of a type that masks submarine noise from sophisticated ASW detection systems of the kind operated by the US and the UK. Additionally, large parts of the Gulf – including much of the southern Gulf on a line from Al Jubail across the tip of Qatar to about half way up the UAE – are less than 20 meters deep. The minimum operating depth of the Kilo is 45 meters, and the limited depth of the area around the Straits can make submarine operations difficult. It is unclear if Iran's recent ASW and submarine exercises have shown it that its midget submarines might have greater striking power in the Gulf and encounter fewer difficulties than its Kilo submarines. If so, Iran might place a greater emphasis on its Ghadir submarines, at least in the initial stages of any conflict.

Submarines are easier to operate in the Gulf of Oman, which is noisy enough to make ASW operations difficult, but such deployments would expose the Kilos to operations by US and British nuclear attack submarines (SSN). It is unlikely that Iran's Kilos could survive for any length of time if hunted by a US or British Navy air-surface-SSN hunter-killer teams.⁹⁹

The effectiveness of Iran's submarines will also depend heavily on the degree of US involvement in ASW operations. The Arab Gulf navies only have token ASW capability. If the Kilos do not face US-led ASW forces, they could operate in or near the Gulf with considerable impunity. If they did face US-led forces, they might be able to attack a few tankers or conduct some mining efforts, but are unlikely to survive extended combat. This makes the Kilos a weapon that may be more effective in threatening Gulf shipping, or as a remote minelayer, than in naval combat. Certainly, Iran's purchase of the Kilos has already received close attention from the Southern Gulf states, and convinced them that they must take Iran more seriously.

Iran has talked about expanding this force. In January-February 2012, Rear Admiral Farhad Amiri of the Iranian navy claimed that Iran was designing and producing two new indigenously developed submarines, the *Fateh*-class (500 tons) and the *Be'sat*-class (12,000 tons); Iran also may have been developing *Qaa'em*-class submarines, which

were designed to supplement its *Kilo* fleet, but have since likely been folded into its other submarine development programs.¹⁰⁰ These claims, however, cannot be verified, and it is unknown whether or not Iran will field these assets. They do, however, reflect the importance Iranian military personnel place on submarines as a potential asset to counter or upset US naval presence in the region.

Iran's Submersibles and Midget Submarines^{101, 102}

As has been mentioned earlier, Iran's "midget" submarines represent another asset in the IRGC Navy's asymmetric forces. They are small, unobtrusive, and can operate in shallower waters better than the much larger Kilo. While they are relatively unsophisticated in comparison to larger, more modern submarines, their small size and low noise profile can be used launch surprise attacks on US forces and covertly lay mines

- IS-120 Ghadir "midget" submarine
 - Number in Service: 16
 - Displacement: 137.8 tons
 - Speed: 10 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
- *Nahang*-class:
 - Number in Service: 1
 - Displacement: 110/127 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 *Nahang* is reportedly stationed in the Caspian Sea, but can be transported overland to the Gulf.

While they would be unable to survive for any considerable length of time if they engaged prepared US forces, small submarines can be widely dispersed, used without warning against targets without ASW capability or that appear to lack readiness. They do pose a threat to US forces or unprotected commercial craft in a limited asymmetric campaign or the opening stages of a major conflict. Importantly, it must be noted that the modern South Korean ASW corvette sunk by North Korea in 2010, the *Cheonan*, is thought to have met its end at the hands of a North Korean *Yono*-class submarine, on which both the *Nahang* and the *Ghadir*-class are based.¹⁰³ Consequently, it is clear that

these vessels are capable of damaging or even sinking better-equipped, more advanced forces.

Swimmer Delivery Vehicles (SDVs)^{104, 105}

The capabilities of Iran's SDVs are not fully described in open source reporting. It is likely that their primary purpose is reconnaissance, sabotage, and the insertion of special operations soldiers and combat divers. They are likely restricted to short-range, coastal operations. Although it appears that their capability to threaten US forces directly are limited given their lack of armament and range, their small size and ability to elude detection render them potentially dangerous in an asymmetric campaign, particularly in a sabotage capacity.

- Al-Sabehat 15:
 - Number in Service: 5 (est.)
 - Armament: Up to 17 limpet mines
- Ghavasi-class "Chariot":
 - Number in Service: 1
 - Armament: Unknown. Possibly limpet mines carried by combat divers, or a single 533 mm torpedo.

Major Surface Warships^{106, 107}

Iran's key surface ships have been described earlier, and seem unlikely to play a significant role in any Iranian effort to close the Gulf. However, a summary analysis of their size and armament illustrates the range of surface threats that Iran might deploy:

- Sa'am-class (also called Alvand-class) light patrol frigates:
 - Number in service: 3
 - Displacement: 1,372 tons
 - Crew: 125-146
 - Speed: 39 kts
 - Armament: BM-21 artillery rockets, 3 x GAM-B01 20mm cannon, 1 x 76mm gun, 4 x SM-1 SAM launchers, 4 x C-802 anti-ship missiles (CSS-N-4 *Sardine?*), 2 x triple 324mm torpedo tubes (6 eff.), 1 x 114 mm gun
- Mouj-class corvette:
 - Number in service: 2
 - Displacement: 1,200 tons
 - Crew: 120-140
 - Speed: 28+ kts
 - Armament: 4 x C-802 anti-ship missiles (CSS-N-4 *Sardine?*), 4 x SM-1 SAM launchers, 1 x 76mm gun, 2 x GAM-B01 20mm cannons, 1 x Bofors 40mm AA gun, 2 x triple 324mm torpedo tubes (6 eff.), 1 x 76mm gun
- Bayandor (PF-103) missile/gun corvette:
 - Number in service: 2
 - Displacement: 900-1,153 tons
 - Crew: 140

- Speed: 20 kts
- Armament: 4 x C-802 anti-ship missiles (CSS-N-4 *Sardine?*), 3 x 76mm gun, 2 x Bofors twin 40mm AA guns, 2 x triple 324mm torpedo tubes
- Electronics:
 - Radar: AN/SPS-6C D Band Air Search, Decca 1226SS I band surface search, Raytheon 1650 I Band Nav, Mk 36 I/J band FC
 - Sonar: AN/SQS-17 Active/Passive sonar
 - EW: AN/WLR-1 ESM, AN/UPX-12B IFF

As has been noted earlier, such ships are an uncertain asset. Their air and missile defenses are poor to mediocre, they are highly visible targets, and they are easy to detect by radar. Committing them to combat almost ensures their loss, as the US-Iranian “tanker war” during 1987-1988 demonstrated. Moreover, if Iran does use them, they constitute a highly visible act of act that is clearly attributable to Iran – justifying an immediate and massive response.

Despite this, Iran has been upgrading its frigate and corvette holdings and building new major combatants. One potential use is to intimidate Iran’s GCC (and potentially Caspian) neighbors, pushing Iran’s edge in a force-on-force conflict if the US isn’t involved. Iran also probably has other, more unpredictable uses for these vessels – for suicide missions, as decoys, extended operations outside the Gulf before a conflict begins, raids in poor weather, or some other unforeseen use.

Fast-attack Watercraft, Speedboats, Patrol Craft, and Hovercraft^{108, 109}

Iran seems more likely to focus on the use of smaller ships. The IRGC Naval Branch and Iranian Navy’s ability to use such assets is shown by wide range of smaller vessels that they can now use for asymmetric warfare:

- *Kaman*-class and *Sina*-class guided missile patrol boats:
 - Number in service: 14 *Kaman*, 3 *Sina*
 - Armament: 4 x C-802 anti-ship missiles or 4 Noor/Qader anti-ship missiles, 1 x OTO-Melara 76mm Rapid Fire gun, 1 x Bofors 40mm AA gun. Some *Sina* are equipped with a 20mm cannon instead of the Bofors 40mm
 - Electronics:
 - Radar: Signaal WM28 I/J band surface search and FC radar, Decca 1226SS I band surface search.
 - EW: Alligator ECM
- *Thondor*-class missile boat:
 - Number in service: 10
 - Displacement: 208 tons
 - Crew: 31
 - Speed: 35 kts
 - Armament: 4 x C-802 anti-ship missiles, 1 x twin 30mm AA gun, 1 x twin 23mm AA gun
- C-14 China Cat:

- Number in service: 9
- Displacement: 19 tons
- Crew: 5
- Speed: 55 kts
- Armament: 4 x C-704 Nasr anti-ship missiles, 1x 122mm MLRS (12 barrels), 1 x 23mm cannon, and 1 x 12.7mm heavy machine guns on some craft
- Mk-13 Patrol Craft:
 - Number in service: 4-10
 - Armament: 2 x C-704 Nasr anti-ship missiles, 2 x 324mm torpedo tubes
- *Kajami*-class (Taedong-B) Submersible Torpedo Boat
 - Number in service: 3
 - Speed: 50 kts (est.)
 - Submerged speed: 4 kts
 - Armament: 2 x 324mm torpedoes
- *Gahjae*-class (Taedong-C) semi-submersible torpedo boat:
 - Number in service: 3 (est.)
 - Speed: 50 kts
 - Submerged speed: unknown
 - Armament: 2 lightweight torpedoes
- IPS-18 *Tir*-class torpedo boat:
 - Number in service: 10
 - Displacement: 32 tons
 - Crew: 6
 - Speed: 52 kts
 - Armament: 2 x 533mm, 1 x 12.7mm heavy machine gun
- IPS-16 fast attack craft (*Peykaap/Peykaap I, Bavar Peykaap II, Zolfaqar/Peykaap III*):
 - Number in service: 15 *Paykaap*, 25 *Bavar*, 6 *Zolfaqar*
 - Displacement 13.75 tons
 - Crew: 3
 - Speed: 52 kts
 - Armament:
 - *Paykaap*: 2 x 324mm torpedo tubes, small arms
 - *Bavar*: 2 x C-701 “Kowsar” anti-ship missiles or C-704 “Nasr” anti-ship missiles, 2 x 324mm torpedo tubes, small arms
 - *Zolfaqar*: 2 x C-701 “Kowsar” anti-ship missiles or C-704 “Nasr” anti-ship missiles, 2 x 12.7 mm heavy machine guns
- *Dalam*-class torpedo boat:
 - Number in service: 2 (est.)

- Status largely unknown. Capable of firing Russian Shkval (Hoot) supercavitating rocket torpedoes
- Possibly withdrawn from service?
- *Tarlan*-class torpedo boat:
 - Number in service: 15 (est.)
 - Displacement: 9.9 tons
 - Speed: 50 kts
 - Armament: 1 x Shkval (Hoot) rocket torpedo or other 533mm torpedo, 1 x 12.7mm heavy machine gun
 - Armament unknown according to Jane's, but theorized that Shkvals could be mounted on the craft.
- Explosive motor boat:
 - Number in service: unknown
 - Crew: 1
 - Warhead: 500lb shaped charge (est.)
 - Escape vehicle: 1 x Yamaha Waverunner VX Sport jet ski
 - Note: This craft is designed to destroy larger vessels by ramming them. The pilot, however, is not intended to die in the attack, and is theoretically capable of escaping the vehicle before impact on a jet ski. The craft is rumored to be piloted by specially IRGC special forces operatives similar to combat divers.
- *Seraj-1*-class (Bladerunner) MLRS boat:
 - Number in service: unknown
 - Displacement: 2.5 tons
 - Speed: 50-62 kts
 - Armament: 1 x 12.7mm heavy machine gun mounted on the bow, 107mm MLRS mounted above the cockpit
- FB RIB-33 high speed patrol boats:
 - Number in service: unknown
 - Displacement: 3.2+ tons
 - Crew: 3
 - Speed: 57 kts (max.)
 - Armament: 1 x 11-barrel MLRS
- FB MIL-40 MLRS craft:
 - Number in service: 2
 - Displacement: 6.6 tons
 - Crew: 3
 - Speed: 62 kts
 - Armament: 1 x 11-barrel 107 mm MLRS, 1 x 12.7mm heavy machine gun
 - Rocket launching capability not noted in Jane's

- MIL-55 HSPB:
 - Number in service: 1
 - Displacement: 17.1 tons
 - Crew: 5
 - Speed: 72 kts
 - Armament: 1 x 11-barrel 107mm MLRS, 1 x 12.7mm heavy machine gun, mines
 - Potential armament not noted in Jane's
- *Torough*-class Patrol Boat (Boghammar):
 - Number in service: 30
 - Displacement: 7.7 tons
 - Speed: 46 kts
 - Armament: Variable. Typical armament consists of 1 x 12.7mm heavy machine gun and 1 x 106mm recoilless rifle
- *Ashoura*-class (MIG-G-0800):
 - Number in service: 20
 - Armament: Variable. Typical armament can consist of 1 x 12.7mm heavy machine gun, 1 x 12-barrel 107mm rocket launcher, or 1 x M-08 (Sadaf-1/2) mine. Other possible armaments include 107mm recoilless rockets, RPG-7 launchers, and small arms.
- Type-4 high-speed patrol boats:
 - Specific stats unknown. Reportedly similar to the *Ashoura*-class of speed boats.
- Murce MIG-G-0900:
 - Number in service: 30
 - Armament: 3 x 12.7mm heavy machine gun, 1 x 12-barrel 107mm MLRS. Other possible armaments include 106mm recoilless rockets, RPG-7 launchers, and small arms.
- Parvin PGM-9
 - Number in service: 3
 - Displacement: 100-150 tons
 - Crew: 20
 - Speed: 22 knots
 - Armament: 1 x 40mm cannon, 1 or 2 x 20mm cannons, 2 x 12.7mm heavy machine guns, 1 x 81mm mortar, 4 racks of depth charges, 2 x 1 C-704
 - Electronics: Furunno I Band Navigation
 - Mortars not mentioned in Jane's
- MIG-S-2600:
 - Number in service: 6
 - Displacement: 85 tons
 - Speed: 35 kts
 - Armament: 1 x 107 mm MRL, 1 x twin ZU-23mm cannon

- Radar: Decca 1226
- 65' Mark III patrol boat:
 - Number in service: 10
 - Displacement: 46.3 tons
 - Crew: 8
 - Speed: 30 kts
 - Armament: Variable. Armament can consist of 12.7mm heavy machine guns, 7.62mm machine guns, Mk 16 20mm cannon, Mk 19 40mm grenade launcher, Mk3 40mm Bofors cannon, Mk4 60mm, or Mk2 81mm mortar. Small arms.
- Pashe (MIG-G-1900):
 - Number in service: 10 (est.)
 - Based on US Mk II patrol boats. Reportedly armed with a twin ZU-23 23mm cannon. Also equipped with surface search/navigation radar.
- Ghaem (MIG-S-1800):
 - Number in service: 20 (est.)
 - IRGCN patrol craft. Armament reportedly small arms and an Oerlikon 20 mm cannon.
- Kashdom-II inshore patrol craft:
 - Number in service: 15
 - Displacement: 19.6 tons
 - Speed: 50 kts
 - Armament: 1 x 23mm cannon, 1 x 12.7 mm heavy machine gun
- Peterson patrol boat:
 - Number in service: 30
 - Displacement: 20.1 tons
 - Crew: 5
 - Speed: 26 kts
 - Armament: 2 x 12.7mm heavy machine guns
 - Not found in Jane's
- BH-7 "Wellington" Mk5 hovercraft:
 - Number in service: 2-6
 - Displacement: 55 tons
 - Speed: 30-70 kts
 - Armament: 2 x C-802 anti-ship missiles, 2 x 12.7mm heavy machine guns

These craft are capable of carrying a wide range machine guns, rockets, missiles, and torpedoes, and all can be adapted to lay mines. As noted earlier, they are also being supplemented by new 70 knot low observable explosive boats designed for suicide missiles.

While most such vessels are unsophisticated, they could still be used in clusters or larger efforts to try to swarm US ships and overwhelm their defenses through sheer mobility and volume of fire. Alternatively, they could be used to conduct sporadic attacks in a long battle of attrition operating unpredictably from bases or hidden small sites anywhere in the Gulf or outside it.

Shore and Ship-based ASCMs^{110, 111}

Iran possesses a large number of shore, ship-based, and air-launched anti-ship missiles and ASCMs, most of which are operated by elements of the IRGC. These assets include shore batteries of ASCMs near the Strait, along Iran's coast and on its islands in the Gulf, many of which are on mobile launchers. It is notable that the US never successfully targeted Iraq's anti-ship missile assets during the war to liberate Kuwait although they were deployed along a far smaller coastal area. Many of Iran's missiles can be deployed on the smaller, harder to detect, and more expendable ships and boats in IRIN or IRGCN, or on Iran's fighters. Some could be remotely target by maritime patrol aircraft or UAVs.

Most of Iran's missiles are either Chinese-made, or derive from Chinese designs. Various reports indicate that they include the CSS-N-2 Silkworm, CSS-C-3 Seersucker (C-201), CSS-N-4 Sardine (C-801 Noor, C-801K), CSS-N-8 Saccade (C-802), C-701/TL-10 Kowsar, Sedjil, Ra'ad, Nasr, and the Ghader.^{112,113} Experts feel that the primary threats now come from the C-700 and C-800 series.

- CSS-N-4 Sardine/C-801 Noor
 - Number in service: 60-200 (includes all C-800 series missiles)
 - Range: 80km
 - Warhead: 165 kg
 - Speed: High subsonic
 - Launch platform(s): Truck launchers, Alvand/Mouj FFGs, Bayandor FSG, Hamzeh FSG, Kaman PTG, Thondar PCFG. Kilo possible.
 - *In January 2012, *Jane's* reported that Iran tested a reportedly upgraded version of the C-802 Noor missile during the Velayat-90 war games. The new missile, called the "Ghader," has a 200 km range according to Iranian sources. The existence of this missile has since then been confirmed.
- C-801K (air-launched version of the C-801 Noor):
 - Range: 37 km
 - Warhead: 165 kg
 - Speed: High subsonic
 - Launch platforms: F-4 Phantom, Su-24 Fencer, Mi-17 Hip.
- CSS-N-8 Saccade/C-802
 - Range: 120 km
 - Warhead: 165 kg
 - Speed: High subsonic
 - Launch platforms: Truck launchers, Alvand/Mowj FFGs, Bayandor FSG, Hamzeh FSG, Kaman PTG, Thondar PCFG.

- In 2010, Iran displayed the air-launched C-802k “Ghaem” next to a photo of an F-4 Phantom, which could potentially reflect its intended delivery platform. Some reporting indicates that this version of the missile possesses a greater operational range than the C-802.
- C-701/TL-10 Kowsar:
 - Launch platforms: trucks, shore batteries, ships, helicopters, and jets.
 - Kowsar TL-10A:
 - Range: 3-15 km
 - Speed: Mach .85
 - Warhead: 30 kg semi-armor piercing
 - Guidance: TV
 - Kowsar 1/C-701T:
 - Range: 4-15 km
 - Speed: Mach .8
 - Warhead 29 kg semi-armor piercing
 - Guidance: TV
 - Kowsar 2:
 - Little info. Likely IR-guided.
 - Kowsar 3/C-701R:
 - Range 4-25 km
 - Speed: Mach .78
 - Warhead: 29 kg
 - Guidance: Radar
 - In February 2, *Jane’s* reported that Iran unveiled a domestically produced version of the C-701 called the “Zafar.” Its exact capabilities remain unknown and unconfirmed.¹¹⁴ The “Zafar” is likely based off of the radar guided variant, C-701R.
- C-704/Nasr:
 - Range: 8-35 km
 - Warhead: 130 kg
 - Speed: Mach .9
 - Guidance: Radar
 - Launch platforms: Shore and ship-based launchers
- CSS-C-3 Seersucker/HY-2
 - Number in service: 300
 - Range: 90 km
 - Warhead: 450 kg
 - Speed: High subsonic
 - Launch platforms: Truck or tracked launchers.
- Ra’ad:

- Number in service: Unknown
- Range: 360 km (claimed/unverified)
- Warhead: 450 kg
- Speed: High subsonic
- Launch platforms: Truck or tracked launchers.
- RGM-84A Harpoon:
 - Range: 140 km
 - Warhead: 221 kg penetrating blast
 - Speed: Mach .8
 - Note: These missiles date to the late 1970s. Long thought to have been withdrawn from service, they have been sighted at Iranian military parades. The continued effectiveness of these units cannot be verified.

While many of these missiles are relatively short-ranged, the Strait of Hormuz is only 34 miles wide at its narrowest point, and Iran has many islands near the shipping channels. Smaller ships and boats are harder to detect by radar, and Iran might mount some missiles on commercial ships – a tactic it has practiced with other types of missiles.

Experts believe that Iran is likely planning to stack its missiles, avoiding the C⁴I difficulties associated with massive volleys while preserving their attritive effect against anti-missile systems. Modern anti-missile vessels carry only a limited number of SAMs that are effective against cruise and anti-ship ballistic missiles, restricted by the size of the ship and the expense of individual missiles. Iran, in contrast, has few physical or production line constraints on its supply of offensive missiles – although many indigenous platforms are of comparatively low technology.

This disjoint – large numbers of low quality missiles – may lead Iran to open any hostilities with its domestically produced weapons, exhausting US and Gulf anti-missile systems before firing its best weapons. This stacking threat – while it leaves the launchers and their guiding radar systems vulnerable for longer – does present a threat to military and commercial vessels within range of all systems in the stack.

Naval Mines

As has been stressed throughout this analysis, naval mines can be used in a wide range of ways ranging from free floating, scattered mines that Iran could deny it had deliberately employed to sophisticated laying of “smart” mines. Iran could use almost any ship – Navy, IRGC, or commercial – to try to limit the freedom of movement for US and allied naval forces, block traffic into ports and petroleum facilities, and impede Gulf shipping traffic. Ship captains have been shown to be receptive to monetary incentives to continue shipping (wartime shipping rates) through a conflict.¹¹⁵ But this still requires that mines be cleared to such an extent that captains are willing to take the risk. History does not provide solid conclusions as to how many mines must be cleared before shipping resumes. Regardless of how much shipping can be sustained through a conflict, markets will be tense and prices for goods flowing through the Strait will be elevated.

Iran has a considerable capacity to lay mines. It has stock of at least 2,000-3,000 naval mines – and some reports put the total as high as 20,000, including 5,000 bottom-

influence and smart mines – as well as hundreds of vessels it could muster to lay them. In addition to the aforementioned combat vessels, Iran could use a wide range of other surface ships to mine a given portion of the Gulf (any surface ship can release mines).

Although the exact composition of Iran’s arsenal of mines is highly uncertain, Iran is thought to have increased its stocks of mines from some 1,500 at the time of the Iran-Iraq War to well over 6,000, be able to produce large numbers of cheap conventional mines, and have adapted and produced a range of smart mines. Iran is believed to have significant stocks of more advanced “smart mines” equivalent to mines like the Russian MDM-6 and the Chinese EM-52, as well as the Chinese MC-52, the EM-55, the EM-31, and the EM-11.

- MDM-6:
 - Type: Bottom
 - Warhead: 1,100 kg
 - Operational Depth: 12-120 m
 - Fusing: Magnetic, acoustic, pressure

Note: The MDM-6 is a sophisticated mine that detonates in response to magnetic, acoustic, or pressure influences within a radius of 50-60 meters, and it has an operating depth of approximately 12-120 meters. It is a moored mine that fires a torpedo-like warhead when it senses a ship, and the mine’s warhead consists of 1,100 kg of high explosive. The MDM-6 can be laid by number of systems, including the 533 mm torpedo tubes of Iran’s *Kilo*-class submarines, or from surface ships with the appropriate rail and stern ramps.¹¹⁶

- EM-52:
 - Type: Bottom, rising
 - Warhead: 300 kg
 - Operational Depth: 4.8-183 m
 - Fusing: Acoustic

Note: This mine is guided in its “rocket” ascent phase. It can be deployed with a submarine’s torpedo tubes. It is considered to be Iran’s most potent mine, and, according to some reporting, may be able to pierce the keel of a US aircraft carrier.¹¹⁷

Mines with capabilities like those of the EM-52 and the MDM-6, as well as any other similar “smart” mines in Iran’s arsenal, may be capable of tracking multiple targets, and can be difficult to detect as they rest on or near the seafloor. In one case in 1982, a British minesweeper took six days to identify and neutralize one large smart mine in the Red Sea.¹¹⁸ Even relatively unsophisticated “dumb” mines, however, present a threat to US forces and Gulf shipping, as they are not easily detected or removed, and can be laid in large numbers by almost any ship that has the capacity to physically carry them.

For instance, an Iranian M-08 World War I-era mine nearly sank the USS Samuel B Roberts after the ship struck it on April 14, 1988.¹¹⁹ Although the M-08 is an antiquated moored contact mine, it nearly sank an advanced US naval ship that was caught off guard. Consequently, Iran’s ability to lay a large number of mines in a short period of time remains a critical aspect to its stated capability to deny US forces access to the Gulf, and impede or halt shipping through the Strait.

The fact that Iran can lay mines in so many different ways over so wide an area also presents major problems in terms of mine warfare for the US, its Gulf allies, and Britain and France. However, Iran still faces some limitations in mine laying. Iran's most advanced submarines, the *Kilo*-class, will have difficulty laying mines in the Strait of Hormuz. These submarines have a minimum operating depth of 45 meters and the submarine itself is 25 meters high. Few places in the Strait are more than 80 meters deep. Laying mines in such an environment will require a highly trained and well-practiced crew. The more glaring issue is the number of mines that can be laid per sortie. Considering the United States' "hair-trigger posture," the first sortie undertaken by mine layers may very well set off an American reaction. Large mining operations involving many small vessels or repeated sorties to and from the Iranian coast will be easy to spot and will certainly elicit American reaction.¹²⁰ While larger surface vessels can lay many mines at once, smaller Iranian surface vessels will need to make several trips back to the shore in order to lay more mines. Many speed boats are only large enough to carry one mine (usually a contact mine) and footage has shown speedboats with a maximum of four mines. The initial mine laying will likely be Iran's most effective one as successive mining operations will likely face alert coalition forces. The US now permanently deploys a force of four minesweepers and currently deploys an additional four minesweepers, an extensive ship-based force of minesweeping helicopters, and unmanned undersea vehicles. The Saudi Navy has four aging US Navy MSC-322 (Addriyah-class) minesweepers, and three modern UK Sandown (Al Jawf-class) mine hunters, and several southern Gulf navies have minesweeping helicopters.

As noted earlier, the US has made upgrading its mine warfare capabilities in the Gulf a key part of the new strategy that it announced in January 2012, and the US Navy has extensively planned for both mine warfare in the Gulf under current conditions and upgrading its forces and cooperation with its allies in the future. While these new capabilities are not yet in place, and it may be some time before they reach full effectiveness, the US Navy will soon have a much higher capacity to detect and eliminate mines – particularly if it cooperates with European navies.

The US and its Arab Gulf allies now have relatively limited assets to deal with possible forms of mine laying over so wide and oceanographically complex a region. Any success is heavily dependent on the willingness of the US and GCC states to act immediately if Iran is detected dispersing its mines, and/or arming various craft for actual mine warfare missions. This puts a heavy emphasis on preventive attacks versus mine warfare.

Mine warfare has also long been recognized as a key potential weakness in both US Navy capabilities and in NATO. It is unclear how effective the US has been in modernizing its mine detection and sweeping capability, and NATO European powers have done a better job in slow, peacetime sweeping operations in war. Britain is supposed to have the most modern such vessels in NATO European forces – and its Sandown-class mine sweepers failed to detect an Iraq mine field during the naval campaign in 1991.

This helps explain why the US announced in early 2012 that it would deploy a "mothership" (converted amphibious assault ship) to the Gulf to support mine warfare vessels and SOF. US mine warfare capabilities will also improve steadily in other ways in the near future. As has been described earlier in this analysis, the US has now made upgrading its mine warfare capabilities in the Gulf a key part of its strategy. It held joint

exercises with the British, French, and Gulf navies in the fall of 2012, and it plans to upgrade its mine warfare forces and cooperation with allied mine forces in the future.

While it may be some time before its new capabilities reach full effectiveness, the US Navy is also developing a much higher capacity to detect and eliminate mines. It is moving away from a classic mine hunting and killing approach to one based on detailed mapping of the debris and objects on the bottom in key areas. This allows it to quickly detect changes and possible mines. It is deploying a family of unmanned submersible mine warfare vessels to detect and kill mines, and will replace the use of divers with unmanned systems designed to detect mines and then detonate mines on a proximity and contact basis. These will have the ability to counter the sensors on “smart” mines.

Maritime Patrol Aircraft^{121, 122}

Iran’s P-3F maritime patrol aircraft and reconnaissance are aging, and are large, vulnerable, slow fliers that are easy to detect. Only two to three P-3s now seem to be operational. Nevertheless, Iran has Cessnas and some other smaller aircraft it can use for some aspects of these missions and these aircraft could still play a significant role in any asymmetric warfare scenarios where they could not be engaged and shot down.

- P-3F Orion:
 - Number in service: 2-3
 - Iran’s Orions are the most capable patrol aircraft of Iran’s navy, and they carry out ASW and maritime patrol operations. According to reports from the Gulf, however, the sensors these aircraft possess have degraded as a result of wear and tear, and a lack of spare/replacement parts.
- Da-20A Falcon:
 - Number in service: 1-3
 - Iran’s Da-20As have reportedly been fitted for electronic warfare and electronics intelligence missions. Their configuration and mission capability is uncertain.
- C-130H:
 - Number in service: 5 (est.)
 - Iran uses its C-130s for transport as well as aerial reconnaissance. These aircraft could potentially be used as a platform for laying mines as well.
- Fokker F-27 400M and 600M Friendship:
 - Number in service: 4 (2 of each class)
 - These aircraft are used by the IRGCN as logistics and patrol aircraft. Some reporting indicates that they have been adapted for mine-laying operations.
- DO-228:
 - Number in service: 2 (est.)
 - Twin engine maritime patrol aircraft fitted with surface search radar.

Helicopters^{123, 124}

Iran's naval aviation assets include a number of multipurpose helicopters, most which are used for transport, logistics, and can be fitted with machine guns and rockets. Iran also possesses approximately 50 AH-1J dedicated helicopter gunships. Their capabilities, however, have likely deteriorated without access to spare parts and modern weapons.

Torpedoes^{125, 126}

As noted earlier, Iran has a variety of torpedoes, including wake homing designs. Some can be used at long ranges of 4,000 to 5,000 meters. Others can equip remotely controlled small craft or suicide vessels. Some sources also report it has a range of much longer range homing torpedoes, although experts serious question such reports:

- 53-65KE:
 - Range: 26 km at low speed, 11 km at high speed
 - Speed: 44-65 kts
 - Guidance: Wake-homing
 - Fusing: Contact and magnetic
 - Warhead: 300 kg
 - Depth: 0-366 m
- TEST-71MKE & ME-NK:
 - Range: 12.8 km-26 km
 - Guidance: Active/Passive homing (wire guided)
 - Fusing: Contact and magnetic
 - Warhead: 205 kg
 - Depth: 0-366 m
- PT-97W/YT534W1:
 - Range: 8.7 km-13 km
 - Speed: 35-40 kts
 - Guidance: Passive acoustic homing, wake-homing
 - Fusing: Contact and magnetic
 - Warhead: 250 kg
 - Depth: 2-14 m
- CHT-02D:
 - Range: 8.7-13 km
 - Speed: 35-40kts
 - Guidance: Passive acoustic homing, wake-homing
 - Fusing: Contact and acoustic
 - Warhead: 250 kg
 - Depth: 2-14 m

- VA-111E Shkval “Hoot”:
 - Range 11-15 km
 - Speed: about 200 kts
 - Guidance: Internal – straight line
 - Fusing: Magnetic or timer
 - Warhead: 700 kg
 - Depth: 6 m

Note: The VA-111E is a supercavitating torpedo. This means that the torpedo generates a gas cavity around itself while it moves through water, which enables it to move at extremely high speed. As a result, however, it does not have sonar tracking, and can only travel in a straight line. These properties render the VA-111E an excellent weapon for an ambush or first strike on unsuspecting targets, but disadvantage it in the sense that it cannot “lock on” a target. It is currently believed that Iran has a very limited number of these torpedoes, potentially as few as two.

- Mk-44/46 & ET-52:
 - Range: 5.6 km
 - Speed: 30 kts
 - Guidance: VHF active. Capable of helical search patterns.
 - Fusing: Contact
 - Warhead: 34 kg
 - Depth: 0-305 m
- DPRK 32 cm Torpedo:
 - Range: 4.8 km
 - Speed: Approximately 30 – 35 kts
 - Guidance: Passive acoustic homing, wake-homing
 - Fusing: Contact and magnetic
 - Warhead: Approximately 45 kg
 - Depth: 2-14 m

UCAVs and UAVs

As previous Figures have shown, Iran possesses a number of UAVs and UCAVs of varying sophistication and capability, including the Shahed 129, *Ra’ad*, the *Karrar*, the *Ababil*, and *Mohadjer*. Outfitted with explosives, they could be used as remotely piloted bombs. As in the case of Iran’s ASCMs and light fast-attack craft, significant numbers of these assets armed with an explosive charge could be able to swarm US ships and overwhelm their defenses. Both the *Karrar* and the *R’ad* are known to have ranges in excess of 1,000 km, and can destroy targets with guided munitions.¹²⁷

Iranian military officials have spoken extensively in public about the progress made by Iran in the area of UAVs and UCAVs. In a September 2012 news conference, IRGC Commander Jafari told reporters that Iran had produced a new generation of UAV called the “*Shahed 129*.” Jafari said the Shahed 129 was capable of 24-hour non-stop flight,

could carry out combat and reconnaissance missions, was armed with Sadid missiles able to hit long distance targets, and was IRGC's latest achievement in this field. (ISNA, 17 September)

Iran's Bases and Other Assets for "Closing the Gulf"

Iran's submarines are only a small part of the assets it can use. Iran has a wide range of surface assets and has naval bases and small military and civil, and contingency facilities in many places in the Gulf and in the Gulf of Oman. It has "stacked" layers of different types of land-based anti-ship missiles in the Strait of Hormuz, and it has the ability to operate from a range of islands near the main shipping channels in the Gulf, including Sirri and three islands it has seized from the UAE: Abu Musa and the Greater and Lesser Tunbs.

There are numerous coastal and island areas where Iran could disperse its forces to launch and sustain an asymmetric campaign to attempt to attack US and Southern Gulf forces, impede or halt commercial traffic, or launch small raids. These include the bases and facilities listed below:

Iranian Military Installations in the Gulf¹²⁸

- Bandar-e Khomeini (30°25'41.42"N, 49° 4'50.18"E)
 - The exact naval/military presence at Bandar-e Khomeini is unknown, and there does not appear to be a formal military facility. However, given this facility's strategic location, it likely has a military dimension.
- Bandar-e Mahshahr (30°29'43.62"N, 49°12'23.91"E)
 - This base is largely limited to housing patrol boats speedboats, some of which are armed with anti-ship missiles and torpedoes. As of June 30, 2009, its observable assets include the following:
 - 3 IPS-16 Paykaap
 - 5 Bavar
 - 1 IPS-18 Tir
 - 7 battle-ready speedboats
 - 30+ non-battle-ready speedboats
 - 1 Mk III patrol boat
 - 2 unknown patrol boats
 - 5-6 unidentified support/patrol boats
- Khorramshahr (30°26'2.71"N, 48°11'34.25"E)
 - Khorramshahr is the former headquarters of the Imperial Iranian Navy, and it is currently overseen and controlled by the IRGC-owned Shahid Mousavi industries group. It is the home to extensive repair and overhaul facilities of the IRGC Navy.
- Kharg Island (29°14'48.01"N, 50°19'48.88"E)
 - Kharg Island is the home of one of Iran's largest and most valuable petrochemical facilities. Its harbors are located alongside the protected eastern shore of the island with three observable individual harbors, though the other harbors are likely capable of hosting ships as well, and due to its strategic position, the island as a whole is probably capable of hosting much larger ships than what is visible.

Kharg's visible naval assets are composed of medium-large sized fast-attack crafts (FACs) such as several unknown types such as a Thondar look-alike, but with smaller rear-mounted missiles and a different bridge. There are also four more FAC or patrol boat of an unknown type. In the same harbor, there are a number of high-quality speedboats.

There are also a number of other military installations on the island, including a HAWK battery as well as several HQ-2 SAM systems of questionable operability. As of March 4, 2004, observable assets at the base include the following:

- 4 unknown patrol boats
- 20+ speedboats
- 1 unknown FAC
- Bandar-e Bushehr (28°58'2.58"N, 50°51'50.74"E)
 - This facility houses major assets of both the Iranian Navy and the IRGCN, as well as several of Iran's larger corvette-sized vessels. It also serves as a storage and repair/overhaul facility for Iran's naval assets.

Bandar-e Bushehr is also the home base for two of the IRIN's *Bayandor*-class corvettes, one of which is the IRIS 82 Naqdi, which has been refitted with two C-802 anti-ship missiles and new guns, which gives it an appearance distinct from that of the 81 Bayandor. This facility also houses 6-7 Kaman/*Sina*-class missile boats, including possibly the P228 Gorz. The port also houses a number of speedboats and semi-submersible vessels, as well as two RH-53D Sea Stallions and six AB-212 ASW helicopters. As of June 16, 2009, observable assets at the base include the following:

- 2 *Bayandor*-class corvettes
- 6 Kaman/*Sina*-class FACs
- 2 Hendijan support ships
- Various speedboats

As of January 16, 2010, the following assets have been observed at the naval academy (28°53'47.19"N, 50°51'3.96"E):

- 1 unidentified midget submarine (23 m)
- 2 unidentified midget submarines (17 m & 13 m)
- 3 probably Al Sabehat 15 SDVs
- 1 hover craft
- Various other small craft

- Asalouyeh (27°27'21.08"N, 52°38'15.55"E)
 - Inaugurated in 2008, this base is a recent addition to Iran's naval facilities. According to IRGCN Admiral Morteza Saffari, the base would house torpedo boats, FACs, shore-based anti-ship missiles, and possibly IPS-series patrol boats and Thondar FACs.
- 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 airstrip: 27° 9'15.68"N, 56° 9'49.97"E)
 - Bandar-e Abbas has been the headquarters of the Iranian navy since 1977, and is located in the Strait of Hormuz itself. It is Iran's largest and most important naval base, as well as the home of the majority of Iran's submarines fleet, naval aviation assets, and hovercraft. Moreover, it also the home of Shahid Darvishi shipbuilders, which produces a large number

of Iranian naval assets, including submersibles, landing craft, and tugboats. As of June 29, 2009, observable assets of the base include the following:

- 1 Bandar Abbas support ship
 - A number of unknown support ships
 - 1 Jamaran (Mouj) frigate
 - 1 Alvand frigate
 - 3 Thondar missile boats
 - 2 IPS-16
 - 4 IPS-18
 - 31+ speedboats
- Jask (25°40'40.90"N, 57°51'4.54"E)
 - IRGC base located approximately 150 km to the east of the Strait of Hormuz. It is suspected to house Ghadir midget submarines, as well as F-27 maritime patrol craft.
 - Bostanu (27° 2'58.22"N, 55°59'3.22"E)
 - Recently established IRGCN FAC and midget submarine base. It is known to house ship repair and building facilities. Located approximately 25 km to the west of Bandar-e Abbas
 - 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)
 - IRGC base. Suspected to house midget submarines and is suspected to house a large number of coastal anti-ship ballistic missile bunkers. As of December 21, 2003, observable assets at the base include the following:
 - 34+ speedboats
 - 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.

Iran can also use other shore-based anti-ship missile sites, other commercial ports, small harbors, and contingency facilities to support and deploy a wide range of military assets. These assets include surface ships, mines, land-based anti-ship missiles, maritime patrol aircraft, combat aircraft with anti-ship missiles, UAVs, and UCAVs.

Prioritizing These Threats

While Iran presents a wide range of such threats, the most serious military threat it poses may be the threat of a clash or conflict in the Gulf. Iran's assets include small, mobile, hard-to-detect platforms such as the Qadr-SS-3 midget submarine, high-speed combat boats such as the Seraj-1 and Zolfaqar, the Bavar-2 flying boat, the Kaviran all-terrain

vehicle, and the ATV-500 *Jaguar*, among others, all of which fit into the IRGC's asymmetric doctrine.^{129, 130, 131}

They also include the potential use of UCAVs, some 20 midget submarines, armed and unarmed unmanned submersibles, and new systems like the 70-knot, low observable Bladerunner 35 speed boat and other similar vessels armed with explosives to act as suicide boats. Further, Iran has developed a system for storing mines in a wide range of locations on its Gulf and Gulf of Oman coasts, dispersing them quickly to small shore facilities and/or boats, and making virtually any boat or ship a potential mine layer.

Iran practices using smaller combat ships in "clusters" of up to 10 against civilian or military targets, or in small groups of very different forces using different tactics and targets in a slow battle of attrition that poses a constant low-level threat calculated to avoid a massive US or Gulf response. These forces can be widely dispersed and used in unpredictable attacks, raising the risks and costs for civilian ships operating in the Gulf.

Moreover, also these forces can be concealed away from ports and military bases, giving Iran a second-strike capability. Iran can either escalate or drag out a constant crisis, seeking to wear down resistance to its demand or win grudging acceptance of its nuclear problems in the way that India, North Korea, and Pakistan have done, or provide a believable deterrent to what it would perceive as an unwarranted attack on its facilities. These capabilities include Iran's ability to threaten and intimate its Gulf neighbors, and threaten Gulf exports.

These systems are low-tech and lightly armed, and are not capital-intensive. They are intended to offset superior military technology through sheer numbers, stealthiness, and high mobility. Iran understands that it cannot reasonably win a fight against the US in a conventional war or direct frontal confrontation, and these assets are designed to strike at vulnerable targets and critical infrastructure, such as Gulf shipping, oil tankers, oil platforms, and coastal desalination facilities.

VII. US and Arab Gulf Options for Competing with Iran's Asymmetric Forces

The US, Britain, France, the Southern Gulf states, and other Arab states have long been reacting to both the threat posed by Iran's conventional forces and growing asymmetric capabilities, and its ties to non-state actors. Nevertheless, the net impact of Iran's extensive asymmetric assets and doctrine on Iranian, US, and Gulf capabilities remains uncertain. Neither the US nor any other conventional power has yet engaged asymmetric forces of the size and magnitude of those of Iran, therefore a net assessment of Iran's capabilities on the Gulf military balance is problematic and theoretical at best.

What is certain is that Iran's doctrine of using light fast-attack watercraft, submarines, mines, missile barrages, and other irregular warfare assets provides Iran with the ability to strike at critical infrastructure, Gulf commerce, larger conventional forces with little or no warning, and give it the potential capability to halt shipping in and out of the Gulf for a short period of time. This makes Iran's asymmetric warfare capabilities of key concern when assessing Iran's capacity to challenge the US and other large conventional military forces in the region.

US Forces in the Gulf

The US and its Gulf allies have established a major conventional presence in the Gulf in response to Iran's expanding capacity to wage asymmetric warfare. The US maintains installations in Kuwait (several jointly operated air and military facilities), Qatar (key air and command and control facilities), Bahrain (where the US 5th fleet is currently based), and Oman (preposition and contingency facilities). And as a legacy of forces stationed there between 1990 and 2003, Saudi Arabia also has bases that could accommodate US troops in an emergency.

The US cooperates closely with Saudi Arabia and the UAE, and has large groups of military advisors and contractor support in both countries. Britain and France also play a major role. Britain is particularly important in supplying key weapons to Saudi Arabia and in supporting Oman, and France plays a substantial role in Djibouti and the security of the Red Sea.

The US is strengthening its own forces. In January of 2011, the US announced that it would retool and modify an aging amphibious transport ship, the USS *Ponce*, to become what the US military has designated as an Afloat Forward Staging Base (AFSB) for military operations in the Middle East. According to US military documents obtained by the Washington Post, the purpose of this vessel will be a floating base for US special operations personnel, mine-clearing craft (MH-53 Sea Dragon helicopters), and patrol boats. The ship will also be used a test-bed platform for the Navy's Laser Weapons System and will be deployed to the Gulf sometime in 2014.

The documents indicated that the command vessel will be able to launch the high-speed watercraft and helicopters used by US Special Forces.¹³² Additionally, it must be noted that this ship will serve as an interim vessel before two purpose-built AFSBs can enter service in 2014.¹³³ Given its stated capabilities and area of operations, this AFSB and its

successors will likely be employed as bases to counter Iran's mature arsenal of mines, and strike at Iran's asymmetric assets in the Gulf if necessary. There already have been reports that the US is also building up its demining forces in the Gulf for this purpose and beginning to deploy added Special Forces capabilities.

The US is also reshaping its force posture in the Gulf to take account of its withdrawal from Iraq and the growth of the Iranian threat in other ways. It is deploying advanced missile defense cruisers to the Mediterranean and can rapidly deploy additional air and missile defenses to the Gulf. It is steadily improving its intelligence, surveillance, and reconnaissance capabilities in the region, and is equipping its long-range B-2 stealth bombers with new hard target bombs. In a crisis, it could rapidly deploy F-22 and F-35 fighters that have additional stealth attack capability.

In addition to traditional conventional systems, the US has developed several assets to counter the kinds of threats that Iran's asymmetric fast-attack craft and swarming tactics present – although most are still in the R&D stage. These assets include the Littoral Combat Ship (LCS) and the US Navy's Spike missile program. The LCS was designed to act as a counter to the kinds of threats posed by Iran's light fast-attack craft and other asymmetric assets. It has a shallow draft, and its design emphasizes speed, maneuverability, and mission flexibility.¹³⁴

The Spike missile, while not yet in active service, is a small guided missile being developed by the US Navy as an armament for UAVs and surface ships. The Spike is an optically guided fire-and-forget missile with a range of approximately two miles and carries a 2.2 kg warhead.¹³⁵ Highly versatile, the Spike could be used to great effect against Iran's light, fast-attack crafts. Although these systems are unproven, they are revealing in terms of the US's perception of asymmetric threats and its continuing efforts to counter such threats directly.

The US Navy's weakness in countermine warfare, however, remains a critical area of concern for US military planners and policy makers in the case of a conflict with Iran. In 2006-2007, the US Navy retired and sold its modern *Osprey*-class minesweepers, and its CH-53/MH-53 helicopters are aging. The Navy has decided to replace both systems with the LCS and the MH-60S Seahawk helicopter in the stead of the *Osprey* and the CH-53/MH-53, respectively. While the Navy currently has 12 LCS and 154 MH-60 helicopters in service, the systems they employ to detect and destroy mines have suffered setbacks in terms of development, performance, and delivery, and are largely untested in conflict.¹³⁶

These include the following:¹³⁷

- Raytheon Airborne Mine Neutralization System (AMNS – MH-60S only)
- BAE Systems Archerfish (expendable underwater vehicle that destroys or detonates mines)
- Northrop Grumman Rapid Airborne Mine Clearance System (RAMICS)
- Raytheon AN/AQS-20A towed sonar
- Northrop Grumman Airborne Laser Mine Detection System (AN/AES-1 ALMDS)
- EDO Corporation Organic Airborne And Surface Influence Sweep (OASIS)

Moreover, the mine warfare modules for the LCS are still in development. The LCS class is not currently as capable in countermine warfare as a dedicated minesweeping platform such as the *Osprey*, and the MH-60S will be forced to rely on the systems listed above as, it does not have the power to pull the same hydrofoil mine detecting platforms that the MH-53 can. These weaknesses and uncertainties present a challenge when confronting Iran's ability to lay large numbers of mines in a relatively short period of time.

The US Partnership with Southern Gulf, Other Regional, British, and French forces

US forces in the region are complimented by those of its Gulf allies – which already possess advanced aircraft, surface-to-air missiles, ships, and land weapons – its ties to other allies like Jordan, and its long standing partnership with Britain and France. The US also continues to furnish its regional allies with advanced weapons systems.

Major Improvements in Air Power

The heightening tensions between Iran and the US and the Arab Gulf states during 2011 has led to further agreements and contracts of the sale of advanced aircraft and air and missile defense systems to Gulf states that will greatly strengthen Gulf air forces.

For example, the US Defense Security Cooperation Agency (DSCA) notified Congress on October 20, 2010 of a 10-year \$60 billion US arms sale to Saudi Arabia. The deal included 84 F-15 Saudi Advanced (SA) fighter aircraft, and upgrades for the existing fleet of Royal Saudi Air Force F-15S multi-role fighters. The Obama administration announced that it had concluded a deal with Saudi Arabia to transfer the 84 F-15SA fighters for approximately \$29.4 billion US on December 24, 2011. The aircraft are scheduled to be delivered in 2015, with accompanying upgrades to Saudi Arabia's existing fleet of 70 F-15s and various aerial munitions.¹³⁸

The October 20, 2010 notification also included 70 AH-64 Apache attack helicopters (24 of which will be equipped with the Longbow Fire Control Radar system), 72 UH-60M Blackhawk utility helicopters, 36 AH-6I "Little Bird" light attack helicopters, and 12 MD-530F light turbine helicopters, among other weapons systems.¹³⁹ Similarly, the US and the UAE announced a \$5 billion US arms sale on November 8, 2010 that included 60 AH-64D Apache helicopters.¹⁴⁰ Lastly, the UAE also opened a new naval base at Al Fujairah near the eastern entrance to the Strait of Hormuz on October 10, 2010.¹⁴¹

On December 29, 2011, Andrew J. Shapiro, the Assistant Secretary of Political-Military Affairs, stated the following in a special joint press briefing on this and potential future arms sales to Saudi Arabia,¹⁴²

We are pleased to announce that over this past weekend, the United States and Saudi Arabia signed a letter of offer and acceptance for the sale of up to 84 advanced F-15SA fighter aircraft. It also includes upgrades to its current fleet of 70 F-15 aircraft, as well as munitions, spare parts, training, maintenance, and logistics.

This sale is worth \$29.4 billion. These F-15SA aircraft, manufactured by the Boeing company, will be among the most sophisticated and capable aircraft in the world. This agreement serves to reinforce the strong and enduring relationship between the United States and Saudi Arabia. It demonstrates the US commitment to a strong Saudi defense capability as a key component to regional security.

Since announcing in June – in 2010 our intent to conclude this sale, the Departments of State and Defense have worked closely with the Saudi Government and industry to finalize the particulars of the deal. Jim and I both recently made separate trips to Saudi Arabia, in part to discuss the sale.

Let me outline a few of the reasons why this defense package is so important and historic, and how it will advance US national interests. This sale will send a strong message to countries in the region that the United States is committed to stability in the Gulf and broader Middle East. It will enhance Saudi Arabia's ability to deter and defend against external threats to its sovereignty. It will advance interoperability between the air forces of our two countries through joint training and exercises. And lastly, this agreement will positively impact the US economy and further advance the President's commitment to create jobs by increasing exports. According to industry experts, this agreement will support more than 50,000 American jobs. It will engage 600 suppliers in 44 states and provide \$3.5 billion in annual economic impact to the US economy. This will support jobs not only in the aerospace sector but also in our manufacturing base and support chain, which are all crucial for sustaining our national defense.

I also wanted to note that this sale was carefully assessed under the US Government's Conventional Arms Transfer Policy. This policy requires such sales be deemed in the national security interests of the United States, are consistent with the country's legitimate security needs, and support US regional security objectives. With this agreement, the United States and Saudi Arabia have accomplished a historic achievement in our longstanding security partnership, a partnership that furthers security and stability in the Gulf region. Our longstanding security relationship with Saudi Arabia and other partners in the region has been a primary pillar of regional security for decades. And this sale further illustrates the firm commitment of the United States to the security and stability of the Gulf region.

The Principal Deputy Under Secretary of Defense of Policy, Dr. James N. Miller, elaborated further on the package as well as the intentions of the sale,

Let me start by reiterating that the United States is firmly committed to the security of the Kingdom of Saudi Arabia, as we have been for nearly seven decades, and that more broadly, the United States and Saudi Arabia have a strong mutual interest in the security and stability of the Gulf. Close cooperation between our militaries is central to that security and stability, and we are really announcing today the most recent example of that cooperation.

On December 24th in Riyadh, the United States and Saudi Arabia finalized the letter of offer and acceptance, or LOA, for the purchase of 84 F-15SA aircraft and, as Andrew said, for the upgrade of an additional 70 F-15SA aircraft to this SA configuration. And this government-to-government or foreign military sale is valued at \$29.4 billion.

I'd like to say just a few words about the capabilities that are under consideration. This aircraft, the F-15SA, will be the most capable and versatile aircraft in the Royal Saudi fighter inventory. And indeed, it will be one of the most capable aircraft in the world. The F-15SA will have the latest generation of computing power, radar technology, infrared sensors, and electronic warfare systems. As one example, the F-15SA will be equipped with an active electronically scanned array radar, or AESA. This radar includes the latest technology and will ensure that Saudi Arabia has the capability to operate against regional air threats. This sale also includes AMRAAM and AIM-9X air-to-air missiles, which provide both radar and infrared guided capability. The F-15SA will be able to strike targets day or night in all weather with a variety of precision-guided munitions. The air-to-ground weapon capability includes laser-guided and GPS-guided weapons, along with missiles that can attack ground-based radars and missiles – the Harpoon in particular specialized for maritime attack capabilities.

The communications systems of the F-15SA will allow the US Air Force and Royal Saudi Air Force to operate effectively together in the same airspace. And the system's interoperability will also allow both countries to – excuse me – to participate in coalition training, which is a priority for both of our countries. And in fact, this F-15SA package includes not just aircraft and munitions but the training and logistics support that Andrew talked about, and it's a very robust package. Much of the Saudi training in the F-15SA will occur alongside US forces. This will enhance our

already strong defense relationship. And approximately 5,500 Saudi personnel will be trained through 2019 – 5,500 through 2019, further strengthening the bonds between our forces and between our countries.

I've provided just a very high-level overview of the F-15SA's impressive capabilities, and I know that the Air Force and the Boeing Company will be glad to offer a lot more details. As Andrew said, the US-Saudi security relationship has been a pillar of regional security for decades. And this F-15SA sale demonstrates the firm commitment of the United States to the kingdom, and reinforces our mutual commitment to security and stability in the Gulf....

We expect the first delivery of the F-15SA of the new aircraft in early 2015 and expect the upgrades of the F-15S to the SA configuration to start in 2014. That's the expectation now. Of course, schedules are as schedules are.

With respect to the internal capability of the aircraft, it has very substantial capabilities. I'll give you just a little bit more in terms of the – I mentioned the – some of the munitions – the HARM anti-radiation missile that goes against radars for precision strike capabilities. We've got the Joint Direct Attack Munition, JADM; also the Paveway, which has an analogous capability, the Harpoon anti-ship missile; a very capable system called the Sensor Fuzed Weapon; and for the Defense people in the room, with the Wind Corrected Munitions Dispenser, which is just an incredibly capable system against moving vehicles; and of course air-to-air AMRAAM and AIM-9X capabilities as well. So very significant capabilities.

There's always the possibility that the Saudis would ask for more. This provides them everything that they asked for in their letter of request, and I know we have ongoing discussions that – where something else could be provided in the future.

In addition to purchasing US F-15SA fighters AH-64 Apache attack helicopters, Saudi Arabia agreed to purchase 72 Eurofighter Typhoons in 2006, which are currently in the process of being delivered.¹⁴³ This versatile 4.5 generation fighter is far more advanced and capable than any of Iran's aircraft, and will greatly empower Saudi Arabia to deter foreseeable Iranian aggression and launch retaliatory airstrikes against Iranian naval, coastal, and missile targets.

Missile Defenses

On December 25, 2011, the US finalized an agreement to sell a \$3.5 billion US anti-ballistic missile system known as Theater High Altitude Area Defense (THAAD) to the UAE in the first foreign sale of the system. The system is designed to target and shoot down SRBMs and MRBMs inside and outside of the Earth's atmosphere.

The deal included two full THAAD batteries, 96 missiles, two Raytheon AN/TPY-2 radars, 30 years' worth of spare parts, and support and training to the UAE.¹⁴⁴ The deal was announced during Iran's execution of the Velayat-90 naval exercises during which Iran tested missiles, mines, and other naval assets. Moreover, this deal follows a 2011 \$1.7 billion US commercial contract to upgrade Saudi Patriot anti-missile systems, and a \$900 million US sale of 209 Patriot missiles to Kuwait.¹⁴⁵ The transfer of missile defense systems of this scale and sophistication is unprecedented, and they reflect the threat perceptions of both the US and its regional allies in the Gulf regarding Iran's robust ballistic missile capabilities.

These arms transfers and others like them to virtually every Arab Gulf State represent a trend in Gulf procurement that began in the mid-1990s. Given the strong presence of US and other conventional forces in the region, any Iranian successes, while damaging and disruptive, would be limited in scope and duration by the overwhelming conventional

power of the US and its allies. The arms transfers also provide the GCC with the capability to retaliate to limited Iranian strikes without American support, lowering the response threshold and increasing the costs to Iran of any hostile action.

These purchases have also been supported by a steady increase in joint exercises between US forces, Gulf and other Arab forces, and European air and naval forces. Additionally, major US-led exercises designed to determine the best ways the US, allied, and Arab Gulf navies could to counter Iran's ability to "swarm," use mine warfare, use submersibles, use anti-ship missiles, and fight various forms of wars attrition were held in September 2012. It is unclear what the result of these exercises were in dealing with each of these difficult and uncertain challenges, but it is clear that the US is firmly committed to the defense of the Gulf.

These developments make it clear that not only is the US determined to outfit America's Gulf allies with some of the most advanced systems available in the pursuit of security in the Gulf and the Strait of Hormuz, but that it seeks to make them as proficient as possible in these powerful systems, avoiding past perceptions of Gulf militaries with top-notch equipment manned by under-trained soldiers.

Moreover, these arms transfers and the joint military exercises in the Gulf emphasize interoperability between US and Arab Gulf forces. In light of recent heightened tensions between the US and Iran over the Gulf and the presence of US forces in the region, these statements send a subtle, yet clear message that the US fully intends to bolster its military ties with its allies in the Gulf, an objective that includes supplying them with advanced weapons systems. This aid will provide the armed forces Gulf states with a qualitative superiority over their Iranian counterparts.

It also demonstrates that the US is in the region for the long haul. Despite the proposed pivot to Asia and America's reduced reliance on Gulf petroleum products, America's close and growing ties with Arab Gulf militaries demonstrates that the GCC will not have to face Iran alone. The emphasis on training, base construction, and interoperability suggests that even if US forces in the region decline slightly from their current high, American reinforcements would be able to rapidly integrate with Arab forces in any confrontation over the Gulf or Strait.

More broadly, the US has taken a multifaceted approach to confronting Iran's allies and proxies. In addition to direct military action in Iraq and Afghanistan, the US equipped and trained the security forces and intelligence services of regional allies and client states such as Saudi Arabia, the UAE, Iraq, Lebanon, and Kuwait to provide a counterweight to Iran and its own proxies.

Notable examples include US assistance to the Lebanese Armed Forces, Saudi Arabia's campaign against the Houthi rebels along its border with Yemen, and US efforts to train and equip Iraq's security forces in counterinsurgency tactics.¹⁴⁶ Lastly, the US took steps to curb arms trafficking, and engaged in information campaigns that sought to attack and delegitimize Iran and its allies.

The US, the Southern Gulf, and Iran's Capability for Naval Combat

For all its propaganda-like character, Iran's military rhetoric cannot be disregarded. Moreover, as the scenario analysis of Iran's asymmetric warfare capabilities later in this report shows, Iran's Navy can – at a minimum – play a significant role in intimidating other states and in threatening petroleum exports through the Gulf. The US Secretary of Defense notes in his annual report on Iranian forces to Congress, issued on June 29, 2012, that,¹⁴⁷

Iran's conventional capabilities continue to improve. Naval forces are adding new ships and submarines while expanding bases on the Gulf of Oman, the Persian Gulf, and the Caspian Sea. In addition, Iran continues to expand the breadth of its naval operations and in 2011 and early 2012 deployed two separate groups to the Mediterranean.

At the same time, Iran's navy is as vulnerable to a US or US-Gulf attack or counterattack as every other element of Iran's forces.¹⁴⁸ While it would be costly to destroy Iran's capabilities in an all-out naval conflict, and the political consequences would be subject to the law of unintended consequences, Iran would likely face the destruction of its navy and strategic defeat in any extended campaign at sea.

The US ability to dominate any escalation – including attacks on Iranian bases and superior technology in any conventional engagement – would allow it to apply overwhelming pressure if it chose to and had the support of its Southern Gulf partners.

While pre-conflict mining, missile swarms, and effective submarine tactics might allow Iran to inflict casualties on the US Navy, Gulf navies, and merchant ships, the IRIN and IRGCN would be defeated. As with its air force, the IRIN and IRGCN might be able to prolong the conflict through passive defense, spreading and decentralizing their forces to avoid catastrophic losses in the opening American-led (counter-) attack but the end result would be a decisive Iranian defeat.

Iran must also deal with the fact that the Arab Gulf states have growing naval power, and could play a significant role in dealing with Iran's asymmetric naval threats and combatting littoral forces, and potentially could gain control the Gulf without overwhelming US support. Southern Gulf Navies have also participated in some 60 exercises with the US, British, and French navies, and are improving in both their ability to operate with other navies and in terms of individual capabilities. The UAE Navy is making particularly good progress, although the Saudi Navy lacks readiness and recent Saudi military acquisitions have been focused on building air and land power, leaving their naval forces without a significant technological edge over the IRIN and IRGCN.

At the same time, Southern Gulf navies are weak in the critical areas of anti-submarine warfare, demining capability, and seaborne anti-missile technology, and remain somewhat divided. Iran's air and naval forces might still be used to selectively raid and attack targets in the Gulf region.

As is the case with Southern Gulf air and air defense forces, Southern Gulf naval forces also need an integrated command, control, and IS&R network, and a single naval command facility of the kind provided by US command ships and the 5th Fleet, or could be created by setting up the kind of unified GCC naval command facility that Bahrain has

offered to host. So far, such integration has been undermined by various intra-GCC tensions, preventing the creation of even a GCC-wide general staff. Allegedly, the strongest centralizer-status quo supporter tension has been between the Saudi government and Oman as centralizers and nationalists, respectively, with Saudi-Qatari disputes over Syria policy reducing Riyadh's support.

Southern Gulf naval forces also need more effective sea-air-missile exercises and training as well as standardization and interoperability – although once again all these problems have far less impact if Gulf navies cooperate closely with the US. Without US support, the Arab states are potentially vulnerable to Iranian conventional naval attacks despite their military resources given their lack of strategic depth, training, and real-world war fighting experience. With US support, Iran's weaknesses would be decisive in anything other than a carefully managed asymmetric struggle.

Dealing with the Broader Range of Problems in Gulf Internal Interoperability and Mission Focus

The discussion of Iran's asymmetric forces also reinforces all the caveats highlighted in the discussion relating to the deep problems in cooperation between the Gulf states. These include a lack of interoperability, mission focus, and interest in the efficient use of defense resources and economies scale.

The US has stated its desire to increase interoperability between the US and GCC member states, and between GCC states themselves. Efforts towards this end in the maritime security area have been most successful, highlighted by the large IMCMEX exercise in 2012. However, the more pressing issues of air and missile defense have yet to be resolved. Not only do GCC states mistrust each other, but there are serious doubts among GCC about American reliability in providing the equipment needed to facilitate interoperability.

Some progress has been made in air defense, where a common air picture based on a fiber optic communication network exists between GCC states. This allows a radar operator in the UAE, for example, to see aircraft flying in the region. However, not all parts of GCC states can be adequately protected with current missile resources.¹⁴⁹

The ballistic missile threat from Iran is what concerns the GCC states most, but it is also where cooperation has been the most difficult. They have been frustrated by US export controls on certain military technology, which they say is hindering efforts to build a multilateral integrated missile defense system.¹⁵⁰ For instance, the Link 16 communications system was a piece of technology that GCC states had asked for repeatedly in order to improve communication. However, the US was slow in transferring the technology and only Saudi Arabia and the UAE has this technology.¹⁵¹ To GCC member states, the sluggishness of the FMS process and the apparent reluctance to transfer advanced technology to the Gulf contradicts stated American commitment to a regional security architecture.¹⁵²

Different threat perceptions vis-a-vis Iran also exist between the various Gulf states. For instance, Qatar and Oman have maintained good relations with Iran. Oman was even instrumental in bringing the US and Iran to talks that led to a potential nuclear deal. The potential nuclear deal between the P5+1 and Iran elicited different reactions among the

GCC states, pointing towards various views on Iran. Oman, Qatar, and the UAE saw this as a potential first step towards peacefully resolving disputes with Iran on issues like maritime boundaries and trade. On the other hand, reactions from Saudi Arabia, Bahrain, and Kuwait ranged “from apprehension to outright panic.” While there is certainly a common concern regarding Iran’s growing military power, the degrees of concern vary between GCC member states.¹⁵³

Mistrust between GCC members underlies any interoperability problems. So deep is the mistrust between these states that even organizing a red-teaming exercise between representatives from several GCC members has been a near impossibility.¹⁵⁴ This lack of trust stems not only from different threat perceptions of Iran but also from the support of different political and/or militant groups in other Middle Eastern countries. For instance, Qatar’s support for the Muslim Brotherhood, which Saudi Arabia and the UAE view as a terrorist organization, led to Saudi Arabia and the UAE to withdraw their ambassadors from Qatar. As a result of these divides, GCC member states have preferred to pursue stronger bilateral ties with the US, hampering efforts to increase interoperability among GCC members.¹⁵⁵

There is no standardization and often very limited interoperability within the southern Gulf states. Although President Obama has “designated the GCC eligible for Foreign Military Sales,”¹⁵⁶ some GCC members are more advanced in their procurement policy and ability to integrate systems. These actors do not want to be held back in their own procurement plans.”¹⁵⁷ These lacks of standardization and interoperability show the degree to which each state has pursued its own military procurement plans without regard to the problems this creates for interoperability, common training and tactics, and economies of scale in training, service facilities, and in purchasing upgrades and munitions. Key missions like mine warfare and effective naval missile defense are not addressed and purchases are often made as much for their “glitter factor” in being unique or temporarily superior to a neighbor’s purchases as on the basis of military merit.

In fairness, NATO made and is making some of the same mistakes, but the Southern Gulf states would be far better off focusing on NATO’s successes than by repeating its failures. Unfortunately, they have so far ignored the calls for added unity from senior leaders like King Abdullah of Saudi Arabia, and often remain divided because of past feuds and petty rivalries. There is no way to correctly quantify the added cost and reduction in effectiveness caused by their failures in these areas, but a reasonable guesstimate is that costs have increased by 20-25% and effectiveness has been cut by at least 20-25% - leaving critical gaps in areas like dealing with Iran’s expanding capabilities for mine and other forms of naval asymmetric warfare.

The US can compensate in part by offering its advanced battle management, C⁴I, and intelligence, surveillance, and warning capabilities. The US cannot, however, keep all of the scarce assets needed constantly deployed in the Gulf, and the interoperability it creates can only be practiced during a limited number of joint exercises, and therefore leaves the Southern Gulf states with only limited effectiveness.

The US cannot make up for key mission gaps like mine warfare. It cannot compensate for a lack of integrated air defense systems, maritime surveillance systems, and common land warfare doctrine for dealing with key areas of vulnerability like the “Kuwaiti hinge” near

Iran. It cannot provide economies of scale in training, logistics, maintenance, and purchasing. It cannot help the smaller Gulf military forces compensate for their lack of force size by taking advantage of their large neighbors' C⁴I/BM, training, and maintenance assets.

The US can, however, offer unique advantages as a military partner, compounded by the role Britain and France play in the Gulf. But this is not a rationale for feuding, rivalry, and over dependence at cost of individual and mutual security and efficient military spending.

VIII. The Wild Cards Shaping the Iranian Maritime Threat

All of these challenges and trends need to be considered in the context of a range of “wild cards” that are shaping the future military balance. Iran’s capability to “close the Gulf,” which has been the main focus of the previous scenario analysis – is only one of the future scenarios that must be considered. The rapidly changing political, civil, and strategic dynamics of the region extend beyond the Gulf and create major uncertainties within in. They also create a broader set of questions about containment, deterrence, and the risks of war.

As is noted in the introduction to this study, the risks of any form of actual conflict should not be exaggerated. No major form of conflict in the Gulf is probable when seen from the idealized viewpoint of a “rational bargainer.” Iran’s current regime has so far been cautious in using military force, has much to lose from any sea-air-missile conflict in the Gulf and nearby waters, and must realize that the overall military balance does not favor Iran.

At the same time, the risks that Iran’s growing capabilities could lead to conflict should not be minimized. Little about recent history indicates that war, the way it begins, the way it escalates, and the force mixes involved are always shaped by rational bargainers sharing enough common perceptions and values to show restraint.

Many forms of conflict are possible, and they range from the most limited forms of asymmetric challenge discussed to missile and nuclear challenges discussed. The missile dimension can be termed **Wild Card One** and the nuclear dimension **Wild Card Two**. But, there are many other wild cards that have a more direct impact on the Iranian maritime threat:

Wild Card Three: A Weak, Isolated, and/or Iranian Influenced Iraq

The Iraqi civil war could change the sea-air-missile balance in the upper Gulf. Iraq already has little real warfighting capability to challenge Iran, leaving Kuwait exposed and giving Iran the option of carrying out a limited a naval option focused on Iraq, Kuwait, both, or pressuring both states to halt maritime exports. There is also a growing risk that ethnic and sectarian conflicts will divide Iraq, make it even weaker, halt US arms transfers, and that a combination of civil conflict or tensions and isolation by other Arab states will push Iraq into close ties with Iran. The end result could be something approaching an Iranian-Iraqi access in a maritime conflict or in cooperating to limit oil exports.

The Syrian crisis has changed the role of Iraq in other ways. Turkey has increasingly become involved in the Syrian civil war on the Sunni and Kurdish sides. Turkey has also aligned itself with the Kurds in Iraq in ways that have created growing tensions with the Shi’ite dominated, Maliki-led central government. One key question affecting Iran’s role in future maritime conflicts will be whether Turkey’s growing ties to the Kurds create new petroleum pipeline and export capabilities through Turkey that bypass the Gulf and the maritime routes that Iran can threaten

At the same time, the rise of an Islamic State in Eastern Syria and Western Iraq – and increases the risk that tensions between Sunnis in the Southern Gulf and Jordan, and the Shi'ites and Alawites in Syria, Iraq, and Iran could change the strategic map of the region in ways that would have a major impact on the security of Southern Gulf.

These forcers led the Arab states in the Southern Gulf into a massive arms build-up even before the rise of the Islamic State, and an air and missile defense build-up in cooperation with the United States that is steadily shifting the sea-air-missile balance in the Gulf and nearby waters and ports in the Indian Ocean. The UAE is also expanding its Navy and Saudi Arabia is considering a major new naval expansion plan.

The Iranian threat to maritime traffic -- sea-air-missile balance in the Gulf -- can never be separated from the broader patterns of conflict in the Middle East, and from the more local causes of political turmoil in the Gulf states.

Wild Card Four: The Uncertain Future Role of US Forces and Declining British and French Power Projection Capabilities

There is little current evidence that the various fiscal debates in the US, or present level of defense cuts, will prevent the US from maintaining a mix of sea-air-missile forces capable of deterring -- and defending against -- Iranian forces. There is, however, considerable ambiguity as to how dependent to US will be on power projection versus forward deployed forces, and this is particularly true of land forces.

More broadly, Britain, France, and other NATO European powers face far more serious defense spending constraints than the US, and Britain and France face the prospect of further defense spending cuts plus new priorities for security action in the Mediterranean, Africa, and the Levant. Britain and France have long played a key role as security partners in the gulf

Wild Card Five: Egypt and the Red Sea

The security of the Gulf and US capability to protect maritime traffic is partly dependent on Egypt's alignment with the US, its willingness to allow the US to project power by air and use the Suez Canal, and its role as a major voice in shaping opinion throughout the Arab World..

The other southern or African states of the Red Sea have long been unstable, although their forces have been too small to really matter, and they have no clear ties to Iran. They might become more of a threat if Egypt did not align itself with the US and Arab Gulf states, and this threat would be more severe if Yemen became a threat or French influence and power projection efforts did not continue in Djibouti.

Iran's threat to maritime traffic would be far greater if the Sisi regime in Egypt fails to bring stability and security to the Suez Canal, if tensions between Egypt and the US limit US transit rights through the Canal and overflight rights, or the Red Sea becomes sufficiently unstable so the security of maritime traffic through the Gulf, Gulf of Oman, and Arabian Sea becomes even more critical.

Wild Card Six: Internal Tensions and Instability in the Southern Gulf

The tensions that help limit military cooperation between the Southern Gulf states are, only part of the issues that affect Iran's relative sea-air-missile strength. The Southern Gulf states may have more oil wealth than most Arab states, but this scarcely means they do not have serious internal ethnic and sectarian tensions, that some do not have problems in meeting the key needs and expectations of their peoples, that demographic pressures do not create problems in employment, and that dependence on foreign labor does not increase these problems.

The US, its European allies, and the Southern Gulf states all need to recognize why leaders like King Abdullah, the Sultan Qabus, and the rulers of the UAE have put added resources into deal with civil unrest and needs, and that national security needs do compete for resources with internal security needs. As Egypt, Tunisia, Libya, Yemen, and Syria have all made clear in different ways, the balance of civil stability is always at least as important as the military balance, and is a key factor in shaping the risk of asymmetric warfare.

Wild Card Seven: What If Preventive Strikes Occur

The negotiations between the P5+1 and Iran remain uncertain and a new crisis could occur over Iran's nuclear weapons efforts. If either Israel or the US do launch a preventive strike on Iran, this would change the entire structure of Iranian competition with the US, the Southern Gulf states, and other states.

Iran's leaders have in the past shown that they can be rationale and deterrable, but they also escalated and prolonged the Iran-Iraq War in ways that went far beyond the level of conflict that many US and outside experts predict once Iraq was forced to withdraw from Iran. Game theory, rational bargaining, and escalation ladders based on shared perceptions are useful tools, but history warns that wars generally occur because the sides involved do not share the same information, calculations, perceptions, or values.

Iran leadership might feel it had to lash out in extreme ways – such as a major conflict in the Gulf or effort to “close the Strait of Hormuz” to discourage further attacks, to maintain popular support, seek to intimidate the other Gulf states into supporting some form of petroleum boycott, or simply out of anger or by mistake., Iran might react in ways affected by the uncertainties in its command and control and the risk IRGC commanders may act on their own or under autonomous control (in part to avoid decapitating Western attacks on C⁴I). In the past, some commanders have been encouraged to engage in aggressive behavior.

Much might depend on the political aftermath of any failure of the P5+1-Iran negotiations and just how serious a renewal and expansion of sanctions might be in terms of both Israel's execution of larger scale preventive strikes and Iran's response in ways that affected maritime security. Iran might come to feel that it had no choice other than to use the threat or reality of blocking maritime traffic if sanctions threaten Iran's stability and regime control. It might then react far more if the Iranian leadership assumed the US had given Israel tacit permission or a “green light.”¹⁵⁸

It is harder to estimate what Iran would do if the US carried out a preventive strike, or if an asymmetric conflict in the Gulf escalated to major air and cruise missile strikes on Iran. Iran could not win any such escalation on a purely military level, or even do critical damage to the US military in a war of attrition, at least given its lack of conventionally armed long-range range missiles or rockets with terminal guidance and precision strike capabilities.

Iran might escalate to missile warfare across the Gulf that affected ports, petroleum export facilities, offshore facilities and other aspects of maritime traffic even though its present conventionally armed ballistic missiles lack the accuracy and lethality to do serious damage except through a lucky strike. Iran is, however, now beginning to deploy missiles with GPS guidance and may be able to launch far more lethal attacks against key targets that affect the flow of maritime shipping like ports, desalinization plants and energy infrastructure over the next few years.

Wild Card Eight: Spillover of Tensions with Russia and China

The divisions between Russia and the US/Europe have helped lead to Russia sharply increasing its role in supporting the Assad military forces Syria and rapid delivery of Russian Su-25 combat aircraft to Iraq to deal with the threat posed by the Islamic state. It is at least possible they may make Russia far more willing to transfer advanced sea-air-missile weapons and system to Iran in the future. The same might true of the escalating tensions between the US and China.

Russia and China do have strong incentives not to alienate the Arab petroleum exporting states, but they have used arms transfer to Iran as leverage in the past, and this could increase the Iranian threat to maritime traffic in the future.

Wild Card Nine: A P5+1 – Iran Nuclear Deal

There is a more positive wild card. While some Gulf states have feared that a nuclear deal might lead the US to ally itself with Iran at their expense, there is no practical possibility of this happening. Instead, a successful nuclear deal might lead to a gradually easing of tensions on a far broader level, and cutbacks in the Iran maritime threat.

Any such détente that affected the sea-air-missile-balance would take time and is purely speculative at this point, but Iran, its neighbors, and the US do have a strong incentive to ease the prospects of a regional conflict, push back against the growing Sunni-Shi'ite divisions in the region, and concentrate on the common threat posed by extremist non-Ostate actors. Rationale behavior is always the exception to the rule, but it does happen.

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- ¹ EIA, *World Oil Transit Chokepoints*, Department of Energy, August 22, 2012, 1-2, http://www.eia.gov/countries/analysisbriefs/World_Oil_Transit_Chokepoints/wotc.pdf.
- ² EIA, *Iran*, updated July 22, 2014, <http://www.eia.gov/countries/cab.cfm?fips=IR>.
- ³ Based on the data in the EIA, *International Energy Outlook 2013*, Department of Energy, July 2013, 28-33 and 177-257, [http://www.eia.gov/forecasts/ieo/pdf/0484\(2013\).pdf](http://www.eia.gov/forecasts/ieo/pdf/0484(2013).pdf).
- ⁴ *Ibid.*, 30-33.
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Iranian designation

Fajr-e-Darya

Kowsar

Nasr

Tondar

Noor

Ra’ad

Designation in country of origin

Marte Mk 2 (Italian)/FL-6 (Chinese)

C-701 (Chinese)

C-704 (Chinese)

C-801 (Chinese)

C-802 (Chinese)

HY-2³⁷ (Chinese)

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About the Author

Anthony H. Cordesman holds the Arleigh A. Burke Chair in Strategy at CSIS. He has traveled frequently to Afghanistan and Iraq to consult for MNF-I, ISAF, US commands, and US embassies on the wars in those countries, and he was a member of the Strategic Assessment Group that assisted General Stanley McChrystal in developing a new strategy for Afghanistan in 2009. He frequently acts as a consultant to the State Department, Defense Department, and intelligence community and has worked with US officials on counterterrorism and security in a number of Middle East countries. He has worked extensively in Saudi Arabia and the Persian Gulf.

Before joining CSIS, Cordesman served as director of intelligence assessment in the Office of the Secretary of Defense and as civilian assistant to the deputy secretary of defense. He also served in other government positions, including in the State Department and on NATO International Staff. In addition, was director of policy and planning for resource applications in the Energy Department and was national security assistant to Senator John McCain. His numerous foreign assignments have included posts in the United Kingdom, Lebanon, Egypt, and Iran, as well as with NATO in Brussels and Paris. He is the author of a wide range of studies on energy policy, national and international security, and the Middle East, and his most recent publications include *Iran's Rocket and Missile Forces and Strategic Options* (CSIS/Rowman & Littlefield, 2015), *The Indian Ocean Region: A Strategic Net Assessment* (CSIS/Rowman & Littlefield, 2014), *Iraq in Crisis* (CSIS/Rowman & Littlefield, 2014), *The Gulf Military Balance* (CSIS/Rowman & Littlefield, 2014), and *Iran—Sanctions, Energy, Arms Control, and Regime Change* (CSIS/Rowman & Littlefield, 2014).



Aaron Lin is a researcher with the Burke Chair in Strategy at CSIS and a graduate student at the Elliott School of International Affairs at George Washington University. His studies have taken him to China and Singapore. Before coming to CSIS, he was an intern in the Special Projects Division of the National Consortium for the Study of Terrorism and Responses to Terrorism.

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