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Evolving Threats and Strategic Partnership in the Gulf

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*REVISED April 11,
2014*

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Key Threats

- **Internal ethnic and sectarian tensions, civil conflict, continued instability, failed governance and economy.**
- **Syrian civil war. Iraq, Lebanon, “Shi’ite crescent.”**
- **Sectarian warfare and struggle for future of Islam through and outside region. Sunni on Sunni and vs. Shi’ite struggles**
- **Terrorism, insurgency, civil conflict linked to outside state and non-state actors.**
- **Wars of influence and intimidation**
- **Asymmetric conflicts escalating to conventional conflicts.**
- **Major “conventional” conflict threats: Iran-Arab Gulf, Arab-Israeli, etc.**
- **Economic warfare: sanctions, “close the Gulf,” etc.**
- **Missile and long-range rocket warfare**
- **Proliferation, preventive strikes, containment, nuclear arms race, extended deterrence, “weapons of mass effectiveness”.**

The Problem of Strategic Triage

Major areas of concern:

- Islamic extremism and terrorism
- Iranian nuclear, conventional, and asymmetric threats.
- Syrian civil war, Iraq, Lebanon, Jordan
- Yemen and AQAP
- Egypt and Arab states caught up in political turmoil.
- Iran and Arab Gulf states
- Arab-Israeli?

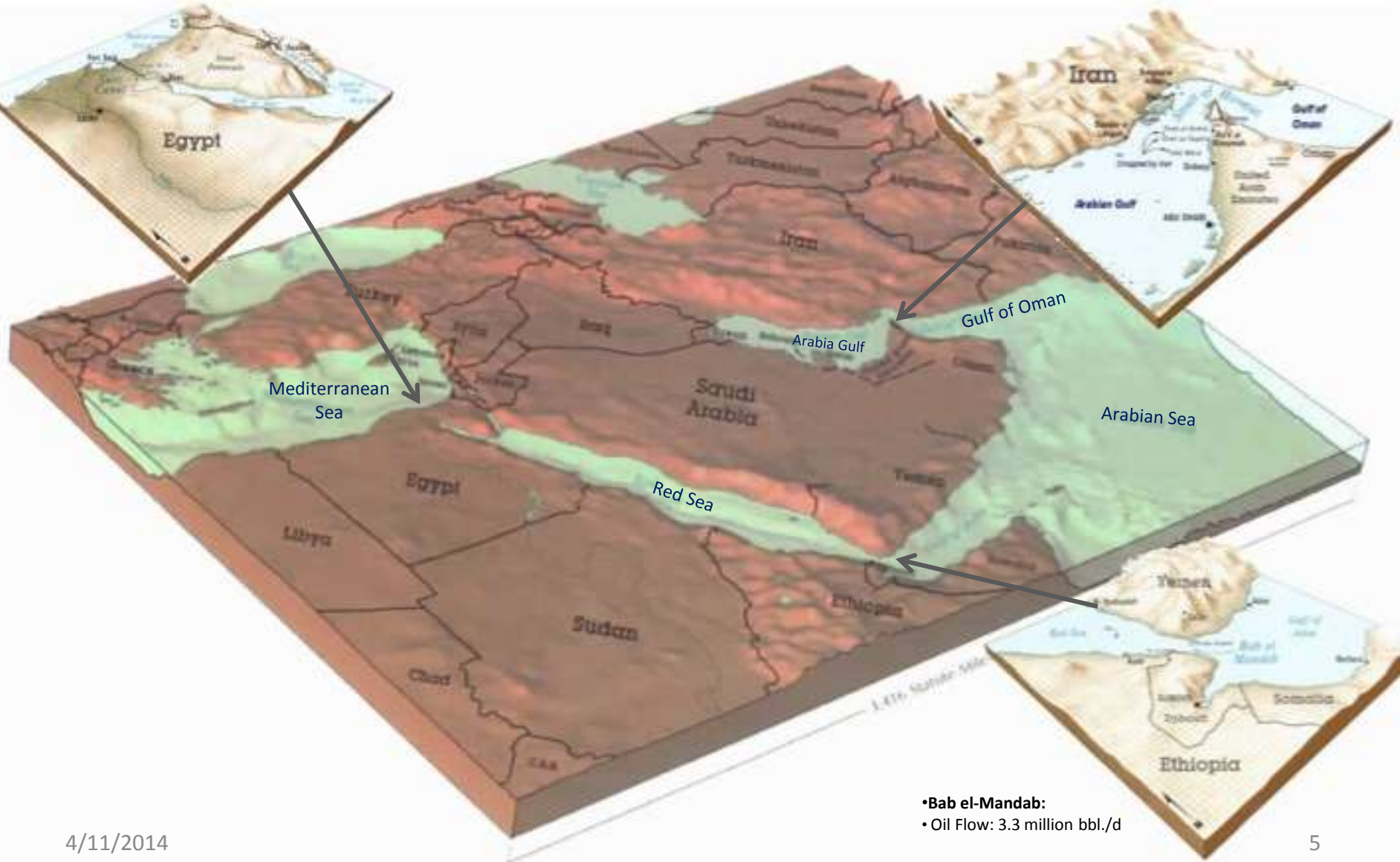


*The Gulf and Environs
Energy is Still the Prize*

Key Oil, Air, Sea Transit Chokepoints

- The Suez Canal/Sumed Pipeline:
- Oil Flow: 4.5 million bbl./d

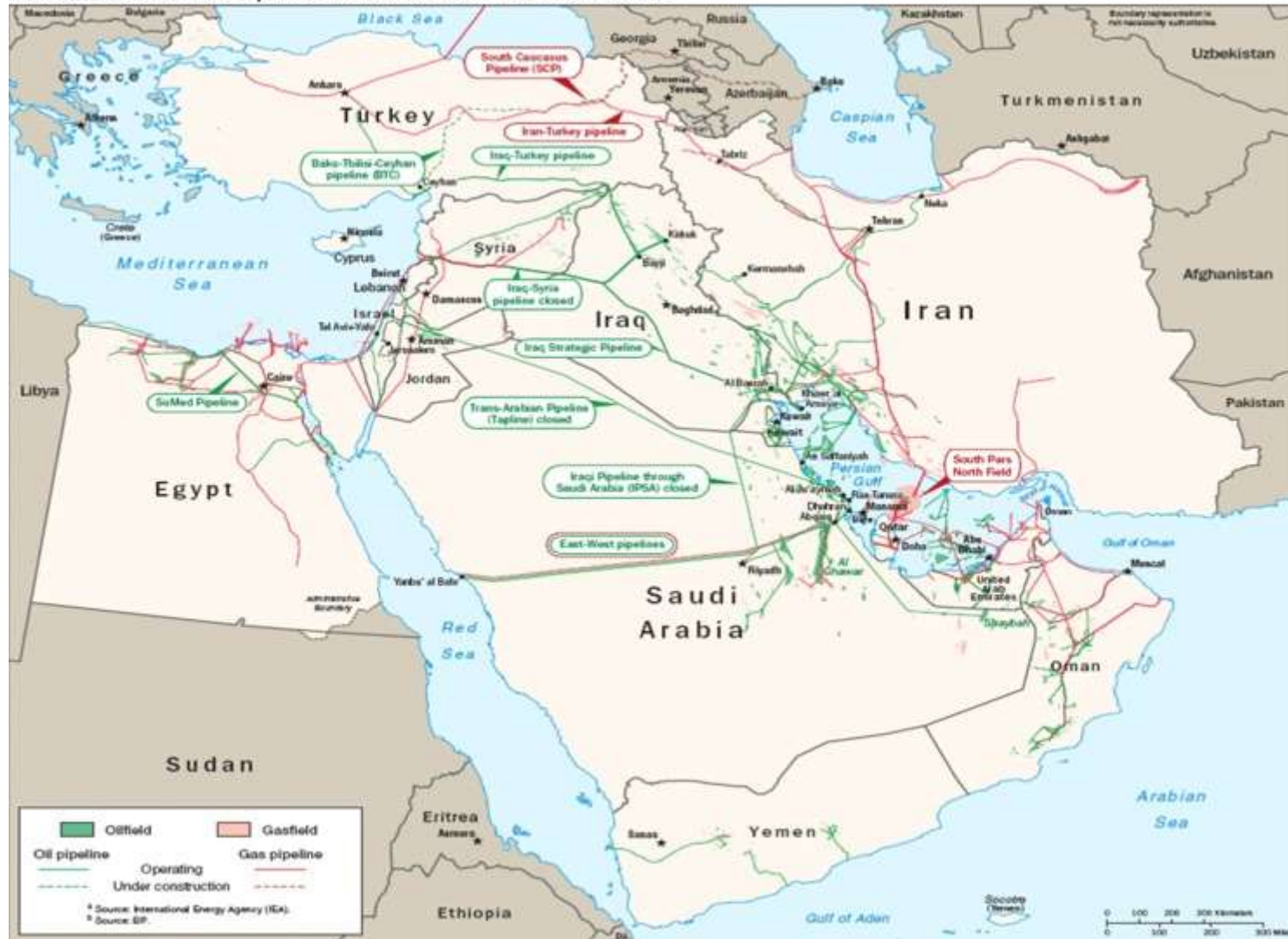
- The Strait of Hormuz:
- Oil Flow: 16.5 million bbl./d



- Bab el-Mandab:
- Oil Flow: 3.3 million bbl./d

Gulf Overland Oil Supply Pipelines

Selected Oil and Gas Pipeline Infrastructure in the Middle East

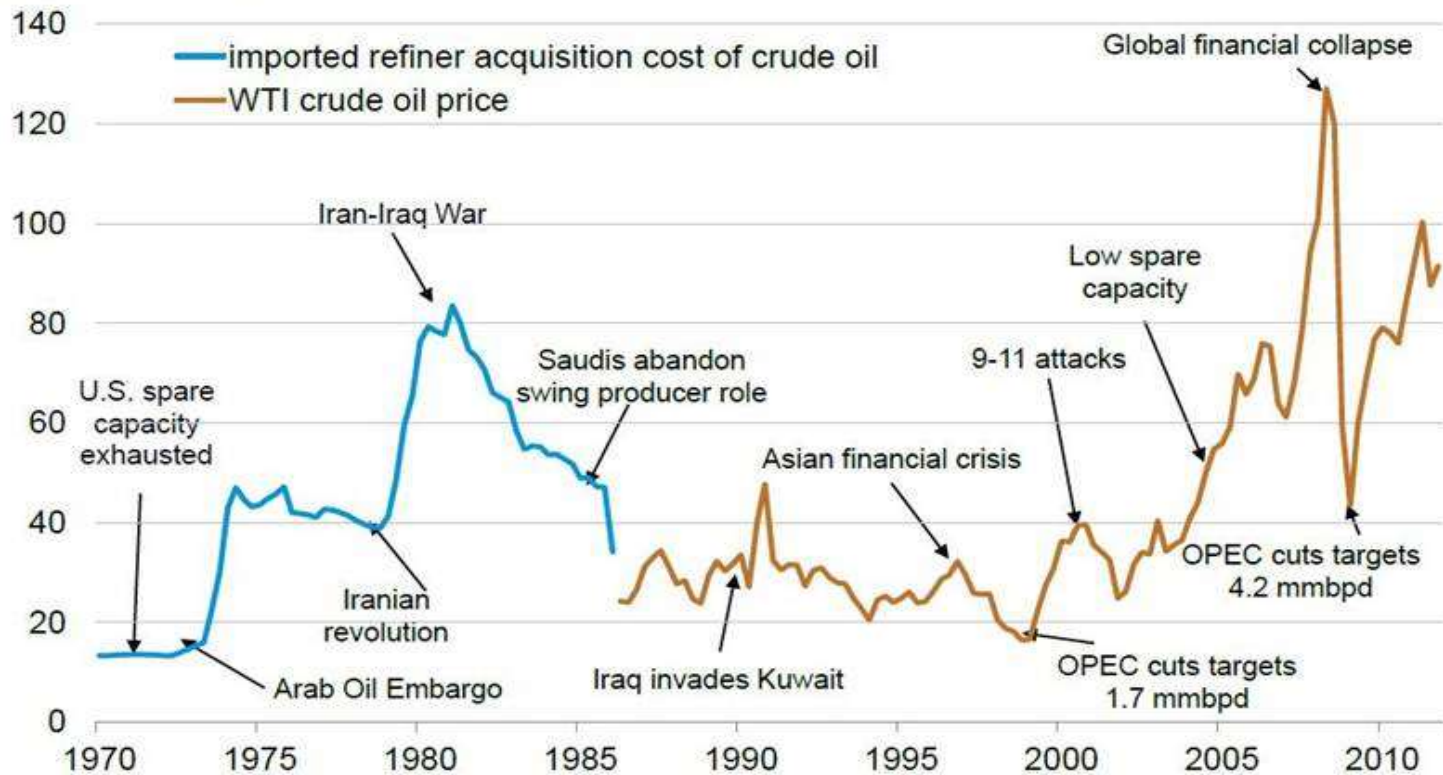


(Source: http://www.eia.doe.gov/emeu/cabs/Persian_Gulf/images/pg_map.pdf)

Critical Threat to US and Global Economy

Crude oil prices react to a variety of geopolitical and economic events

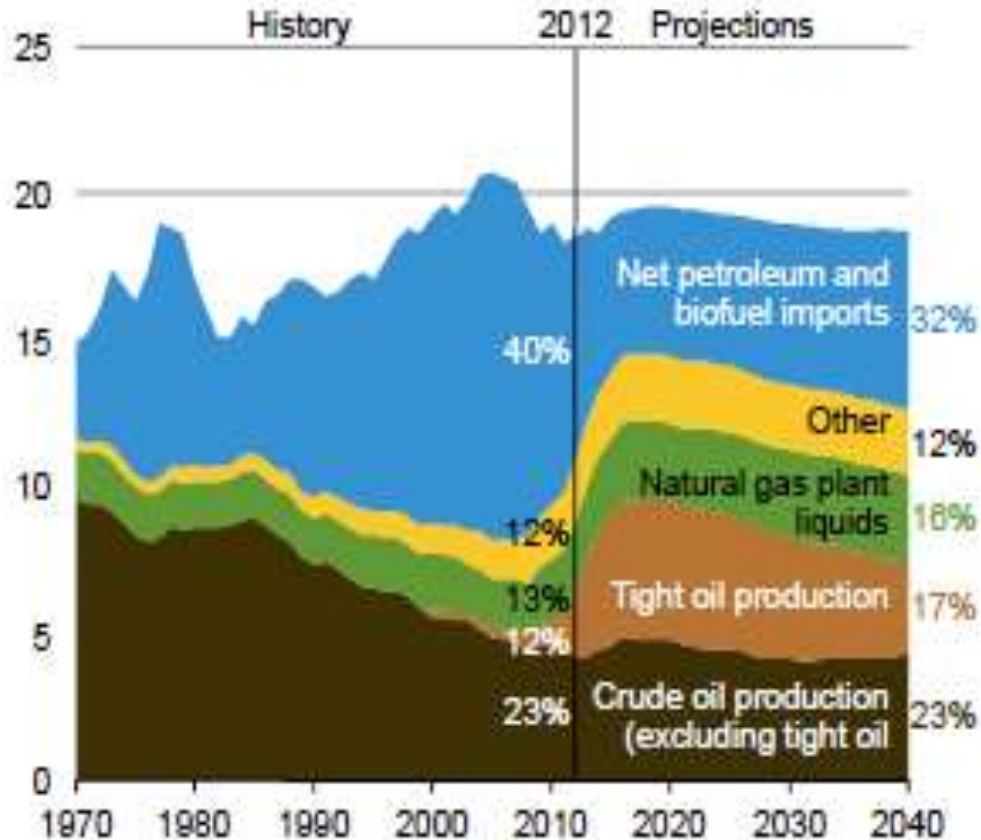
price per barrel
(real 2010 dollars, quarterly average)



Sources: U.S. Energy Information Administration, Thomson Reuters

No US “Energy Independence” Through 2040

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



US economy pays world energy prices in a crisis.

US steadily more dependent on overall health of global economy.

Major indirect imports of Gulf oil through Asia

- Petroleum limited share of US imports: industrial supplies 32.9% (crude oil 8.2%), capital goods 30.4% (computers, telecommunications equipment, motor vehicle parts, office machines, electric power machinery), consumer goods 31.8% (automobiles, clothing, medicines, furniture, toys)
- 30% plus of US imports come from Asia.

Sharing requirements of IAEA agreement

EIA, AEO2014 Early Release Overview, December 2013, p. 1 <http://www.eia.gov/forecasts/aeo/er/pdf/0383er%282014%29.pdf>, and CIA World Factbook, “United states, <https://www.cia.gov/library/publications/the-world-factbook/geos/us.html>.

Gulf Oil Exports Amount to 20% of World Total Production of 87 Million Barrels a Day

Volume of Gulf oil exports amounts to some 20% of all the world's oil production of 87 million a day.

Location	2007	2008	2009	2010	2011
Bab el_Mandab	4.6	4.5	2.9	2.7	3.4
Turkish Straits	2.7	2.7	2.8	2.9	N/A
Danish Straits	3.2	2.8	3.0	3.0	N/A
Strait of Hormuz	16.7	17.5	15.7	15.9	17.0
Panama Canal	0.7	0.7	0.8	0.7	0.8
Crude Oil	0.1	0.2	0.2	0.1	0.1
Petroleum Products	0.6	0.6	0.6	0.6	0.6
Suez Canal and SUMED Pipeline	4.7	4.6	3.0	3.1	3.8
Suez Crude Oil	1.3	1.2	0.6	0.7	0.8
Suez Petroleum Products	1.1	1.3	1.3	1.3	1.4
SUMED Crude Oil	2.4	2.1	1.2	1.1	1.7

Source: EIA/DOE, *World Oil Transit Chokepoints*, August 2012, <http://www.eia.gov/countries/regions-topics2.cfm?fips=WOTC&trk=c>.

Currently Operable Crude Oil Pipelines that Bypass the Strait of Hormuz

If war should come while surplus pipeline capacity is still limited to the high EIA estimate of 4.3 million barrels a day – and all pipeline loading and other facilities remained secure from attack -- this would only provide 25% percent of the 17 million barrels a day flowing through the Gulf.

Pipeline	Kirkuk-Ceyhan (Iraq-Turkey) Pipeline ¹	Petroline (East-West Pipeline)	Abu Dhabi Crude Oil Pipeline United Arab Emirates	Total
Owner	Iraq	Saudi Arabia		
2011 (average)				
Capacity	0.4	3.0	0.0	3.4
Throughput	0.4	2.0	0.0	2.4
Unused Capacity ²	0.0	1.0	0.0	1.0
2012 (mid-year) ³				
Capacity	0.4	4.8	1.5	6.7
Throughput ⁴	0.4	2.0	0.0	2.4
Unused Capacity	0.0	2.8	1.5	4.3

Notes: All estimates are EIA estimates as of August 17, 2012 and expressed in million barrels per day (mbl./d).

1 Although the Kirkuk-Ceyhan Pipeline has a nominal nameplate capacity of 1.6 million mbl./d, its effective capacity is 0.4 million mbl./d because it cannot transport additional volumes of oil until the Strategic Pipeline to which it links can be repaired to bring in additional volumes of oil from the south of Iraq.

2 "Unused Capacity" is defined as pipeline capacity that is not currently utilized and can be readily available.

3 All estimates for 2012 are rates around the mid-year point; not the forecast average for 2012.

4 The 2012 throughput rates are based off of 2011 estimates.

Source: EIA/DOE, *World Oil Transit Chokepoints*, August 2012, <http://www.eia.gov/countries/regionstopics2>.

*As Egypt, Syria, Iraq, Yemen, Libya,
and Tunisia show –*

*Internal Stability is More
Critical than External Threats*

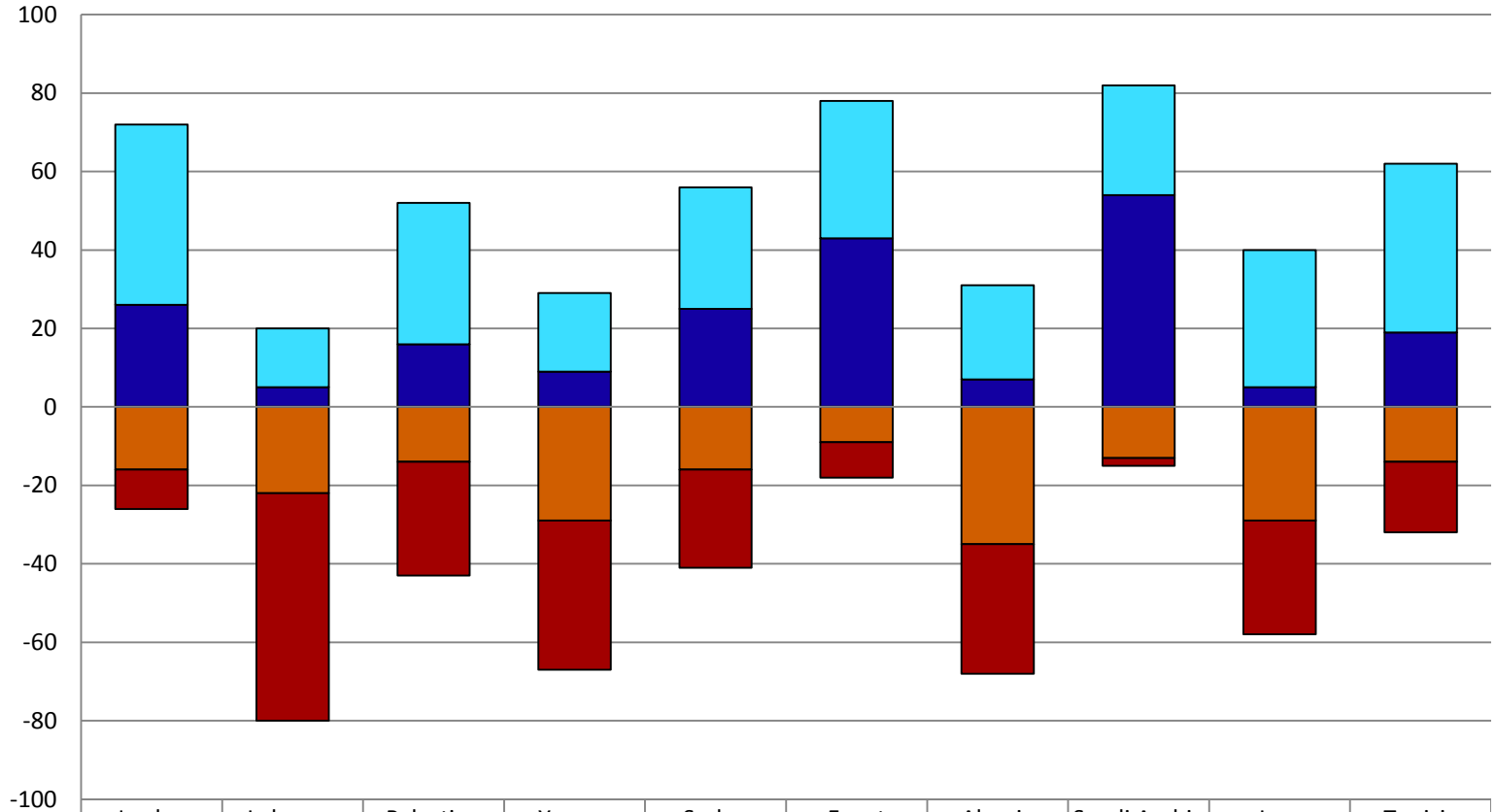
Demographic Pressures

- **Massive population growth since 1950, and will continue through at least 2030.**
- **Matched by dislocation, hyperurbanization, and DP/IDP issues**
- **Broad pressure on agriculture at time need economies of scale and capital – not more farmers.**
- **Strain on all government services and infrastructure.**
- **Challenge of demographic pressure on expectations, status as important as classic economic pressures.**
 - **Failed secularism; unfairness, failed and corrupt governance.**
 - **Limits to education/health/infrastructure/water**
 - **Ethnic, sectarian and tribal pressures**
 - **Cost to leave home, marry**

Popular Perceptions of State Institutions: Popular Trust in the Government (Cabinet)

*Limited-No Trust Denoted by Negative Numbers

Percentage of Respondents
(Negative symbols represent negative opinions)

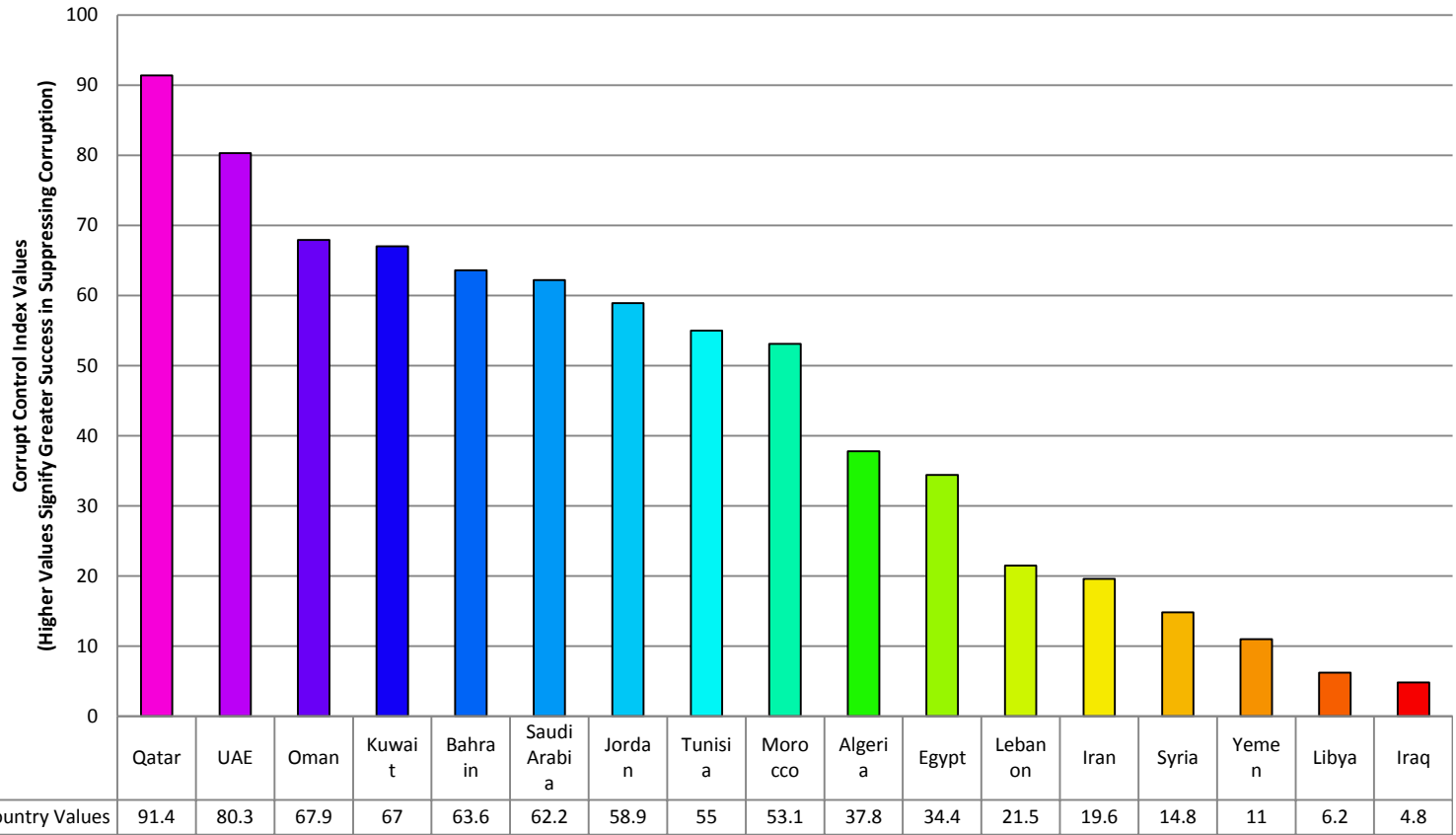


	Jordan	Lebanon	Palestine	Yemen	Sudan	Egypt	Algeria	Saudi Arabia	Iraq	Tunisia
I absolutely do not trust it	-10	-58	-29	-38	-25	-9	-33	-2	-29	-18
I trust it to a limited extent	-16	-22	-14	-29	-16	-9	-35	-13	-29	-14
I trust it to a medium extent	46	15	36	20	31	35	24	28	35	43
I trust it to a great extent	26	5	16	9	25	43	7	54	5	19

Control of Corruption (by world percentile)

Higher figures indicate greater control

2010 Corruption Control Metric



■ 2010 Corruption Control Country Values

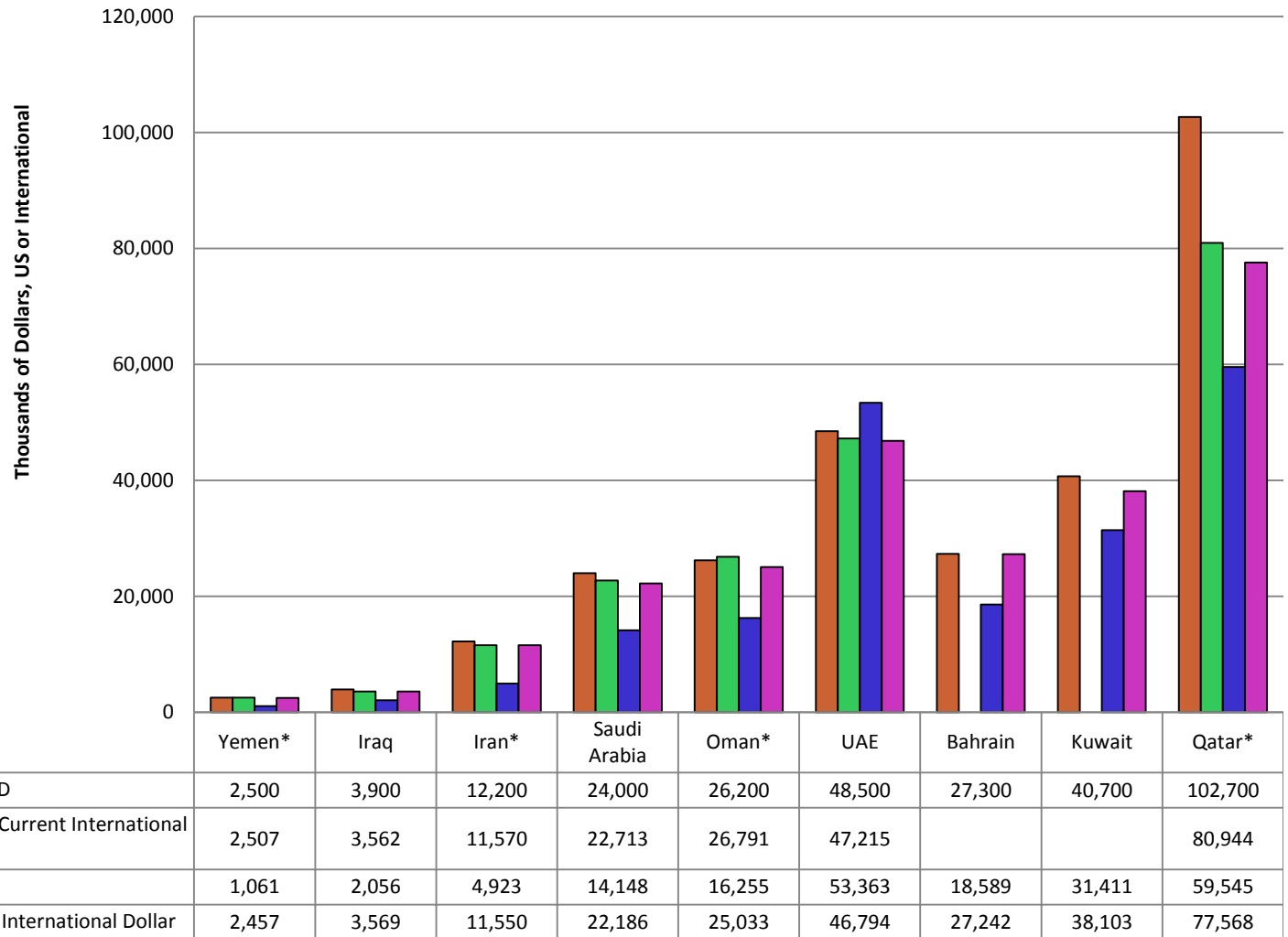
Control of Corruption "captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Source: World Bank Governance Indicators, Accessed January, 2012.

<http://info.worldbank.org/governance/wgi/index.asp>

Gulf GDP Per Capita Estimates by Country

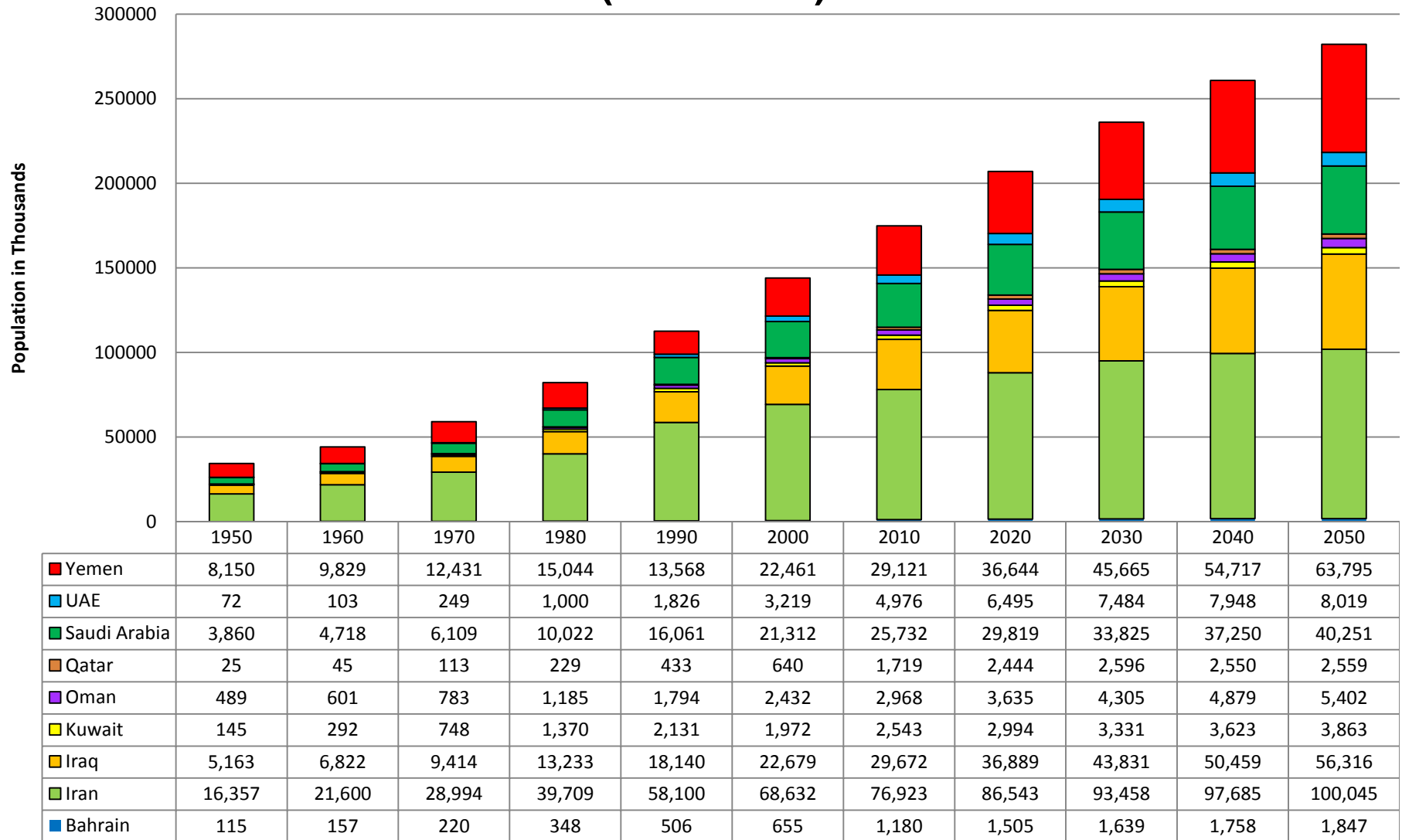
Note:
 - * indicates that the World Bank data for that country is from the year 2009.



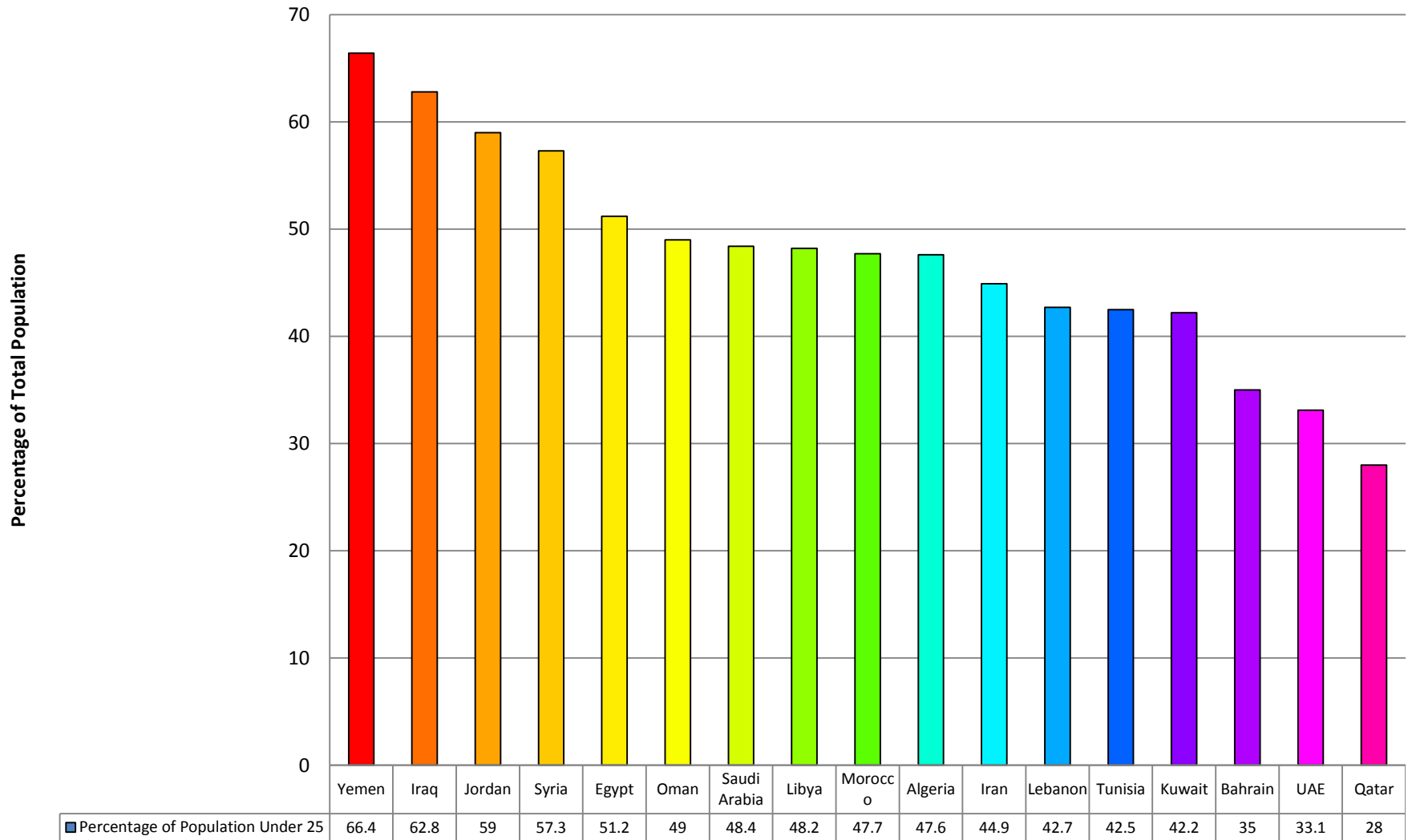
Sources: World Bank Indicators: GDP Per Capita, <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>
 CIA World Factbook, <https://www.cia.gov/library/publications/the-world-factbook/>
 International Monetary Fund, <http://www.imf.org>

Accessed February 1, 2012.

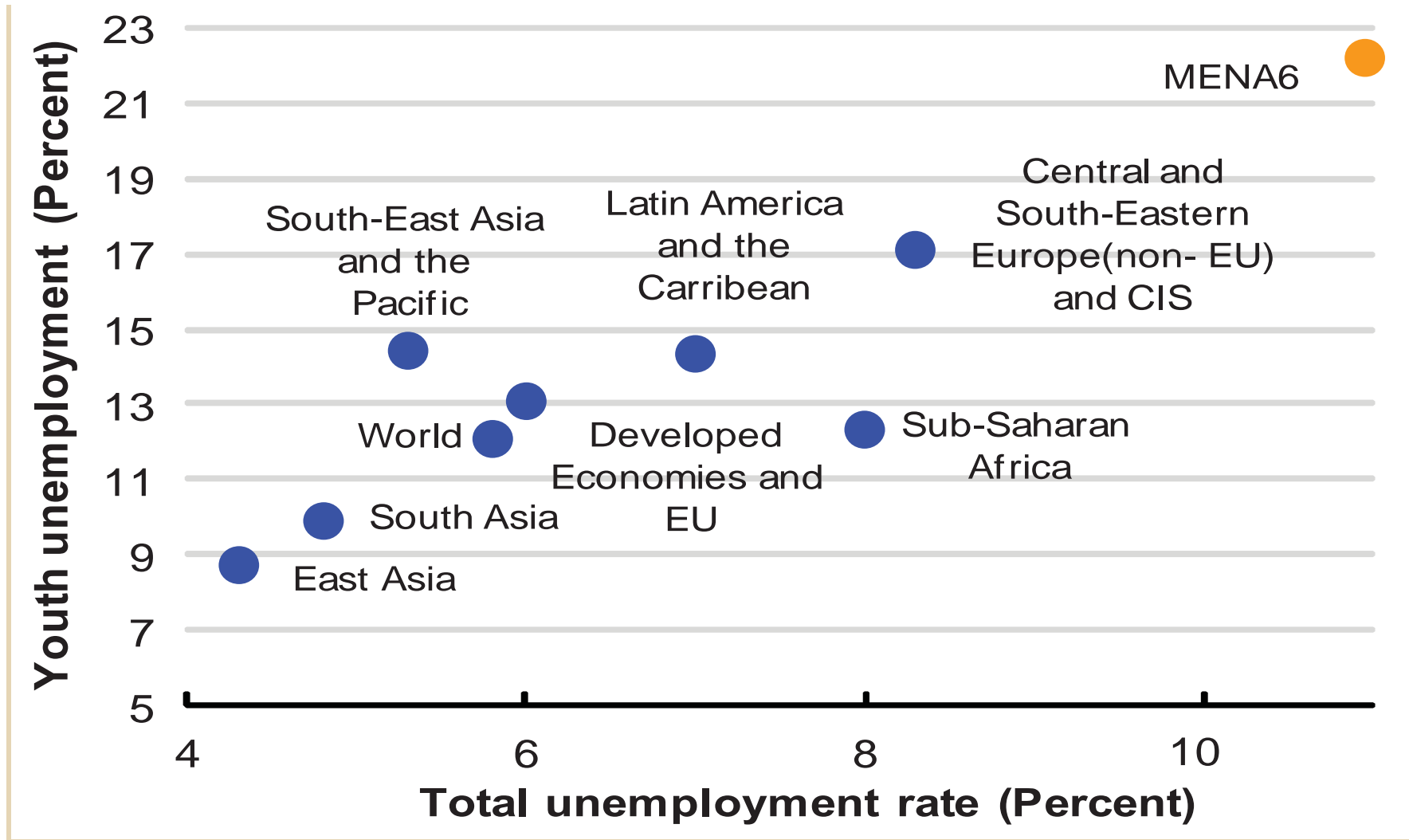
Gulf Demographic Pressure: 1950-2050 (In Millions)



Percentage of the Population Under 25



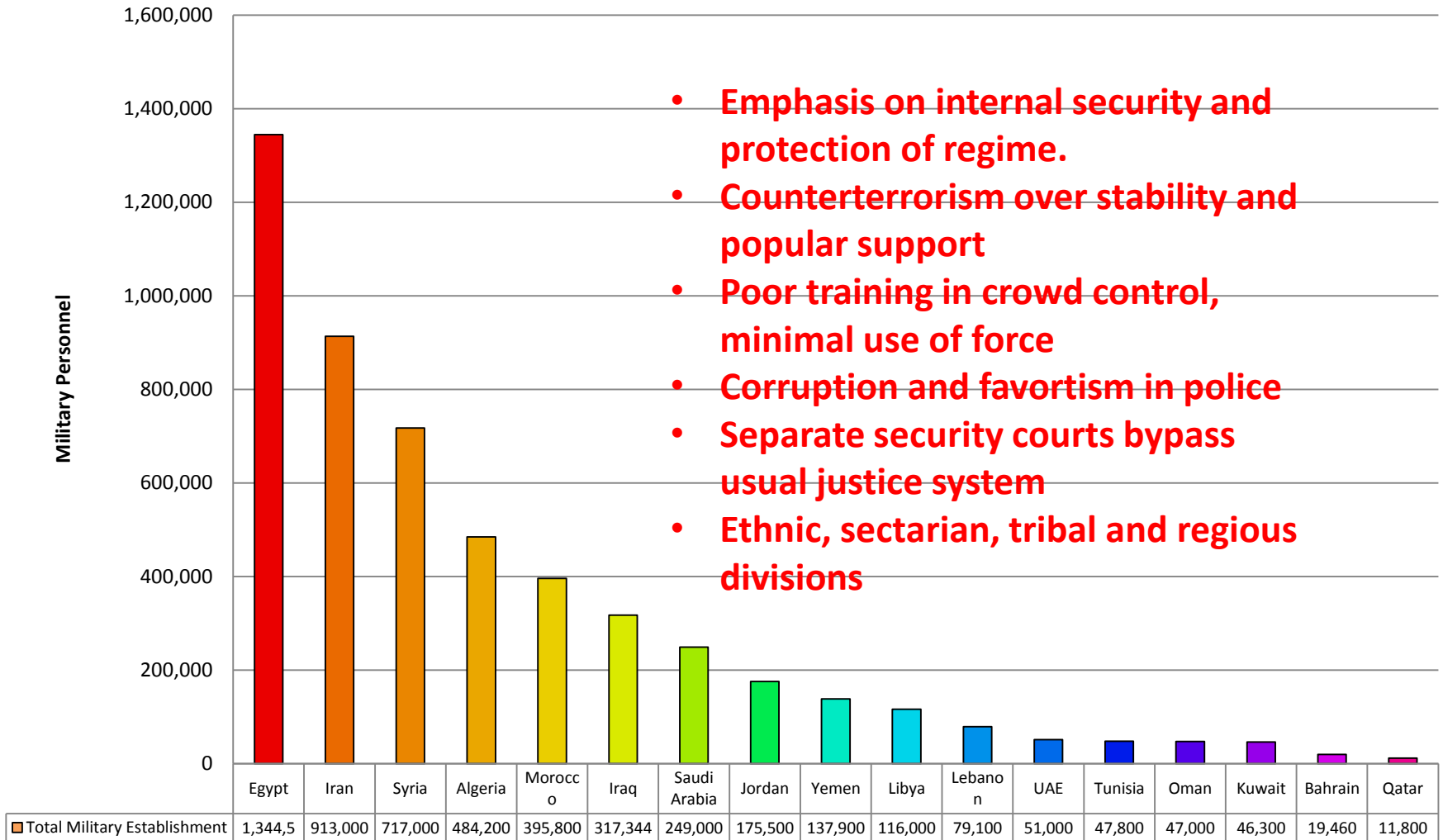
Total and Youth Unemployment Rates by Region (2008)



Source: IMF, *World Economic and Financial Surveys, Regional Economic Outlook, Middle East and Central Asia*, October 2010, p. 38

Excessively Large Paramilitary and National Security Forces

Total Military Establishment



Sunni on Sunni and Sunni-Shi'ite Power Struggles



- Sectarian conflict now extends from India to Lebanon.
- Hazara major issue in Afghanistan and Pakistan.
- Iran is key Shi'ite actor – but “Persian” as well as “Twelver.”
- Fear/Hope of Iran-Iraq-Syria-Lebanon “Shi'ite” Axis.
- Bahrain and Saudi Eastern Province.
- Yemen: Houthi and other Shi'ite elements.
- No unity in Sunni attitudes: range from tolerance to treating Shi'ite as Apostate.
- Shi'ites divided by sect. Alewites in Syria only marginally Shi'ite

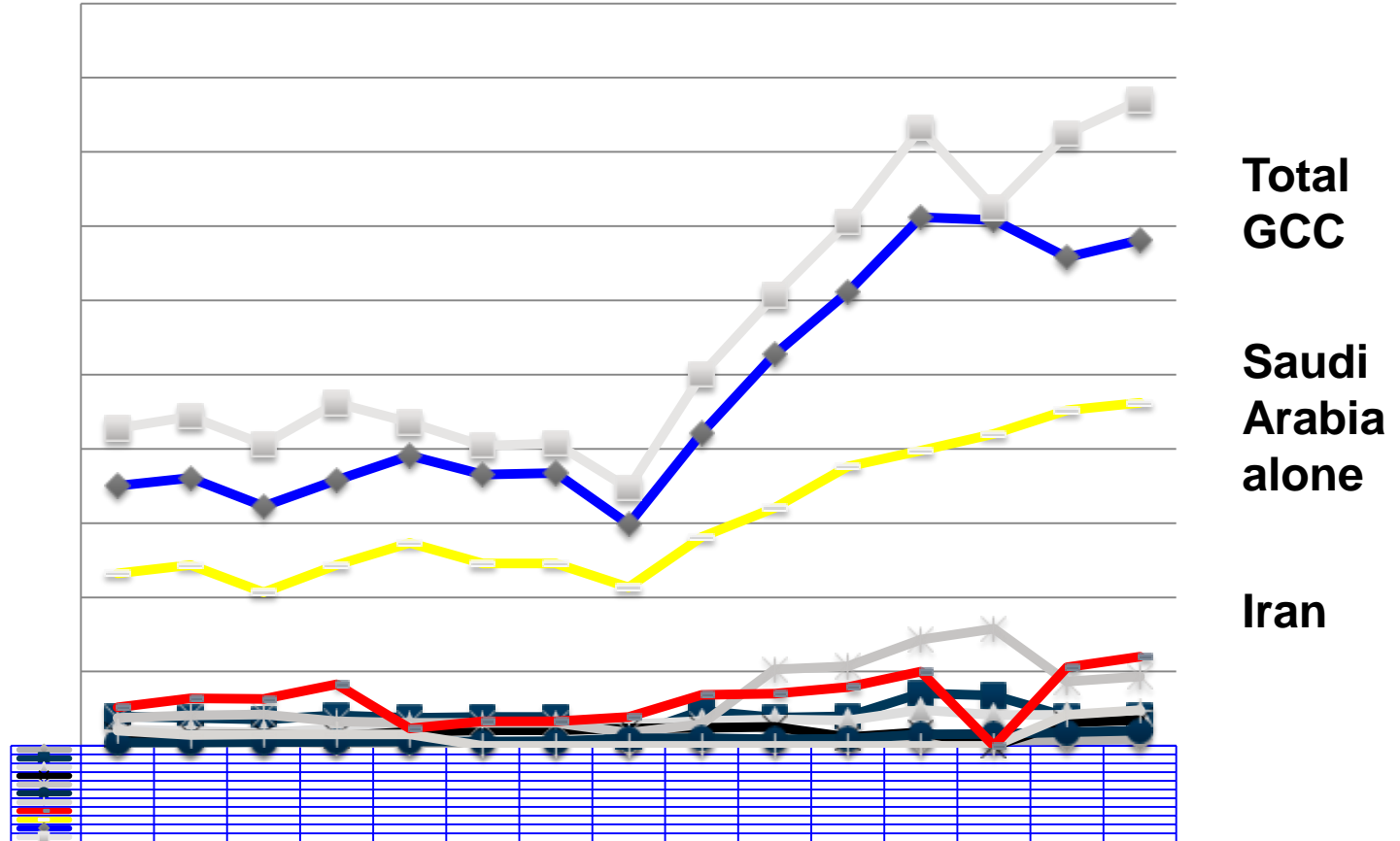
Post-Al Qa'ida and WOT clash within a civilization

Key Shi'ite Actors

- Iran Al Quds Force and MOIS
- Lebanese Hezbollah
- Syrian Alewites
- Iraqi Government, Sadrists, Asaib Ahl al-Haq
- Yemeni Houthi
- Afghan and Pakistani Hazara

***Overwhelming GCC Lead in
Military Spending and Arms
Imports***

The Opportunity: Vast GCC Lead in Military Spending: IISS Estimate: 1997-2011 (\$US Current)



Adapted from annual editions of the IISS *Military Balance*.

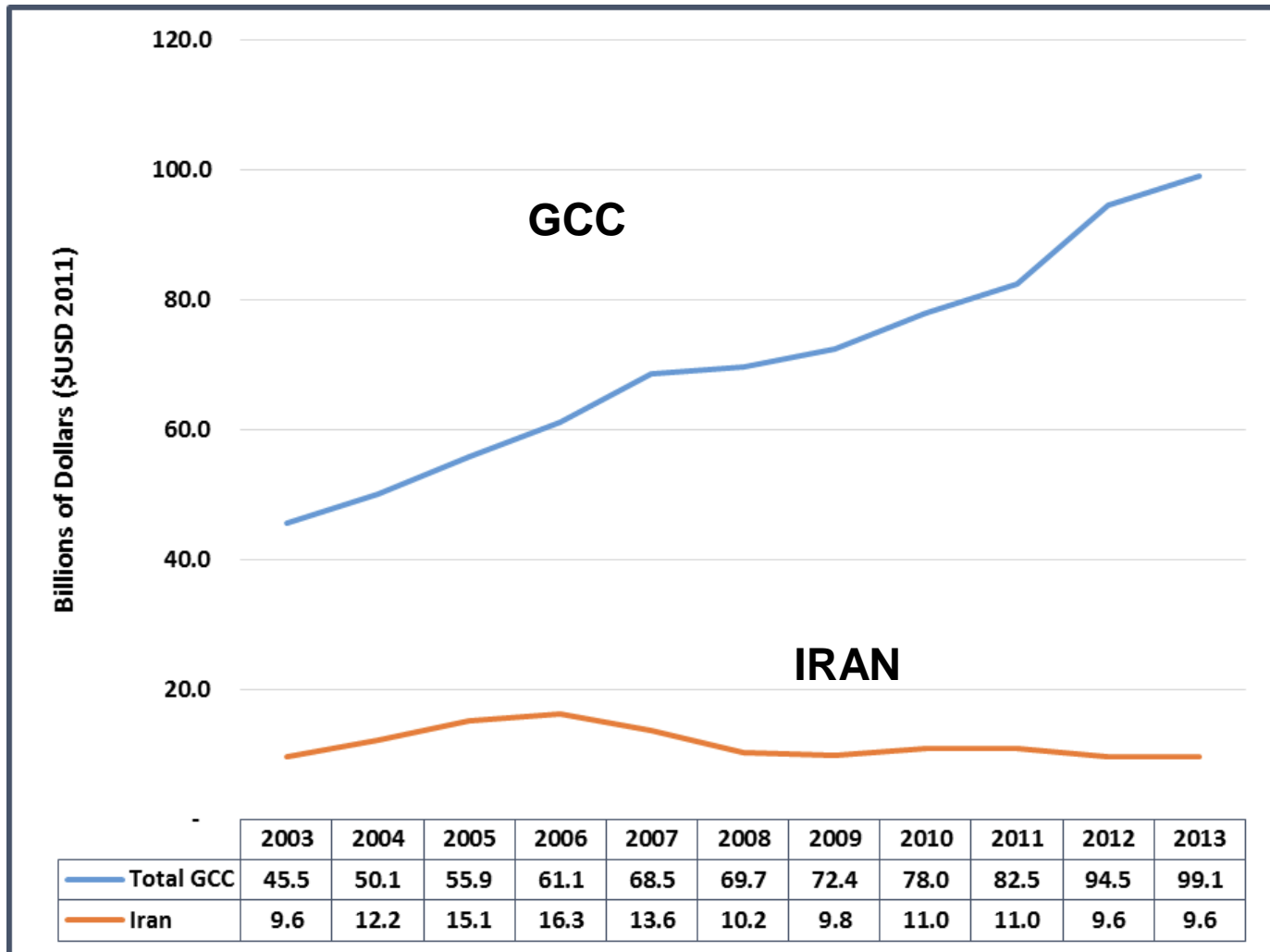
IISS Estimates: 2003-2013

(In \$US Current Millions)

Year	2009	2010	2011	2012	2013	2014
GCC						
Bahrain	705	747	943	1,020	1,390	-
Kuwait	4,180	4,650	4,070	4,620	4,070	-
Oman	4,020	4,180	4,290	6,720	9,250	-
Qatar	2,500	3,120	3,460	3,730	3,980	-
Saudi Arabia	41,300	45,200	48,500	56,700	59,600	-
UAE	7,880	8,650	9,320	9,320	10,100	-
Total	60,585	66,547	70,583	82,110	88,390	-
Saudi as % of Total GCC	68%	68%	69%	68%	67%	-
Other						
Iran	8,640	10,600	26,400	25,200	17,700	-
Iraq	4,900	4,190	12,000	14,700	16,900	-
Yemen	2,020	1,830	1,340	1,630	1,810	-
Jordan	2,330	1,360	1,370	1,220	1,450	-
Iran as % of Total GCC	14%	16%	37%	31%	20%	-

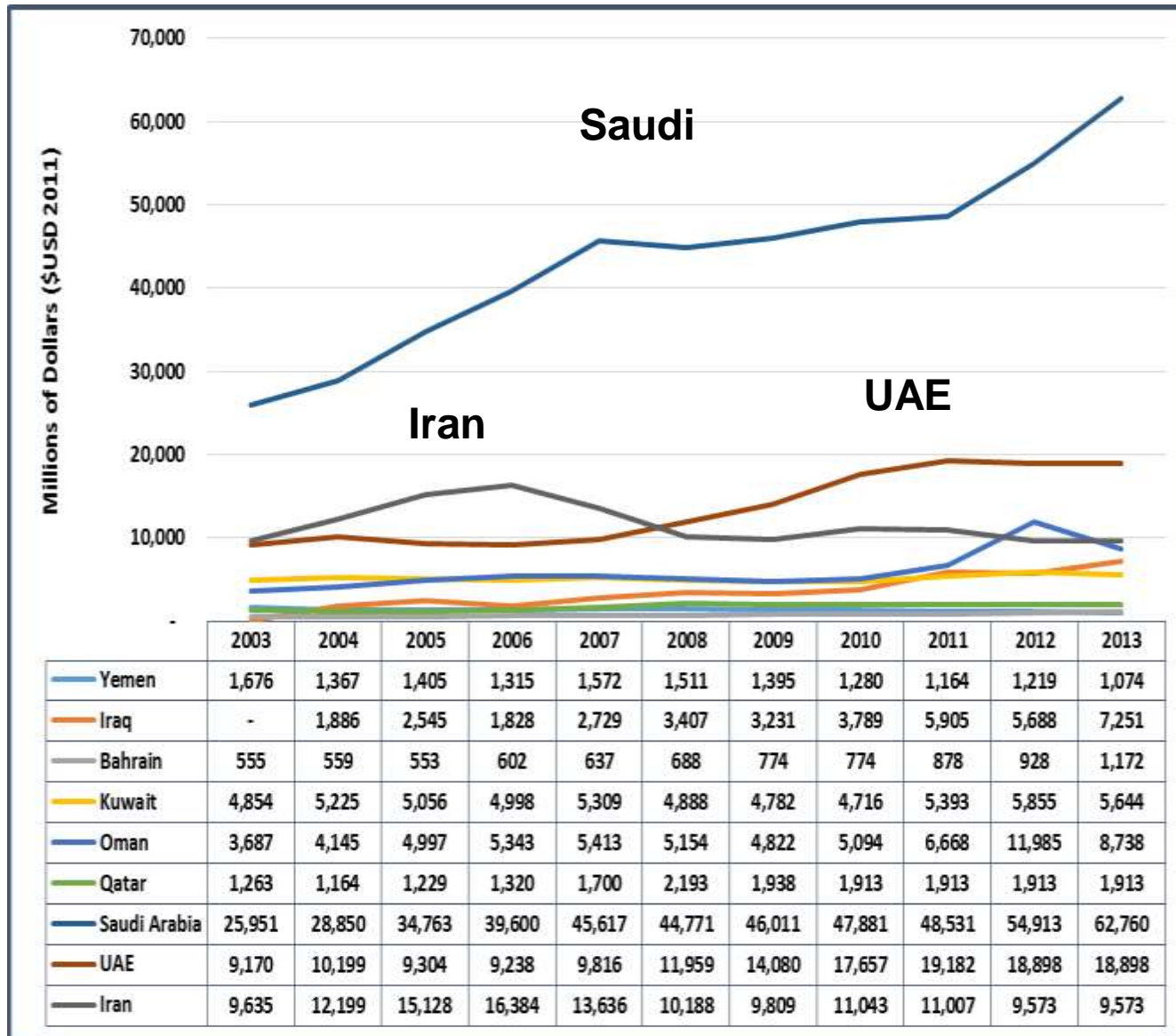
Source: Adapted from various editions of the IISS *Military Balance*.

SIPRI Trend in Total GCC vs. Iran by Year: 2003-2013



Source: Adapted from SIPRI data as of 8.4.14

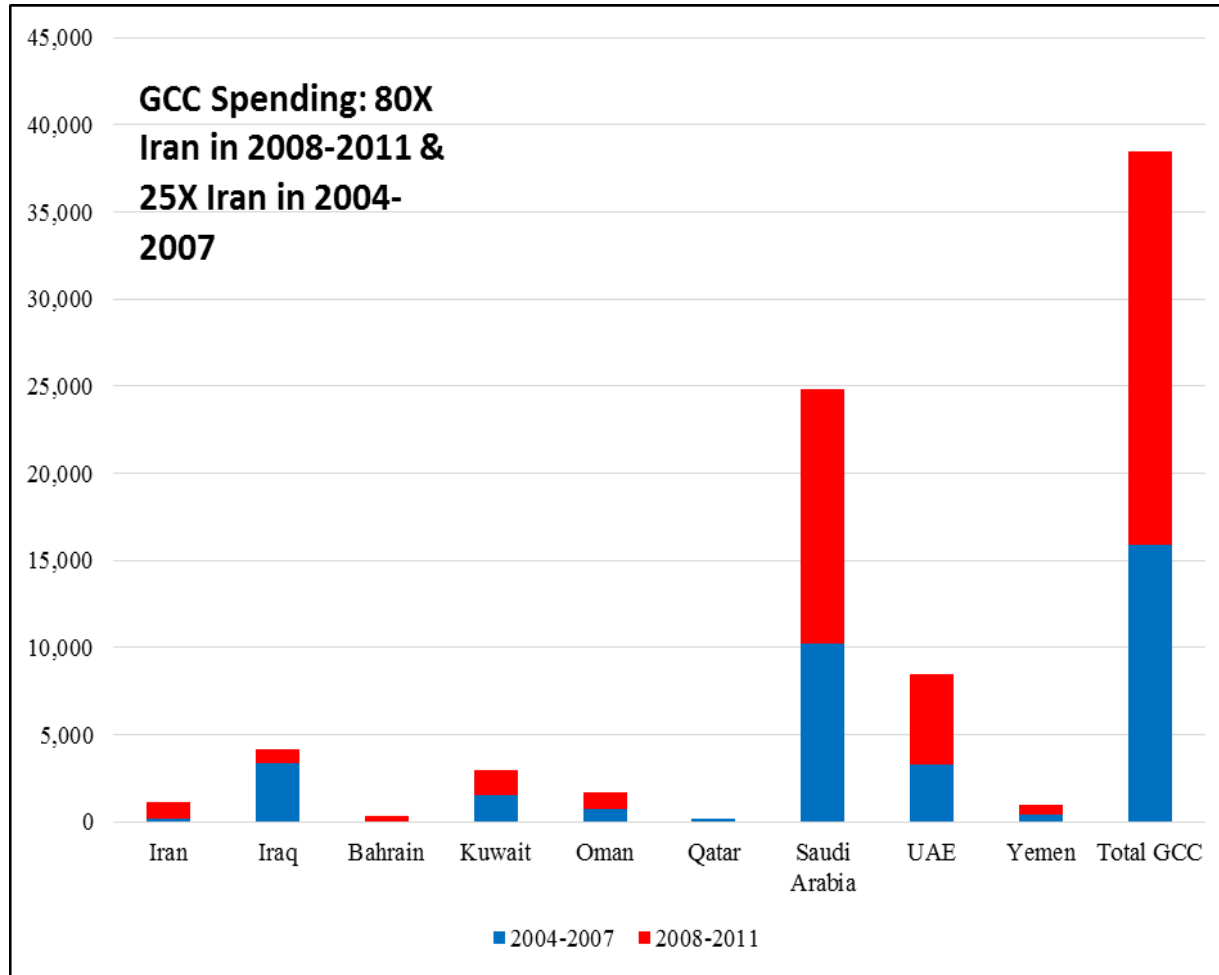
SIPRI: Trend in Gulf Spending by Country by Year: 2003-2013



Source: Adapted from SIPRI data as of 8.4.14

US Arms Delivery Estimates: 2003-2023

(In \$US Current Billions)



Source: Richard F. Grimmett and Paul K. Kerr, Conventional Arms Transfers to Developing Nations, 2004-2011, Congressional Research Service, August 24, 2012. P. 44-45.

US Arms Delivery Estimates: 2003-2023

(In \$US Current Billions)

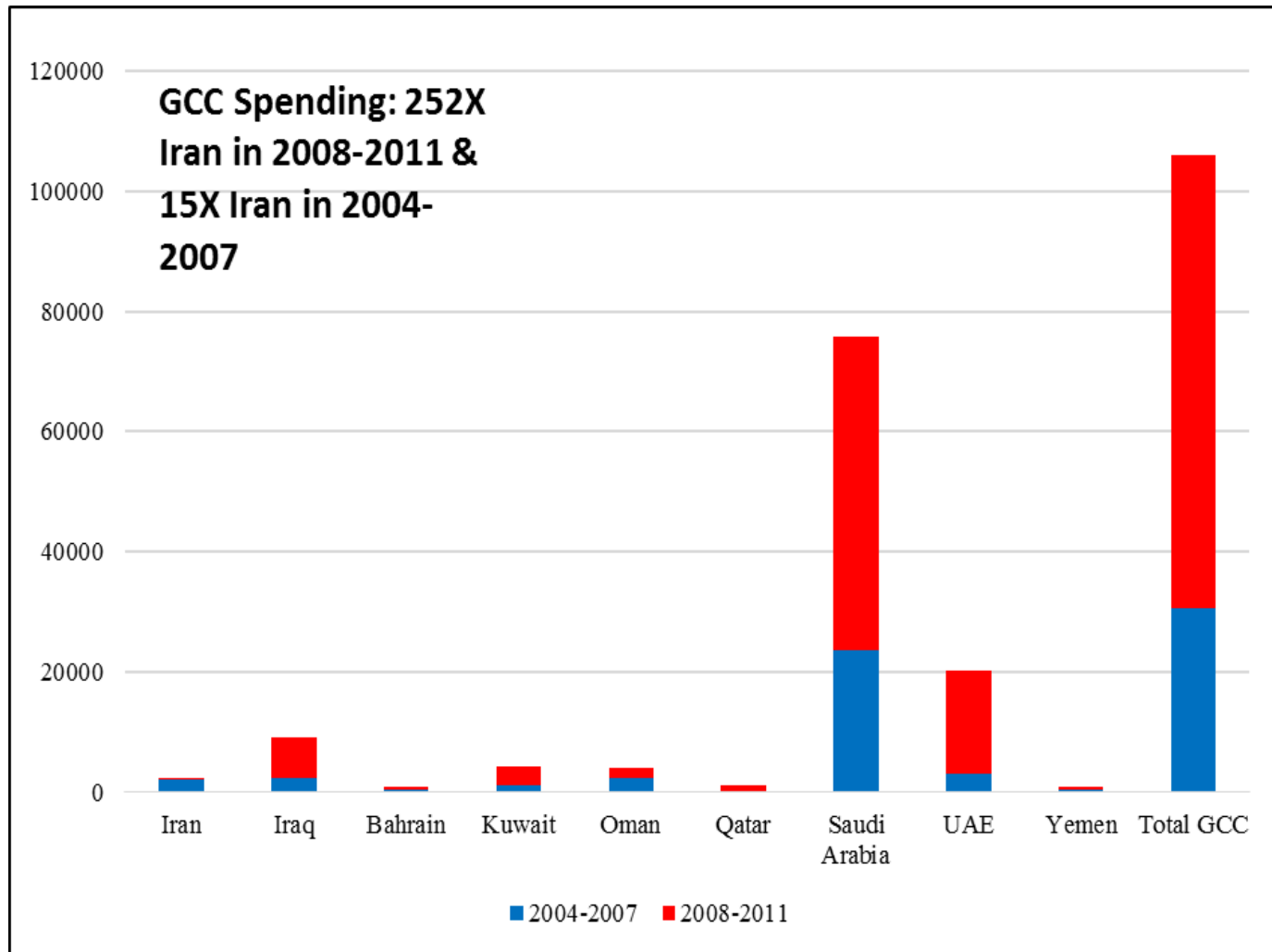
Recipient Country	U.S.	Russia	China	Major West European	All Other European	All Others	Total
2004-2007							
Bahrain	200	0	0	100	0	0	300
Iran	0	500	200	0	0	200	900
Iraq	200	100	0	100	300	100	800
Kuwait	1,500	0	0	0	0	0	1,500
Oman	700	0	0	300	0	0	1,000
Qatar	0	0	0	0	0	0	0
Saudi Arabia	4,300	0	200	9,900	100	100	14,600
UAE	600	200	0	4,000	400	0	5,200
Yemen	0	400	0	0	100	100	600
GCC Total	7,300	200	200	14,300	500	100	22,600

Recipient Country	U.S.	Russia	China	Major West European	All Other European	All Others	Total
2008-2011							
Bahrain	0	0	0	0	0	0	0
Iran	0	200	0	0	0	0	200
Iraq	2,600	300	0	300	100	100	3,400
Kuwait	1,300	100	100	0	0	0	1,500
Oman	200	0	0	500	0	0	700
Qatar	0	0	0	200	0	0	200
Saudi Arabia	5,900	0	700	3,300	300	0	10,200
UAE	2,000	300	100	600	300	0	3,300
Yemen	0	100	0	0	200	100	400
GCC Total	9,400	400	900	4,600	600	0	15,900

Notes: 0—data less than \$50 million or nil. All data are rounded to the nearest \$100 million.
 a. Major West European category includes France, United Kingdom, Germany, and Italy totals as an aggregate figure.

US New Arms Transfer Estimates: 2003-2023

(In \$US Current Billions)



Source: Richard F. Grimmett and Paul K. Kerr, Conventional Arms Transfers to Developing Nations, 2004-2011, Congressional Research Service, August 24, 2012. P. 44-45.

US New Arms Transfer Estimates: 2003-2023

Recipient Country	U.S.	Russia	China	Major West European	All Other European	All Others	Total
2004-2007							
Bahrain	400	0	0	100	0	0	500
Iran	0	1,600	300	0	100	100	2,100
Iraq	1,100	100	100	200	600	200	2,300
Kuwait	1,000	0	0	0	0	0	1,000
Oman	100	0	0	2,100	0	0	2,200
Qatar	0	0	0	0	0	100	100
Saudi Arabia	5,000	0	800	16,900	800	100	23,600
UAE	1,400	300	100	1,100	200	0	3,100
Yemen	0	200	0	0	100	100	400

Recipient Country	U.S.	Russia	China	Major West European	All Other European	All Others	Total
2008-2011							
Bahrain	400	0	0	0	0	0	400
Iran	0	100	0	0	100	100	300
Iraq	4,800	300	0	500	900	200	6,700
Kuwait	2,500	700	0	0	0	0	3,200
Oman	1,500	0	0	200	0	0	1,700
Qatar	200	0	0	800	0	0	1,000
Saudi Arabia	45,600	0	0	5,300	1,100	100	52,100
UAE	14,300	100	0	1,600	1,100	100	17,200
Yemen	0	100	0	0	300	100	500

Notes: 0=data less than \$50 million or nil. All data are rounded to the nearest \$100 million.
 a. Major West European category includes France, United Kingdom, Germany, and Italy totals as an aggregate figure.

Source: Richard F. Grimmett and Paul K. Kerr, Conventional Arms Transfers to Developing Nations, 2004-2011,

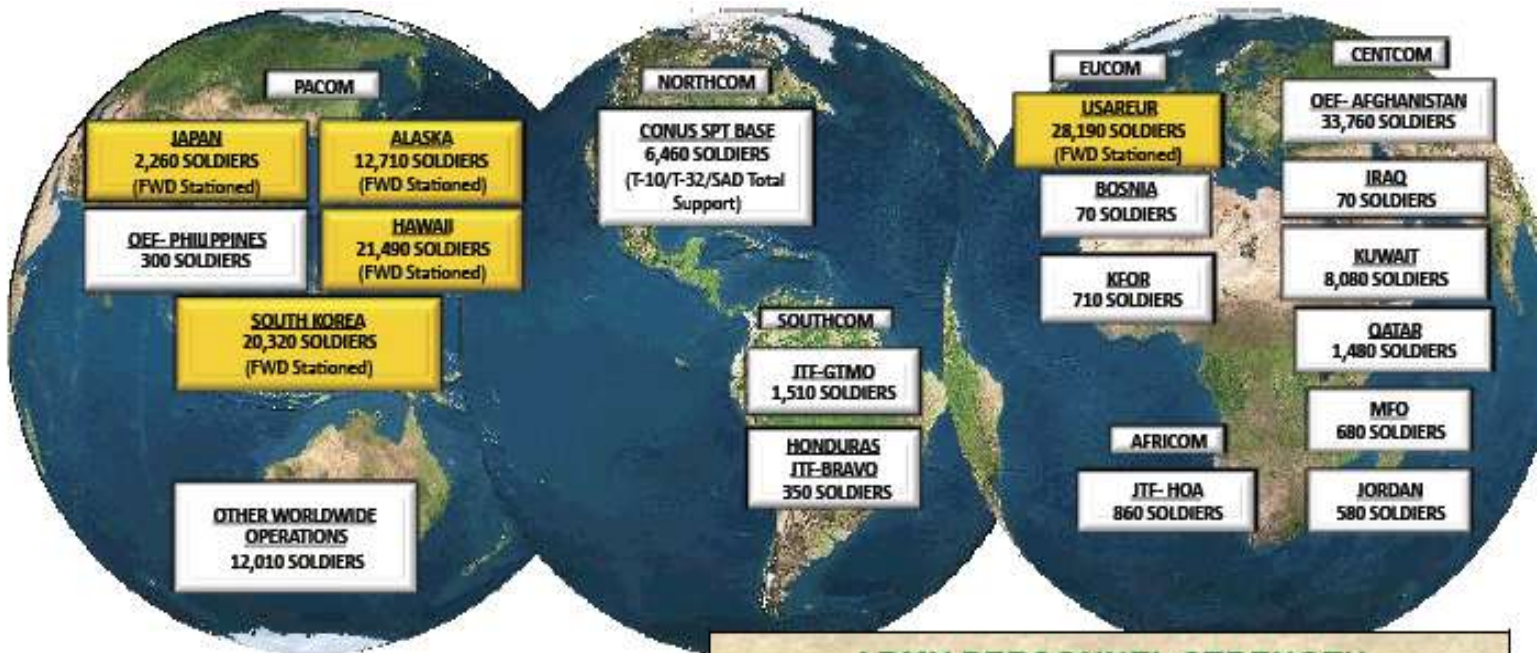
Congressional Research Service, August 24, 2012, P. 44-45

***US Strategy Gives Equal Priority to
Middle East and Asia and Key in
Gulf is US Power Projection
Capability***

US Role in Gulf

- **US strategic guidance, budget submissions through FY2015, and 2014 QDR all give Middle East same priority as Asia.**
- **Key is not US forces in the Gulf, but pool of global power projection assets.**
- **US increasing missile defense ships, SOF, mine warfare, patrol boat forces to deal with Asymmetric threats in the Gulf.**
- **Forward presence and US Bases in Kuwait, Bahrain, Qatar, UAE, and preposition in Oman – plus GCC base over capacity greatly aid US power projection.**
- **US advantage in space systems, other IS&R assets, UAVs/UCAVs/cruise missiles, precision strike, electronic warfare, cyberwarfare.**
- **F-35, new ships and weapons will greatly improve US capability.**
- **“Extended deterrence?”**

US Army Global Pool of Land Forces

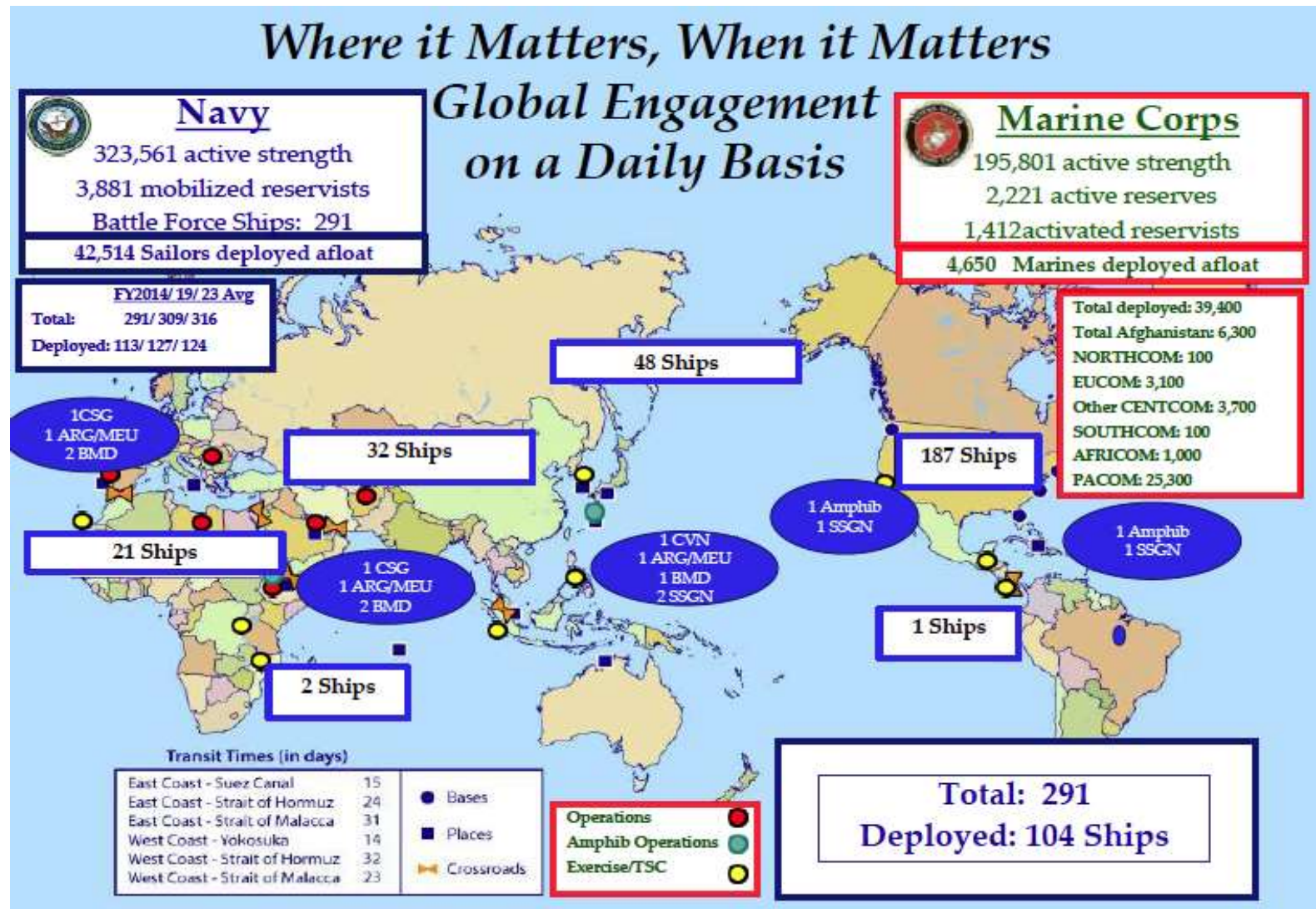


SOLDIERS DEPLOYED	66,920
SOLDIERS FWD STATIONED	84,970
TOTAL SOLDIERS	151,890

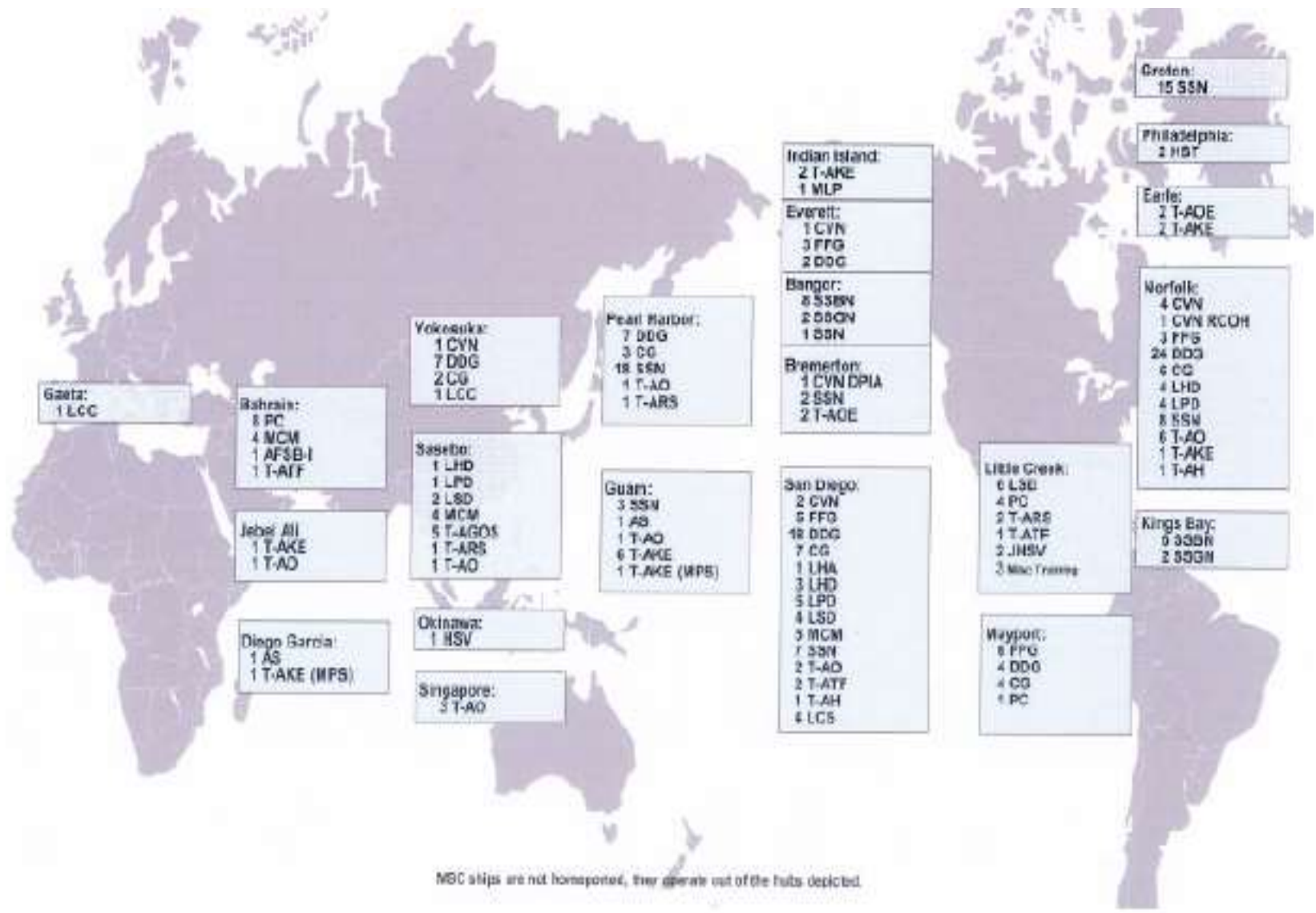
IN NEARLY 150 LOCATIONS WORLDWIDE

ARMY PERSONNEL STRENGTH		
Component	RC AUTHORIZED FOR MOBILIZATION / ON CURRENT	
ACTIVE (AC)	523,000	N/A
RESERVE (RC)		
USAR	196,730	13,250
ARNG	355,270	14,240
	1,075,000	27,490

US Global Pool of Naval and Marine Forces



US Global Pool of Naval Forces



MSC ships are not homeported, they operate out of the hubs depicted.

US Global Pool of Air Forces

Total Aircraft				Aircraft by Function			
A10	243	HC130J	9	Fighter Aircraft		Aerial Refueling Aircraft	
AC130	34	HC130N	6	A10	243	KC135	352
B1	53	HC130P	14	F15C	174	KC46	0
B2	16	HH60	79	F15D	32	KC10	54
B52	63	KC10	54	F15E	192	<i>Total:</i>	406
C12	27	KC135	352	F16C	662	Strategic Airlift Aircraft	
C130H	227	KC46	0	F16D	60	C5	54
C130J	95	LC130	10	F22	166	C17	188
C17	188	MC12	37	F35	17	<i>Total:</i>	242
C20	11	MC130	39	<i>Total:</i>	1546	Tactical Airlift Aircraft	
C21	17	MD1	131			C130H	227
C32	6	MDQ1	129	Heavy Bomber Squadrons:		C130J	95
C37	10	MQ9	186	B52	63	HC130J	9
C38	2	RC135	17	B1	53	HC130N	6
C40	11	RQ4	31	B2	16	HC130P	14
C5	54	U2	24	<i>Total:</i>	132	LC130	10
CV22	41	UH1	42			<i>Total:</i>	361
E3	27	C25	2			ISR Aircraft	
E4	3	WC130H	19			MQ1	129
E8	13	<i>Total:</i>	3640			MQ9	186
E9	2					RC135	17
EC130	13					RQ4	31
F15C	174					U2	24
F15D	32					<i>Total:</i>	387
F15E	192					Command and Control Aircraft	
F16C	662					E3	27
F16D	60					E4	3
F22	166					E8	13
F35	17					<i>Total:</i>	43

The Conventional and Asymmetric Balance in the Gulf

Iran's Strategic Depth



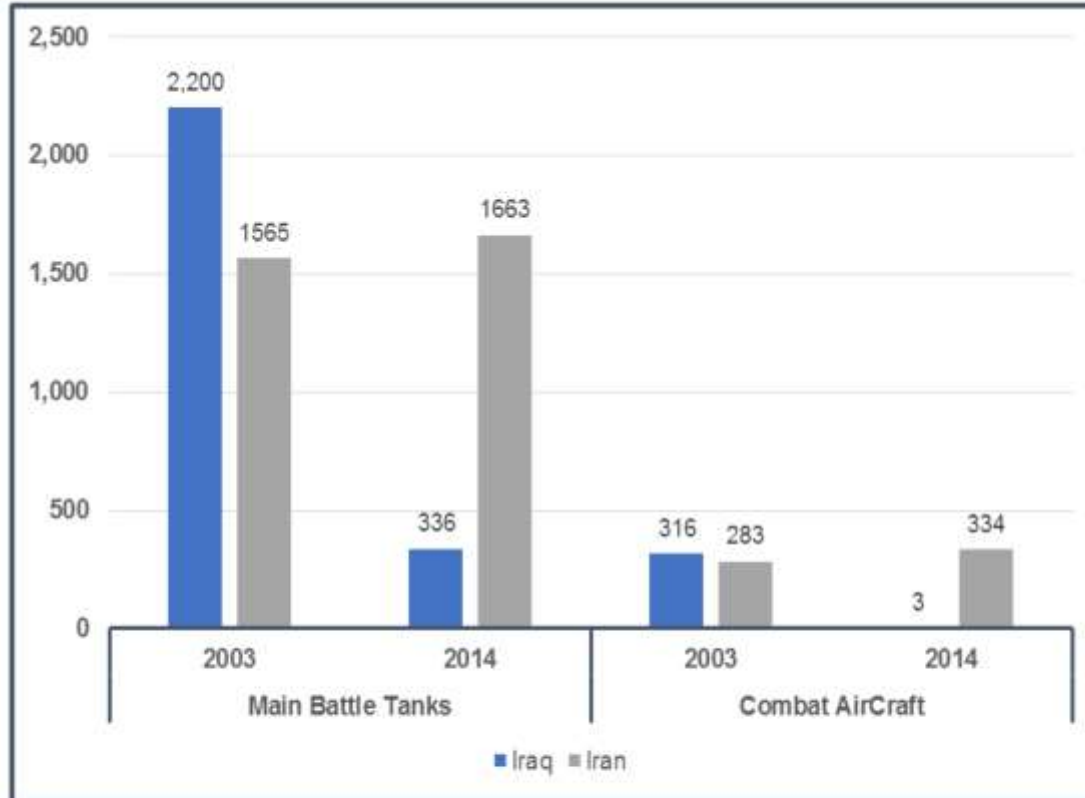
***GCC Lead in Key Land Force
Weapons Even Without US,
British, and French Power
Projection***

Land Threats

- Iran superior in mass, but not weapons quality. Reliance on aging and worn armor, towed artillery.
- Limited Iranian ability to project and sustain armored forces.
- ***No effective air cover, survivable naval escort and defense.***
- Not practice large-scale forced entry with amphibious forces, but significant capability for small raids and can quickly ferry substantial forces if invited in.
- Key GCC area of vulnerability is through Iraq to Kuwait: “Kuwaiti hinge. (Much depends on level of Iraqi ties to Iran.)
- Iranian IRGC, marines, special forces have significant raid capability in Gulf and near coastal areas. Raids on offshore and critical shore facilities.
- Covert operations, sabotage.
- Attacks on US-allied military facilities

Iran vs. Iraq: Losing Both a Threat and a Shield

Iran and Iraq Military Balance in 2003 & 2014

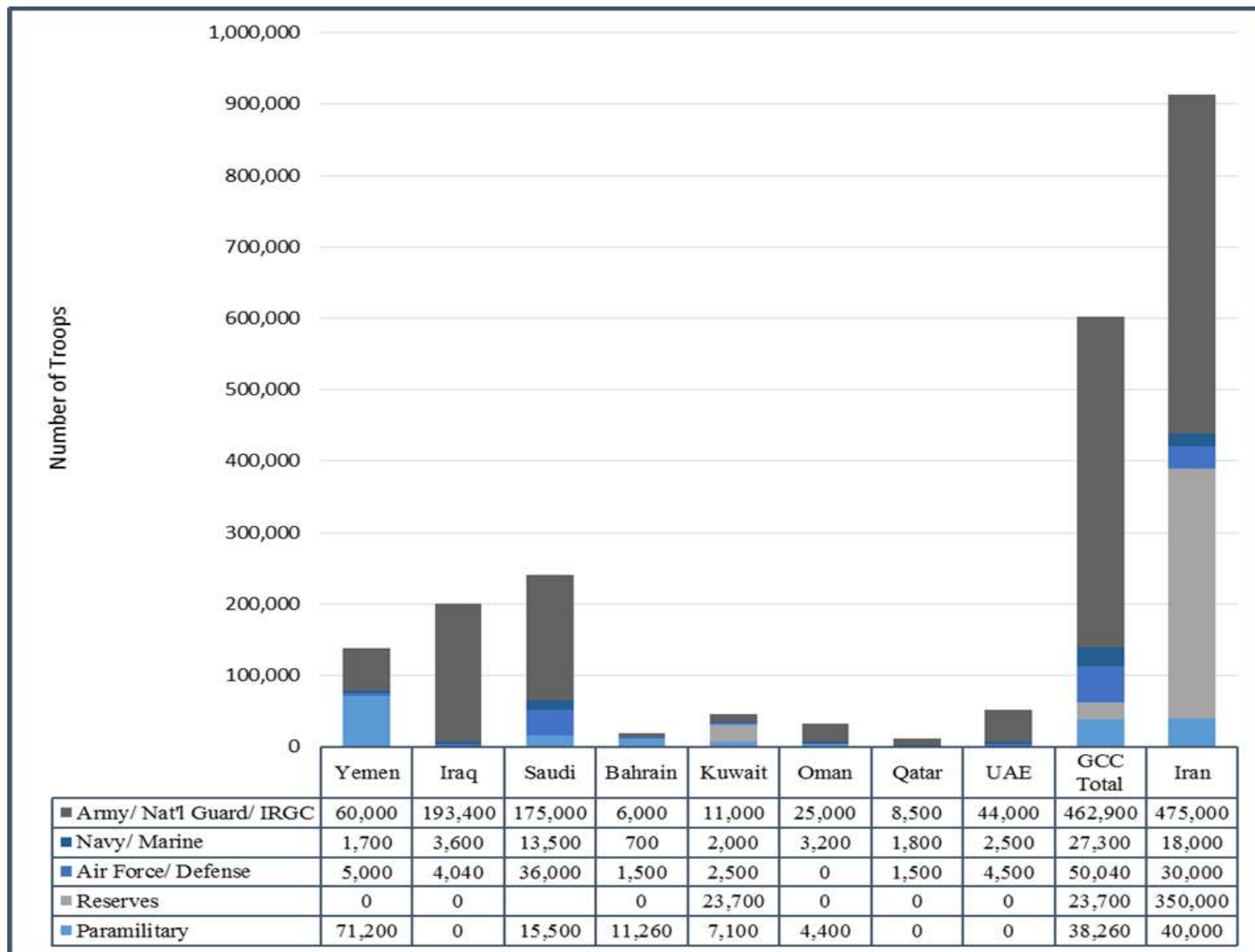


	Main Battle Tanks		Combat Aircraft	
	2003	2014	2003	2014
Iraq	2,200	336	316	3
Iran	1,565	1,663	283	334

The “Kuwaiti Hinge”

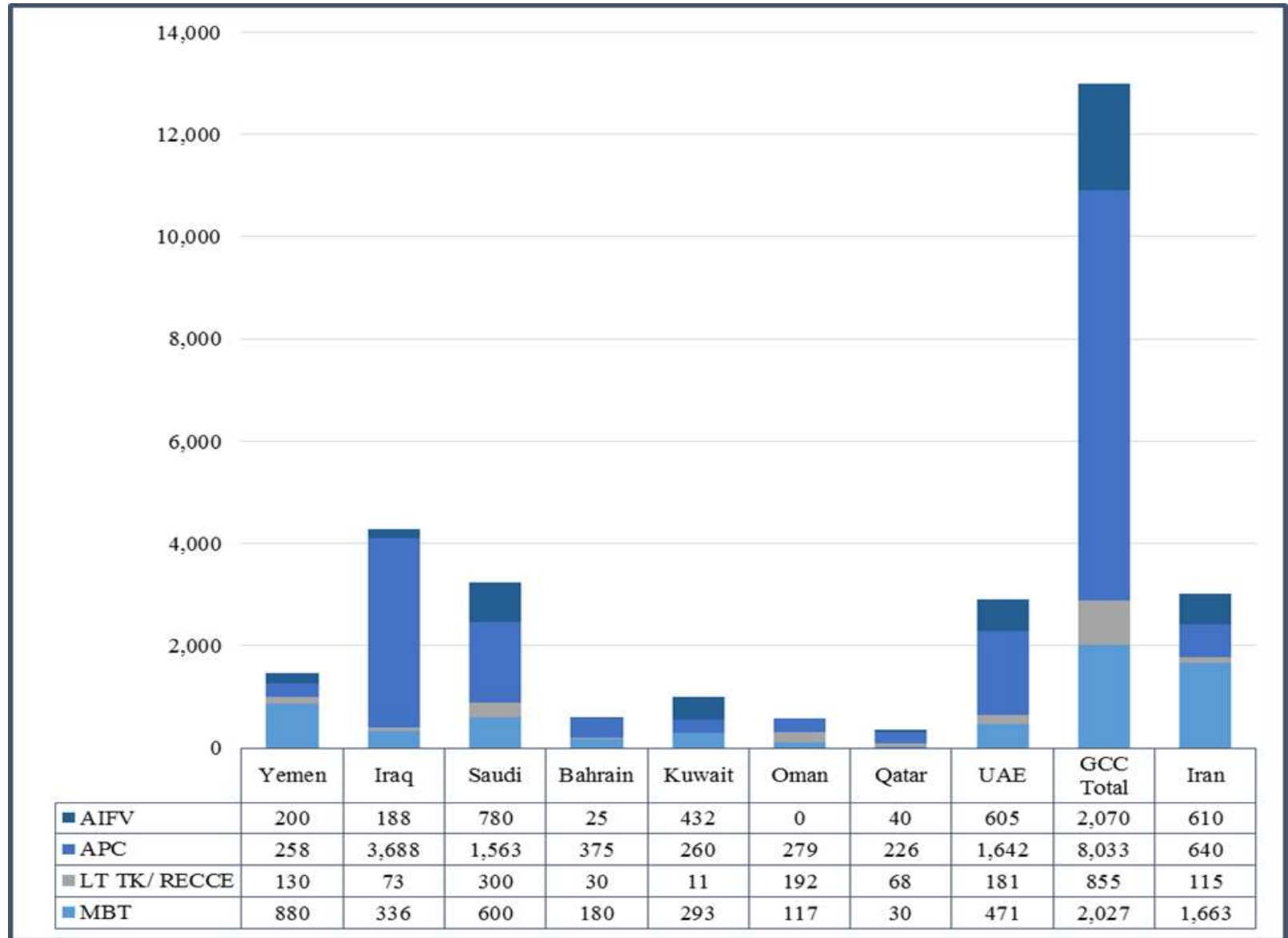


Total Combat Manpower without US and Other Allied Forces



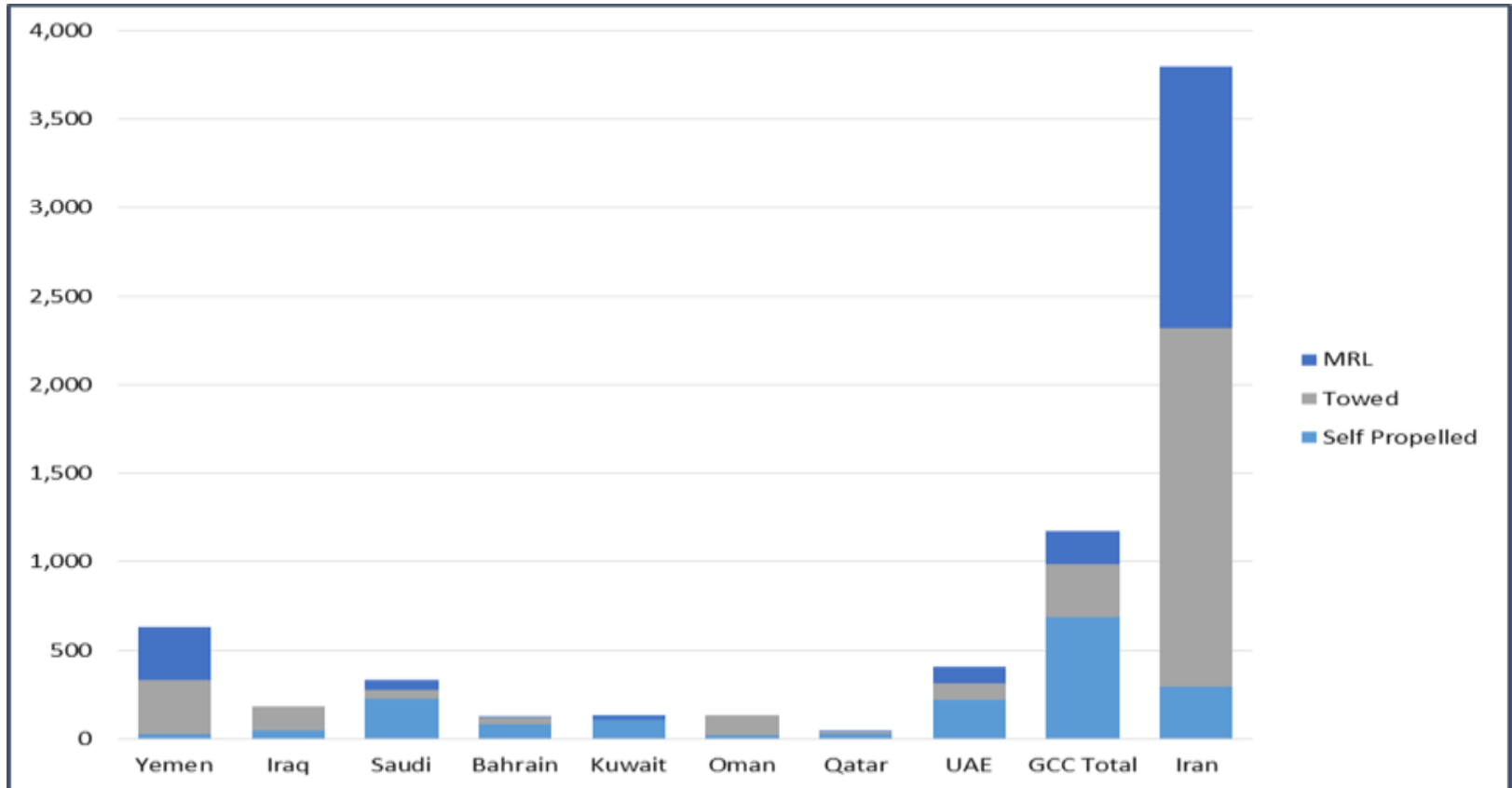
Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance*, 2014 and IHS Jane's Sentinel series

Total Major Armored Weapons 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

Total Major Artillery Weapons without US and Other Allied Forces



	Yemen	Iraq	Saudi	Bahrain	Kuwait	Oman	Qatar	UAE	GCC Total	Iran
Self-Propelled	25	48	224	82	106	24	28	221	685	292
Towed	310	138	50	36	0	108	12	93	299	2,030
MRL	294	some	60	9	27	0	4	92	192	1,476
Mortars	642	1200	437	24	78	101	45	155	437	5000

***GCC Lead in Airpower, SAMs,
and Missile Defense Even
Without US, British, and
French Power Projection***

Air/Missile Threats

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

But:

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

Range of Iran's Air Power



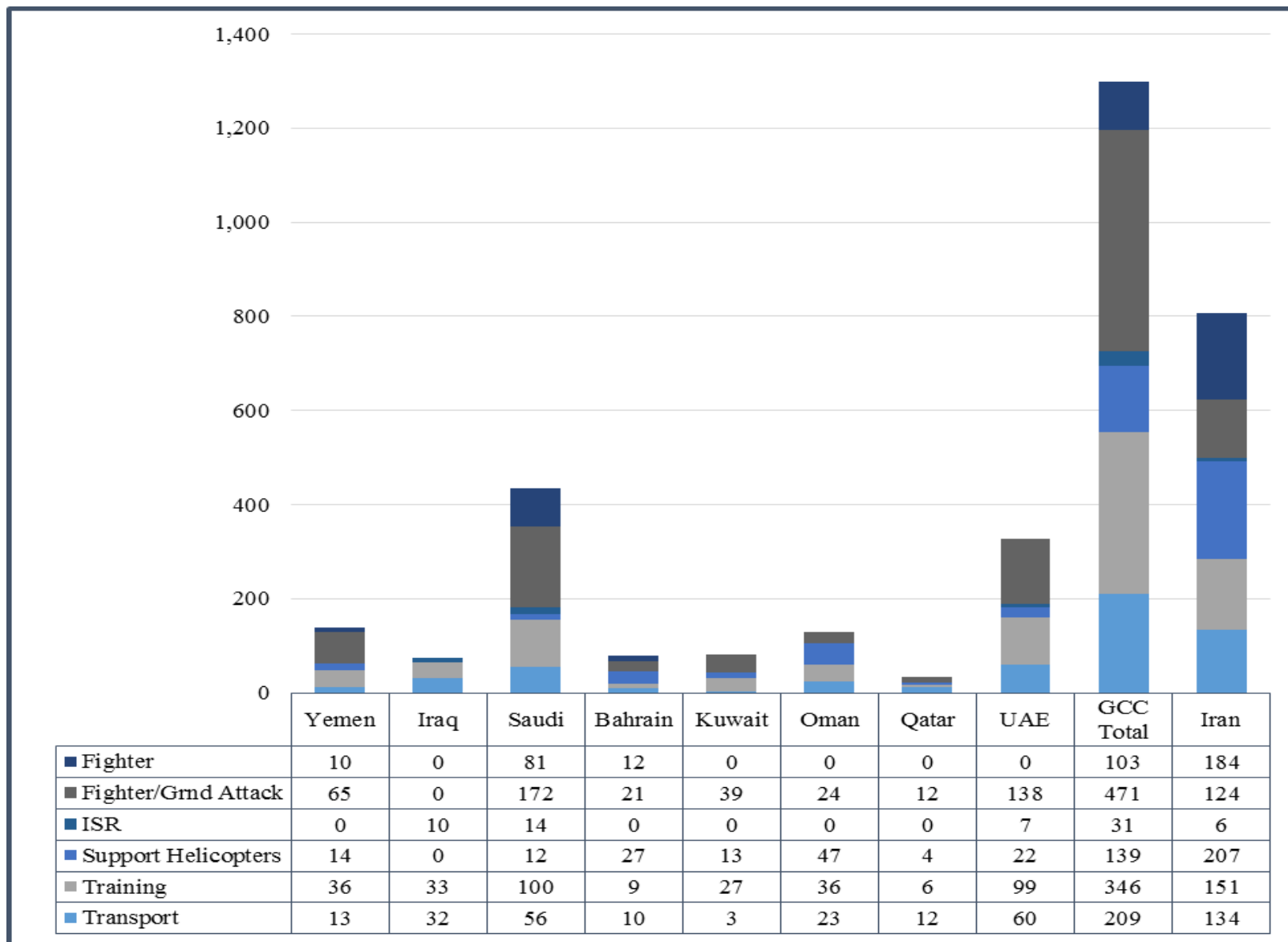
Mission Profile: Hi-Lo-Hi

F-4E (Bushehr):
(4) MK83 1000lb Bombs
(1) 600 Gallon Fuel Tank
10 Minutes loiter time
Range = 400 nmi

SU-24 (Shiraz):
(4) 500 kg/1000 lb Bombs
(1) 400 gallon tank
10 minutes loiter time
Range = 590 nmi

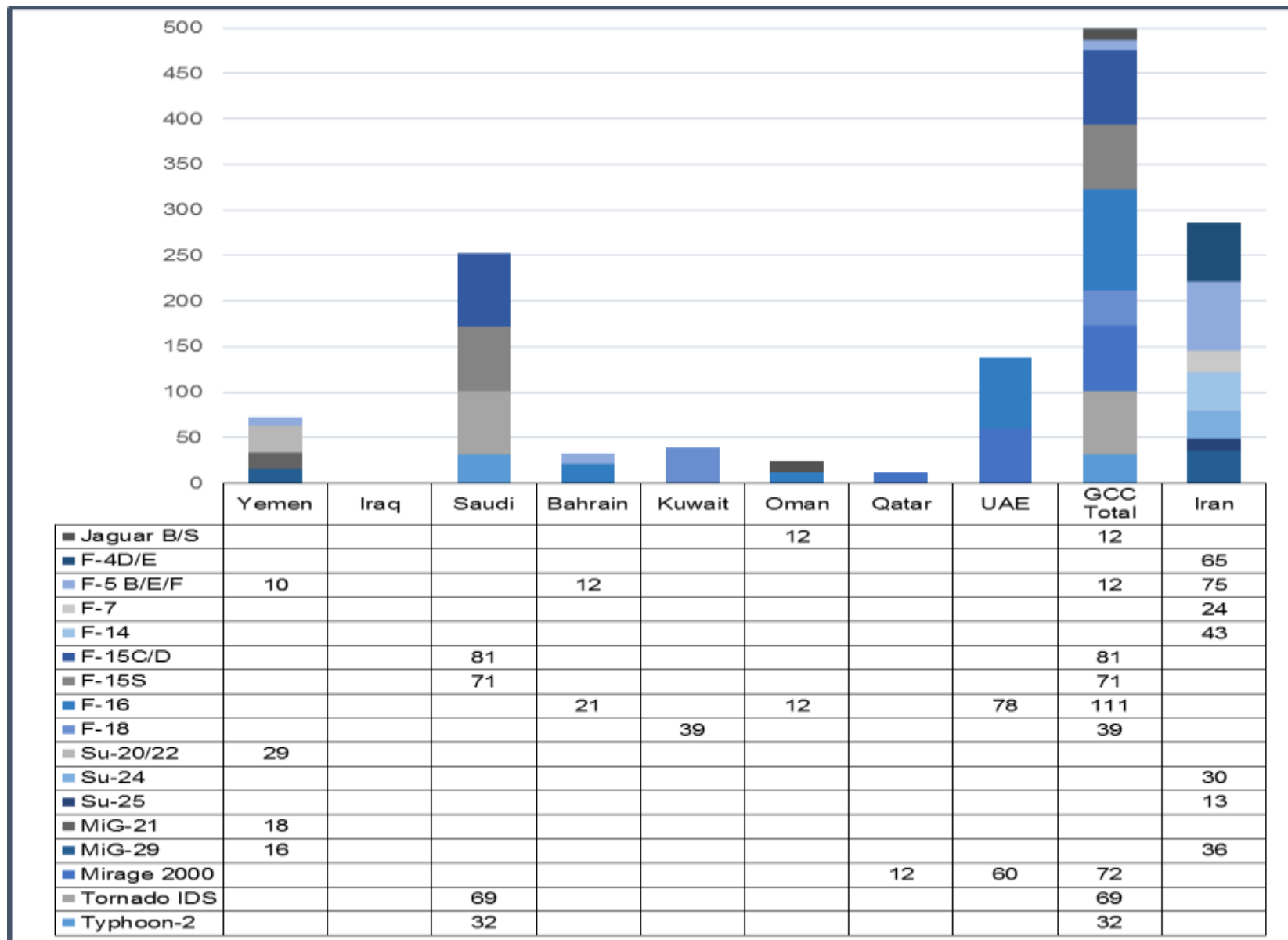
SU-25 (Shiraz):
(4) 500kg/1000lb Bombs
(1) 400 gallon tank
(2) 10 minutes loiter time
Range = 600 nmi

Total Combat Air Strength without US and Other Allied Aircraft



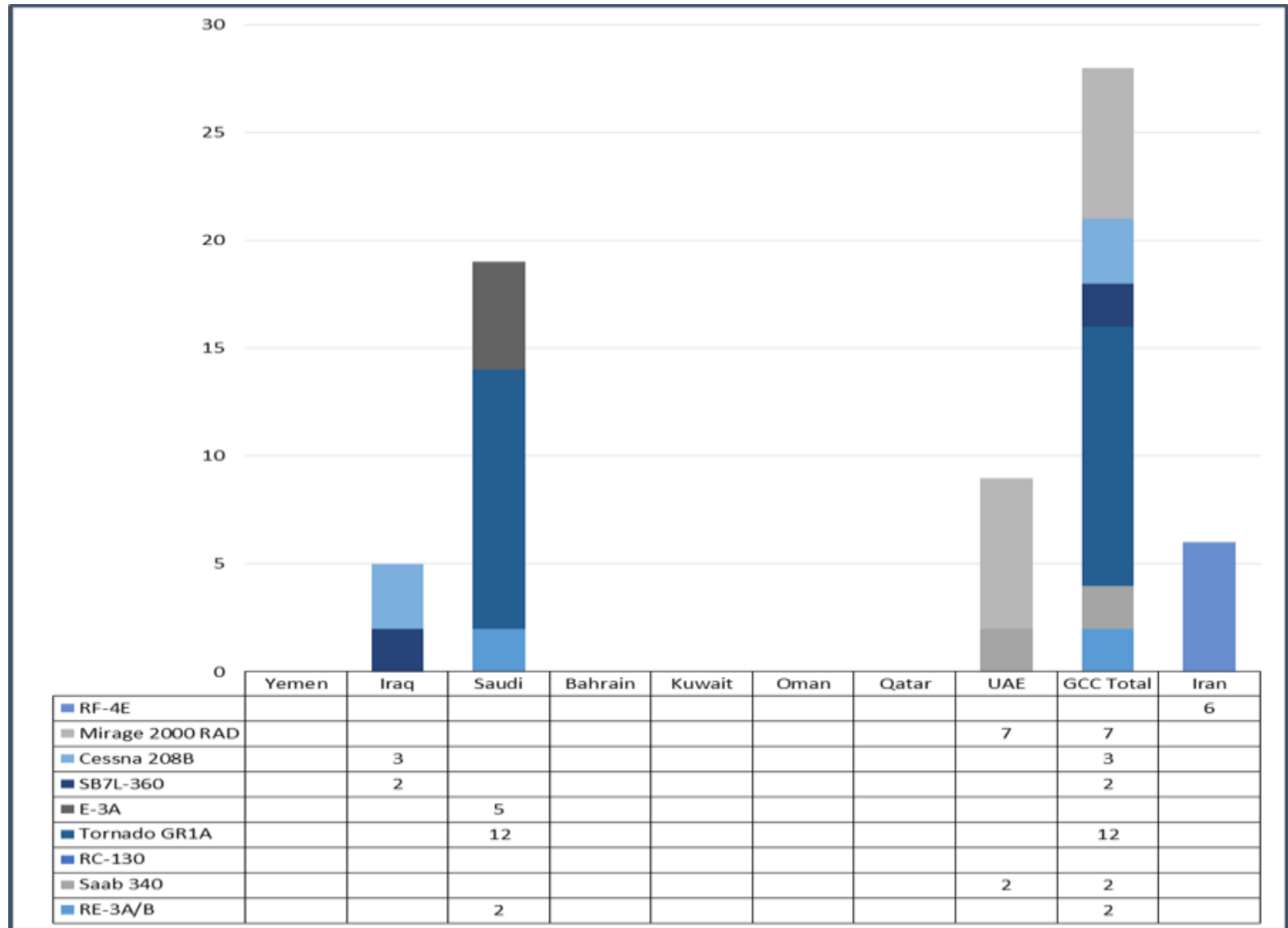
Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance*, 2014 and IHS Jane's Sentinel series

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

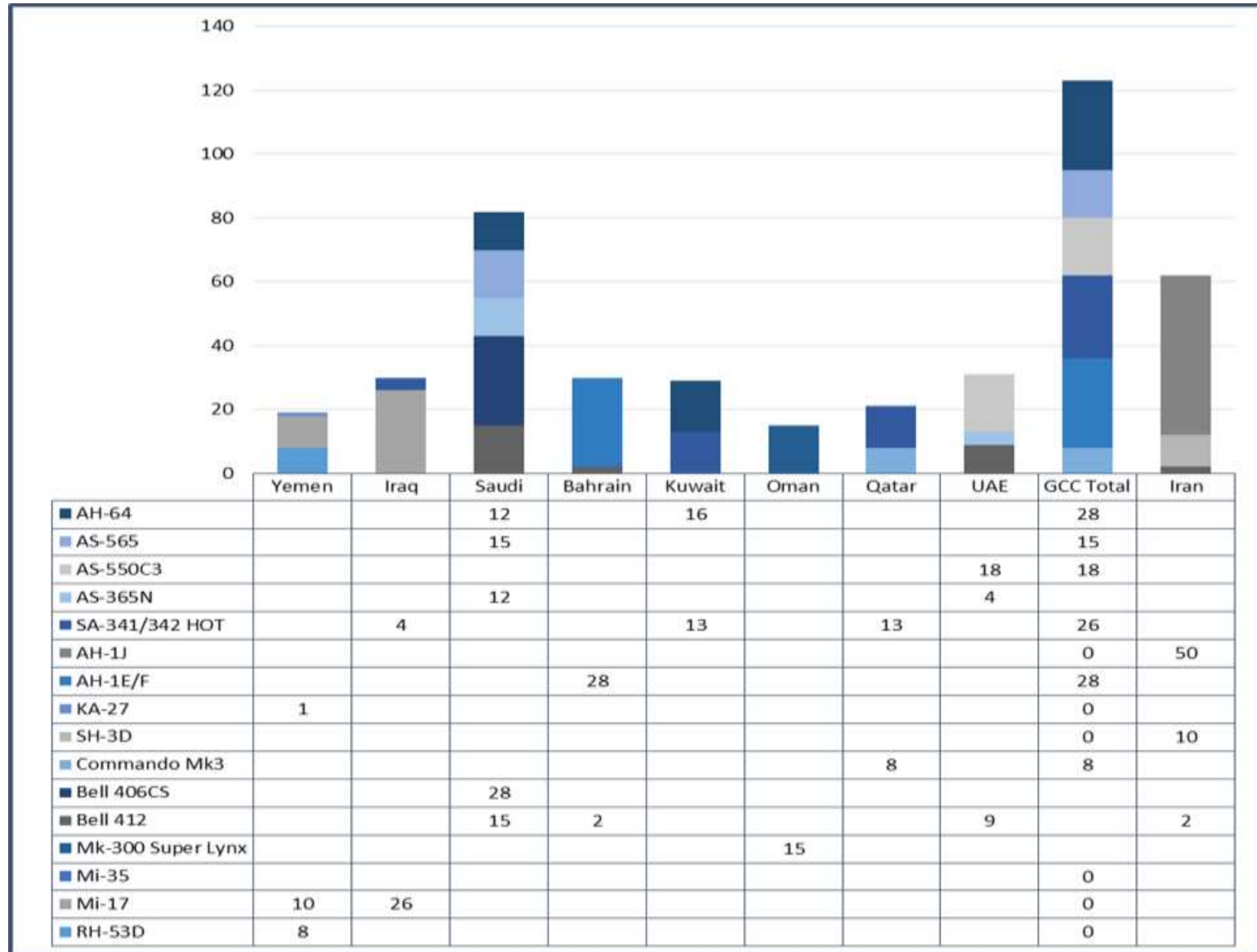


Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance*, 2014 and IHS Jane's Sentinel series

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

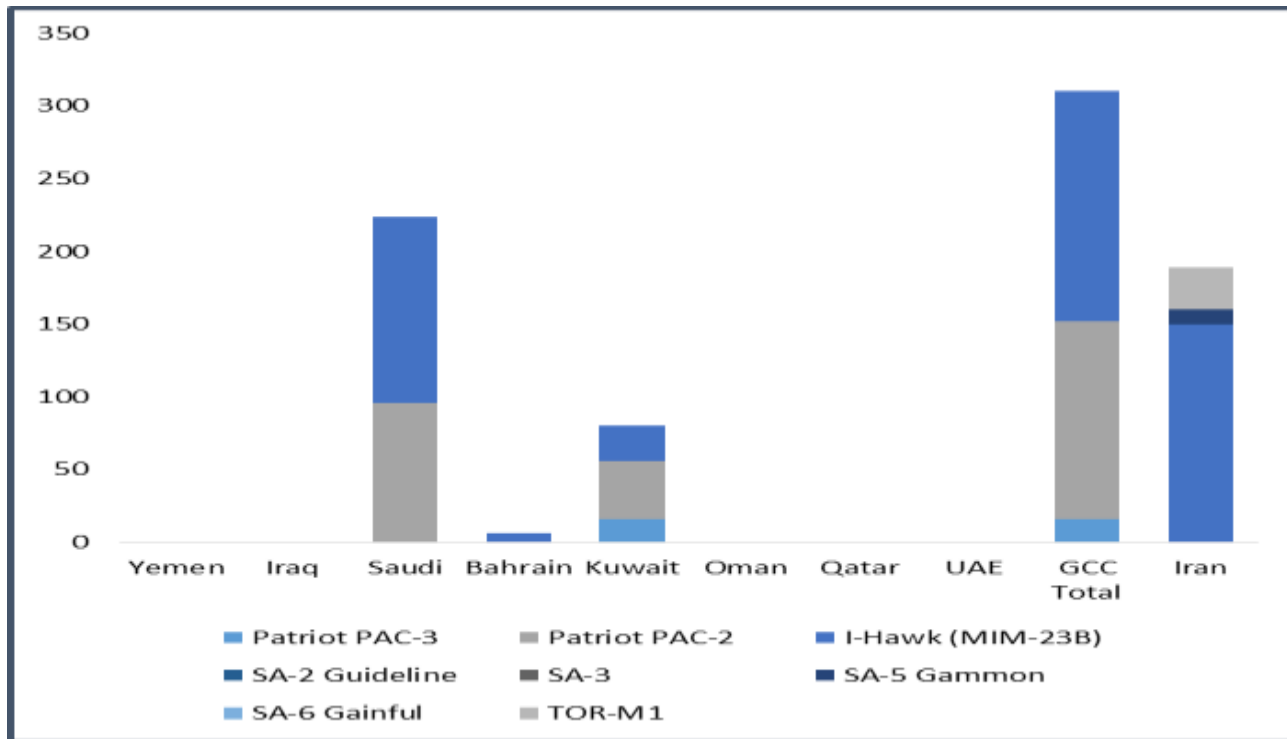


Comparative Attack, Armed, and Naval Combat Helicopters Strength without US and Other Allied Aircraft



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

Comparative Major Surface-to-Air and Ballistic Missile Defense Launcher Strength without US and Other Allied Aircraft



	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

Gulf Land-Based Air Defenses In 2012

Country	Major SAM	Light SAM	AA Guns
Bahrain	6: Hawk MiM-23B	60: R BS-70 18: FIM-92A Stinger 7: Crotale	24 Guns: 12 Oerlikon 35mm 12 L/70 40mm
Iran	16/150: I Hawk 3/10: SA-5 10: SA-5 Gammon 45: SA-2 Guideline	SA-7/14/16, HQ-7 29 SA-15 Some QW-1 Misaq 29 TOR-M1 Some HN-5 5/30 Rapier 10 Pantsyr (SA-22) 250 FM-80 (CH Crotale) 15 Tigercat Some FIM-92A Stinger	1,122 Guns ZSU-23-4 24mm ZPU-2/4 14.5mm ZU-23 23mm M-1939 37mm S-60 57mm 80 ZSU-57-2
Iraq	-----	-----	-----
Kuwait	5/24 I Hawk Phase III 4/30 Patriot PAC-2	12 Aspide 12 Starburst Aspide Stinger	
Oman	-----	Blowpipe 8 Mistral 2SP 12 Pantsyr S1E 34 SA-7 6 Blindfire S713 Martello 20 Javelin 40 Rapier	26 guns 4 ZU-23-2 23mm 10GDF-005 Skyguard 35 12 L-60 40mm
Qatar	-----	10 Blowpipe 12 FIM-92A Stinger 9 Roland II 24 Mistral 20 SA-7	-----
Saudi Arabia (NG)	16/ 128 I Hawk 4-6/16-24 Patriot 2 17/73 Shahine Mobile 16/96 PAC-2 Launchers 17 ANA/FPS-117 radar 73/68 Crotale/ Shahine	40 Crotale 500 Stinger (ARMY) 500 Mistral (ADF) 400 FIM-43 Redeye 500 Redeye (ADF) 73-141 Shahine static 400 FIM-92A Avenger	1,220 guns 92: M-163 Vulcan 20mm 30: M-167 Vulcan 20mm 50 AMX-30SA 30mm 128 GDF Oerlikon 35mm 150 L-70 40mm (in store) 130 M-2 90mm (NG)
UAE	26/36 I Hawk Patriot PAC-3	20 + Blowpipe 20 Mistral Some Rapier Some Crotale Some RB-70 Some Javelin Some SA-18 Grouse	62 guns 42 M-3VDA 20mm SP 20 GCF-BM2 30mm
Yemen	Some SA-2, 3 Some SA-6 Sp	Some 800 SA-7 Some SA-9 SP Some SA-13 SP Some SA-14	530 guns 20 M-163 Vulcan SP 20mm 50 Z SU-23-4 SP 23mm 100 ZSU-23-2 23mm 150 M-1939 37mm 50M-167 20mm 120 S-60 57mm 40M-1939 KS-12 85mm

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

***GCC Challenged in
Seapower Without US,
British, and French Power
Projection, but Major Lead in
Total Modern Air-Sea Assets***

The Key Challenge: Naval Threats

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

But:

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

IRGC Naval Forces

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

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

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

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

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

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

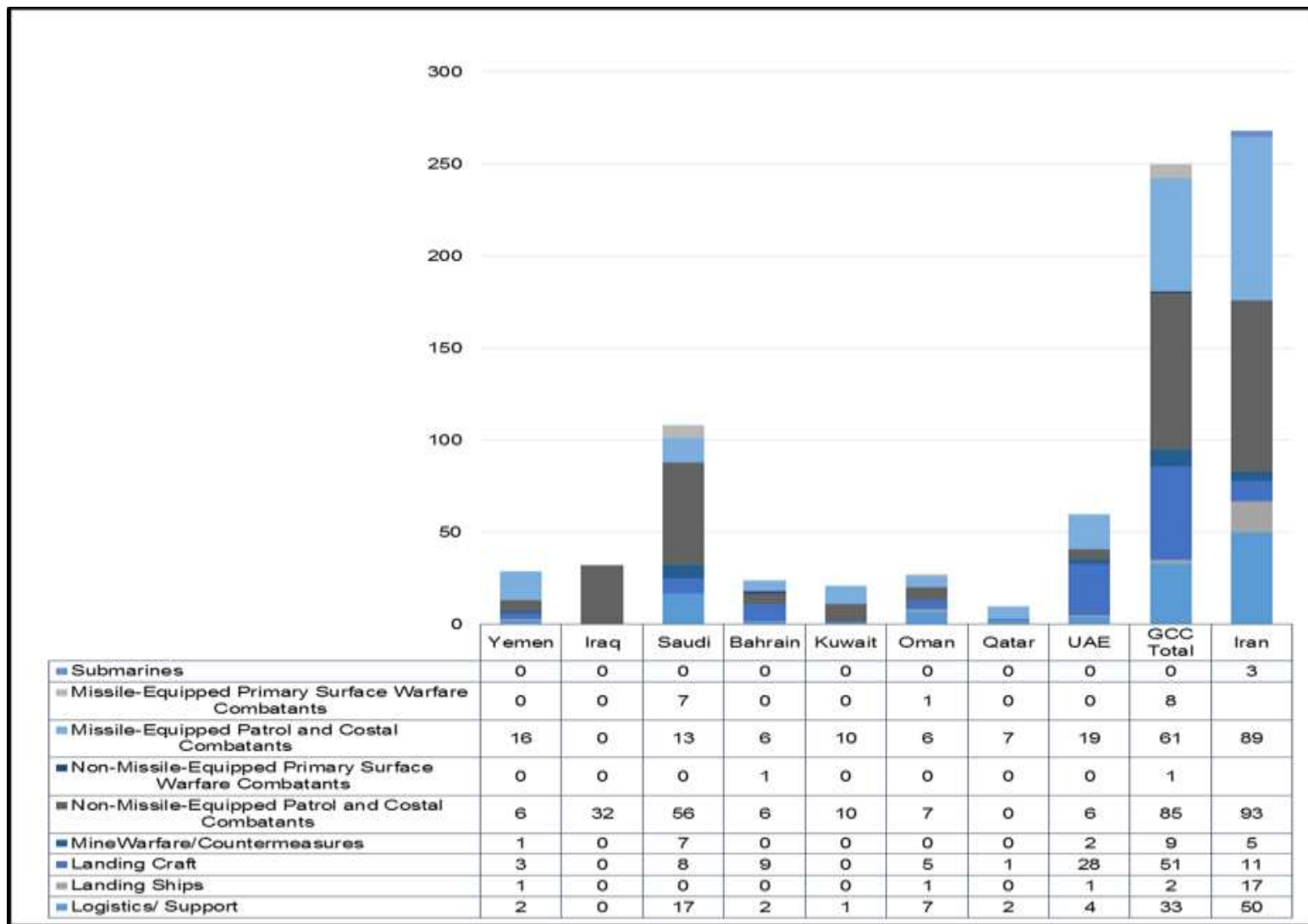
Can deliver conventional weapons, bombs, mines, and CBRN weapons into ports and oil and desalination facilities.

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

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

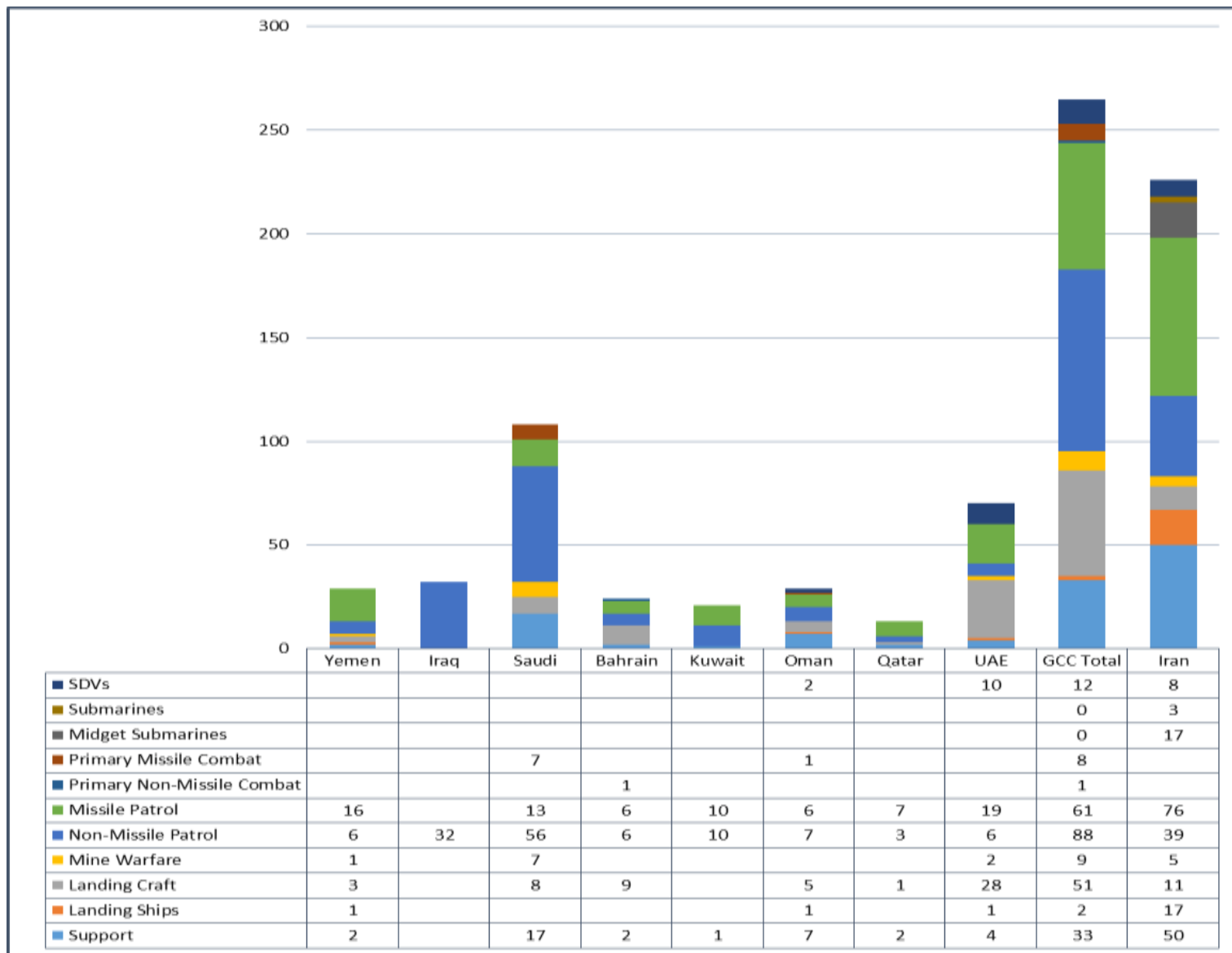
Small fast-attack craft, heavily armed with rockets or anti-ship missiles.

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

Comparative Asymmetric Ship and Boat Strength without US and Other Allied Forces



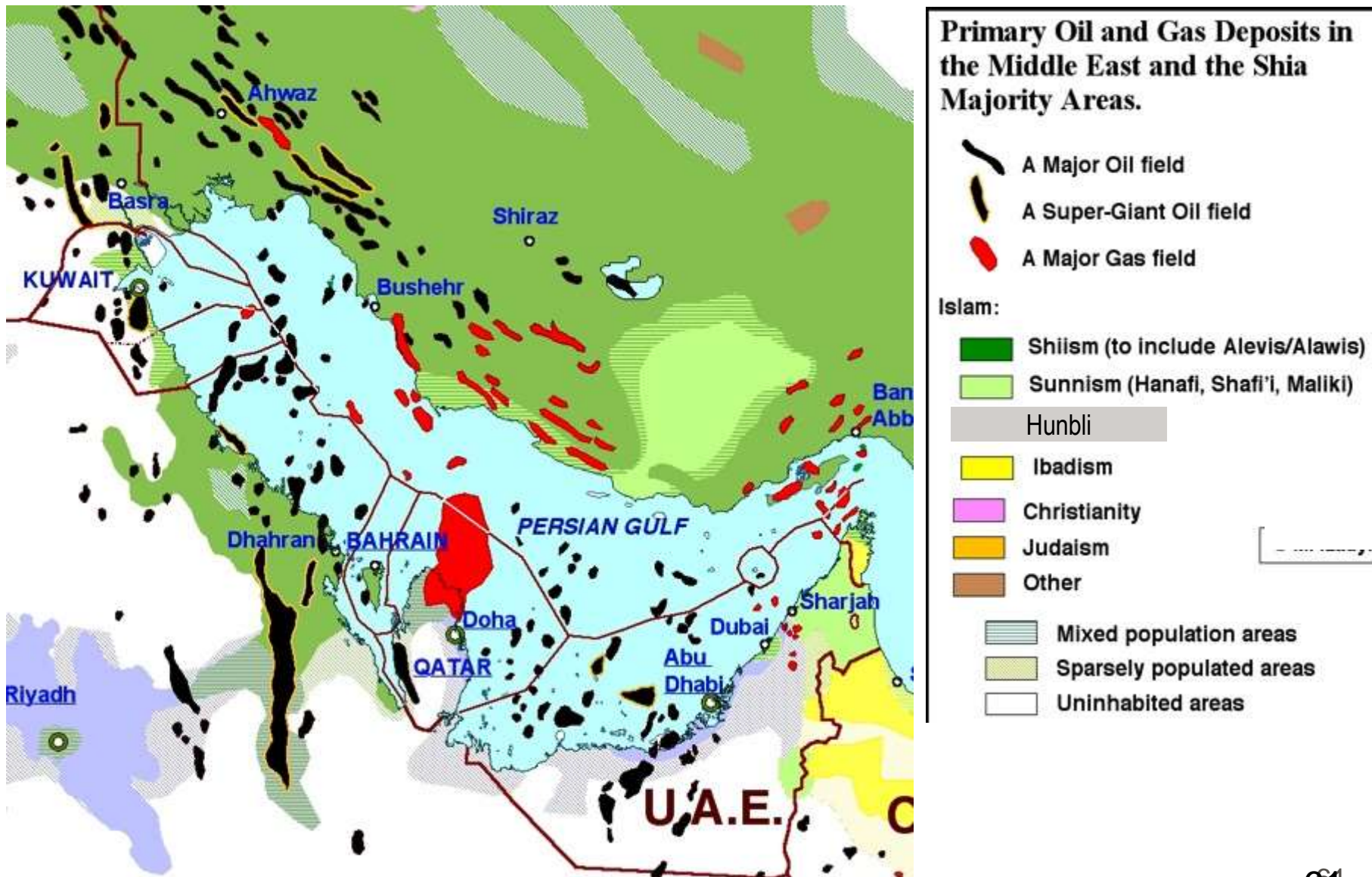
Source: Adapted by Anthony H. Cordesman and Garrett Berntsen from IISS, *Military Balance*, 2014 and IHS Jane's Sentinel series

Gulf Air-Sea-Raid-Sabotage Dynamics

You Don't have to break a Bottle at the Neck



Vulnerability of Gulf Oil Fields



Iranian Gulf Military Installations

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

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

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

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

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

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

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

Jask (25°40'40.90"N, 57°51'4.54"E)

Bostanu (27° 2'58.22"N, 55°59'3.22"E)

Chabahar

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

Qeshm (26°43'10.09"N, 55°58'30.94"E)

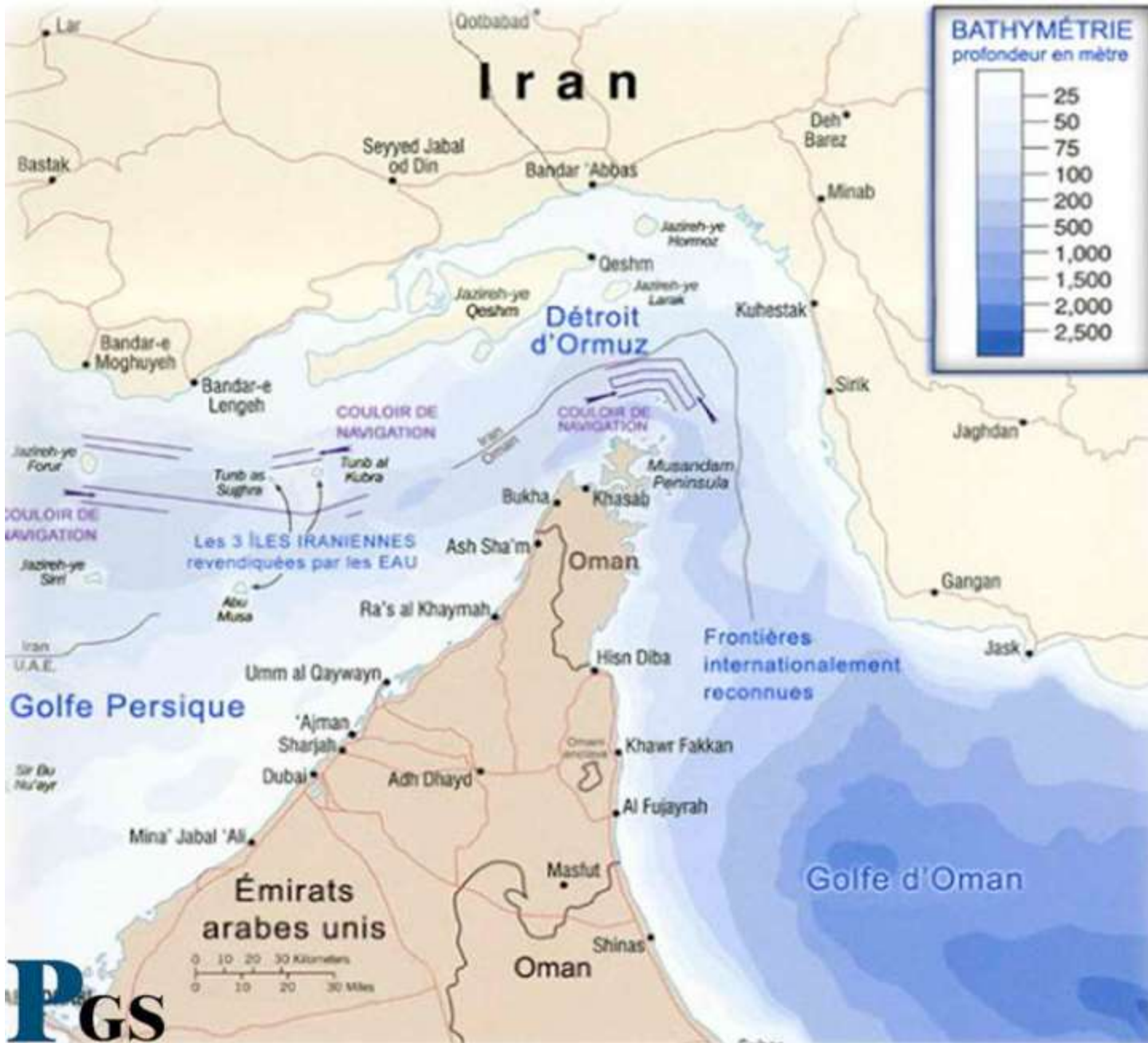
Sirri Island (25°53'40.20"N, 54°33'7.82"E)

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

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

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

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



EIA Estimate in 12/2011:

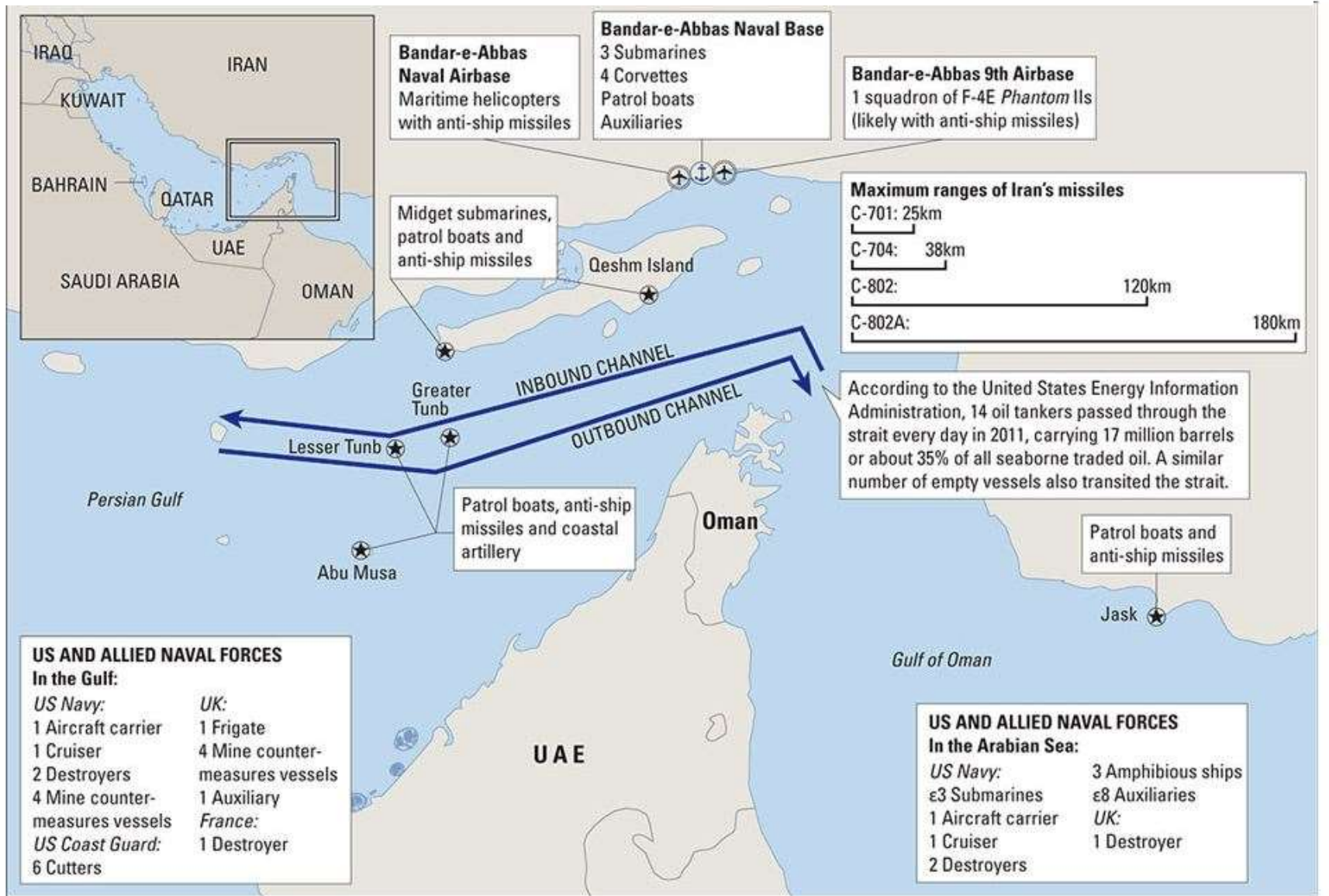
Hormuz is the world's most important oil chokepoint

Its daily oil flow of almost 17 million barrels in 2011, up from between 15.5-16.0 million bbl./d in 2009-2010.

Flows through the Strait in 2011 were roughly 35 percent of all seaborne traded oil,

Or almost 20 percent of oil traded worldwide.

Strait of Hormuz: Iranian, US and Allied assets in the region



Abu Musa



Map of Arabian Sea



Saudi Arabian Oil Exports

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

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

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

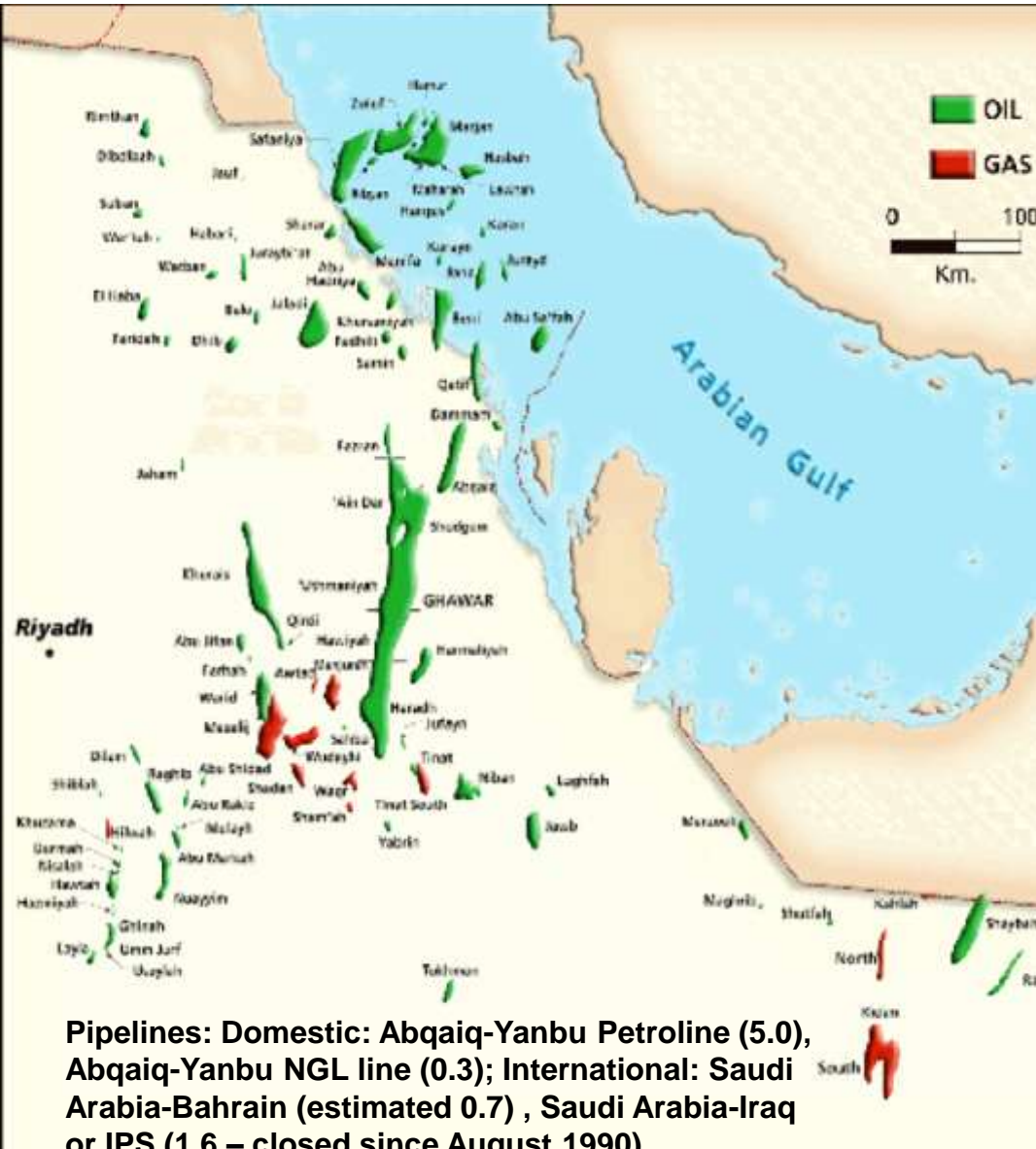
Saudi Arabia has three primary oil export terminals:

- **The Ras Tanura complex has approximately 6 million bbl./d capacity, and the world's largest offshore oil loading facility. It includes the 2.5-million bbl./d port at Ras Tanura. More than 75 percent of exports are loaded at the Ras Tanura Facility.**

- **The 3 to 3.6-million bbl./d Ras al-Ju'aymah facility on the Persian Gulf.**

- **The Yanbu' terminal on the Red Sea, from which most of the remaining 25 percent is exported, has loading capacity of approximately 4.5 million bbl./d crude and 2 million bbl./d for NGL and products. The facility is reportedly not used to full capacity.**

These and a dozen other smaller terminals throughout the country, appear capable of exporting up to 14-15 million bbl./d of crude and refined products, 3-4 million bbl./d higher than Saudi Arabia's current crude oil production capacity.



Pipelines: Domestic: Abqaiq-Yanbu Petroline (5.0), Abqaiq-Yanbu NGL line (0.3); International: Saudi Arabia-Bahrain (estimated 0.7) , Saudi Arabia-Iraq or IPS (1.6 – closed since August 1990), TransArabia Tapline (0.5 – closed since 1984)

Ras Tanura



Desalination Plant



Iranian Oil Facilities



Kharg Island, the site of the vast majority of Iran's exports, has a crude storage capacity of 20.2 million barrels of oil and a loading capacity of 5 million bbl./d.

Lavan Island is the second-largest terminal with capacity to store 5 million barrels and loading capacity of 200,000 bbl./d.

Other important terminals include Kish Island, Abadan, Bandar Mahshar, and Neka (which helps facilitate imports from the Caspian region).

Iran has an expansive domestic oil network including more than 10 pipelines that run between 63 and 630 miles in length.

Iran has invested in its import capacity at the Caspian port to handle increased product shipments from Russia and Azerbaijan, and enable crude swaps with Turkmenistan and Kazakhstan.

In the case of crude swaps, the oil from the Caspian is consumed domestically in Iran, and an equivalent amount of oil is produced for export through the Persian Gulf with a Swiss-trading arm of NIOC for a swap fee.

According to FGE, Khatam Al-Anbia Construction Headquarters (KACH), the construction company controlled by Iran's Islamic Revolutionary Guard Corps (IRGC), was awarded a new contract by NIOC worth \$1.3 billion to build two oil pipelines.

The new oil pipelines will total 684 miles and will deliver crude oil from the Khuzestan Province to the Tehran oil refinery.

In addition, KACH is constructing three other pipelines that will deliver crude oil and petroleum products. These include the Naveen-Kashan, Rafsanjan-Mashhad, and Bandar Abbas-Rafsanjan pipelines.

Key Targets that Illustrate Iran's Vulnerability

- **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 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 Emerging Missile Threat

Missiles and States with Nuclear Weapons

Iran	SRBM < 1000 km	MRBM 1,000 – 3,000 km	IRBM 3,000 – 5,500 km	ICBM > 5,500 km
	Shahab-1	Shahab-3	Shahab-5	Shahab-6
Shahab-2	Shahab-4	-	-	
Mushak-120	Ghadr-101	-	-	
Mushak-160	Ghadr-110	-	-	
Mushak-200	IRIS	-	-	
-	Sajil	-	-	

Syria	SRBM < 1000 km	MRBM 1,000 – 3,000 km	IRBM 3,000 – 5,500 km	ICBM > 5,500 km
	SCUD-B	-	-	-
SCUD-C	-	-	-	-
SCUD-D	-	-	-	-
SS-21b	-	-	-	-

Israel	SRBM < 1000 km	MRBM 1,000 – 3,000 km	IRBM 3,000 – 5,500 km	ICBM > 5,500 km
	-	Jericho II	-	Jericho III

Pakistan	SRBM < 1000 km	MRBM 1,000 – 3,000 km	IRBM 3,000 – 5,500 km	ICBM > 5,500 km
	Shaheen I	Shaheen II	-	-
Hatf I	Ghauri I	-	-	
Hatf II	Ghauri II	-	-	
Hatf III	Ghauri II	-	-	
M-11	-	-	-	

India	SRBM < 1000 km	MRBM 1,000 – 3,000 km	IRBM 3,000 – 5,500 km	ICBM > 5,500 km
	Agni I	Agni II	Agni III	Surya
Prithvi I				
Prithvi II				



Iran is the only state between the four that has signed and ratified the NPT Treaty.

Iran has been heavily investing in:

- Precision Strike Munitions
- Naval-anti-ship weapons such as the Chinese C802 that hit the Israeli Navy ship during the 2006 war in Lebanon and the Ra'ad 350 km anti-ship missile.
- Ballistic Missiles
- Cruise Missiles such as the Kh55 Russian land attack cruise missile, effective against Oil Platforms.

SRBM : Short Range Ballistic Missile

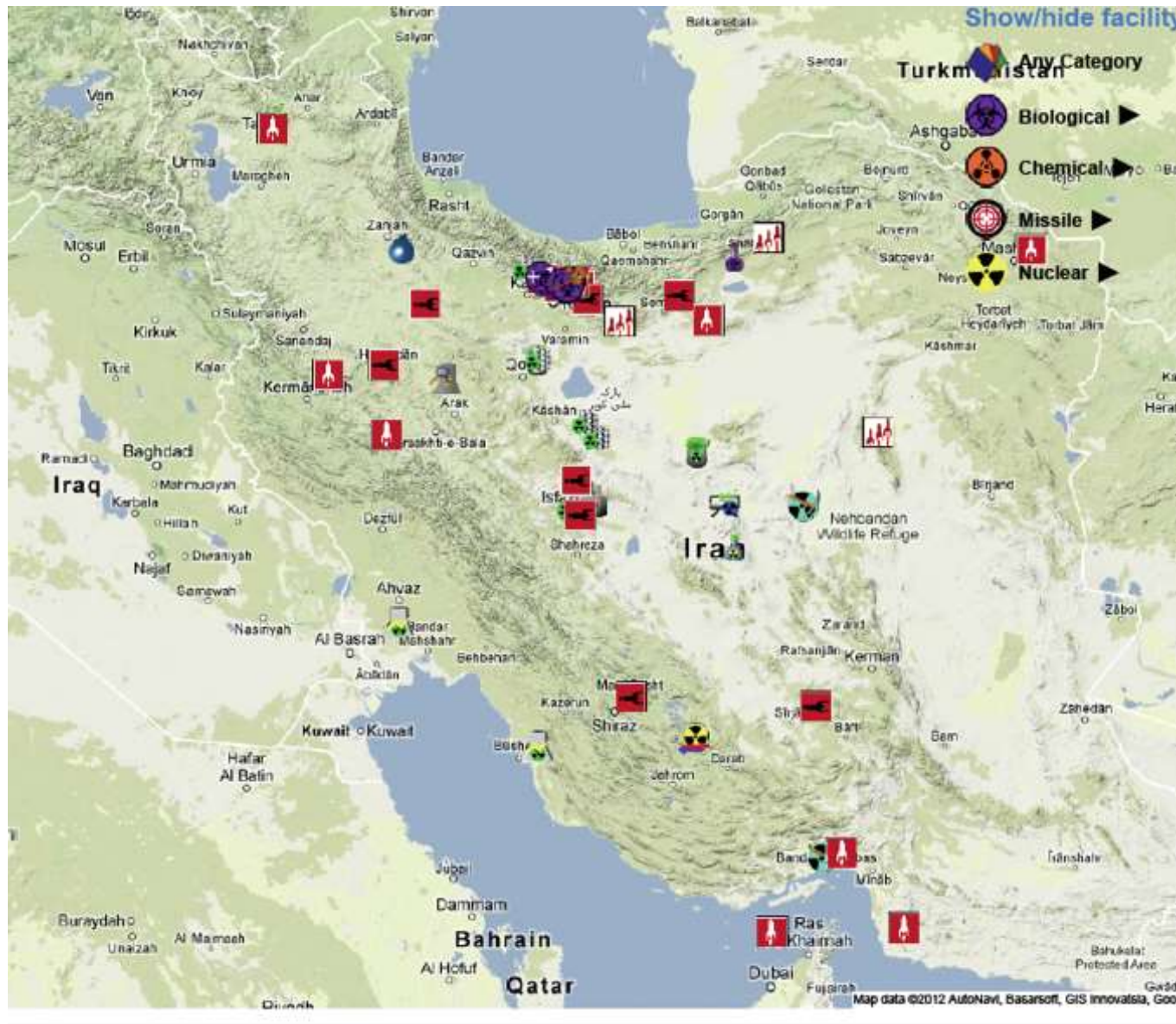
MRBM : Medium Range Ballistic Missile

IRBM : Intermediate Range Ballistic Missile

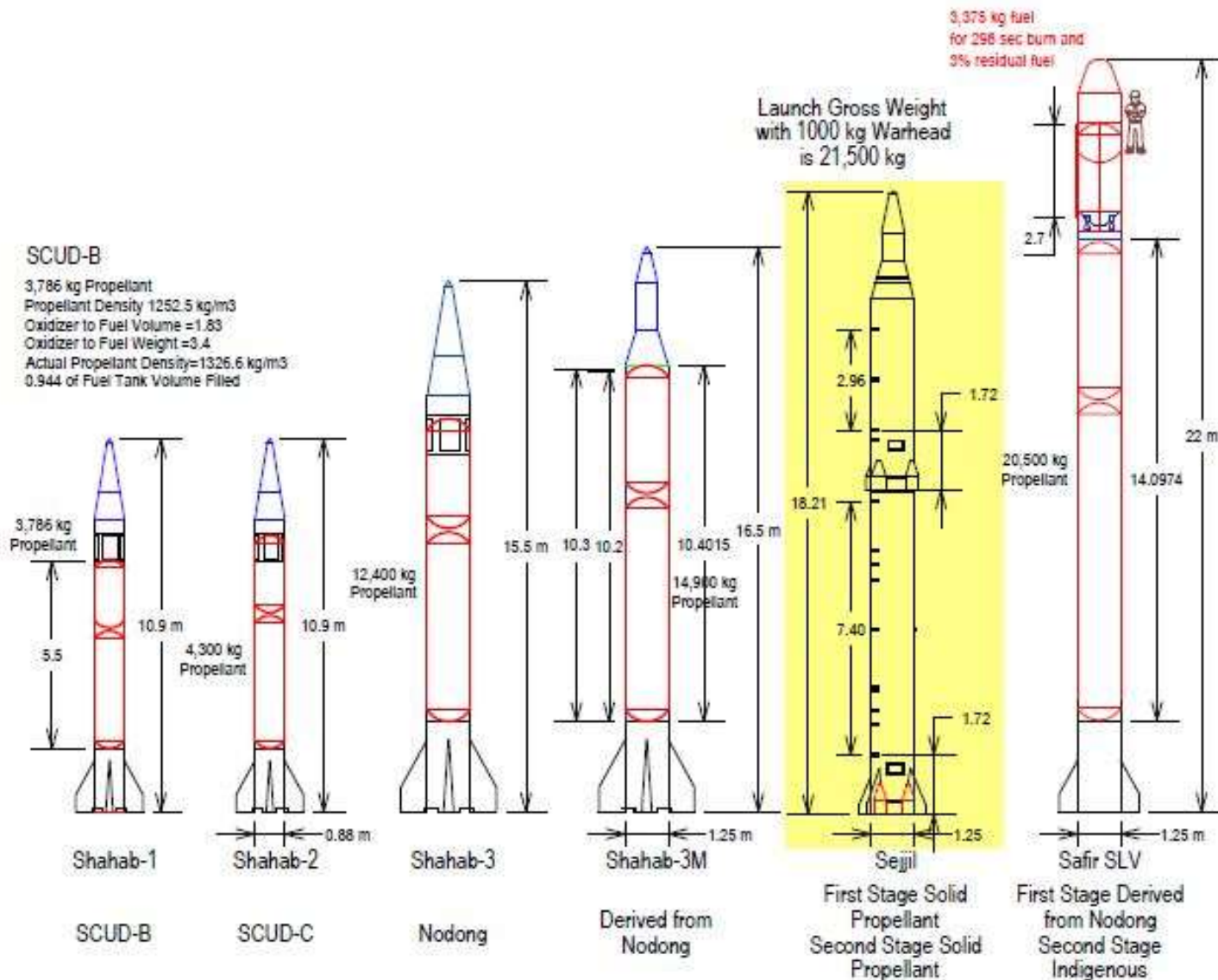
ICBM : Intercontinental Ballistic Missile

37

Iran: Major Open Source Missile and WMD Facilities



Iran's Longer-Range Missiles



(Reference: Theodore Postol, "A Technical Assessment of Iran's Ballistic Missile Program" May 6, 2009. Technical Addendum to the Joint Threat Assessment on Iran's Nuclear And Missile Potential.)

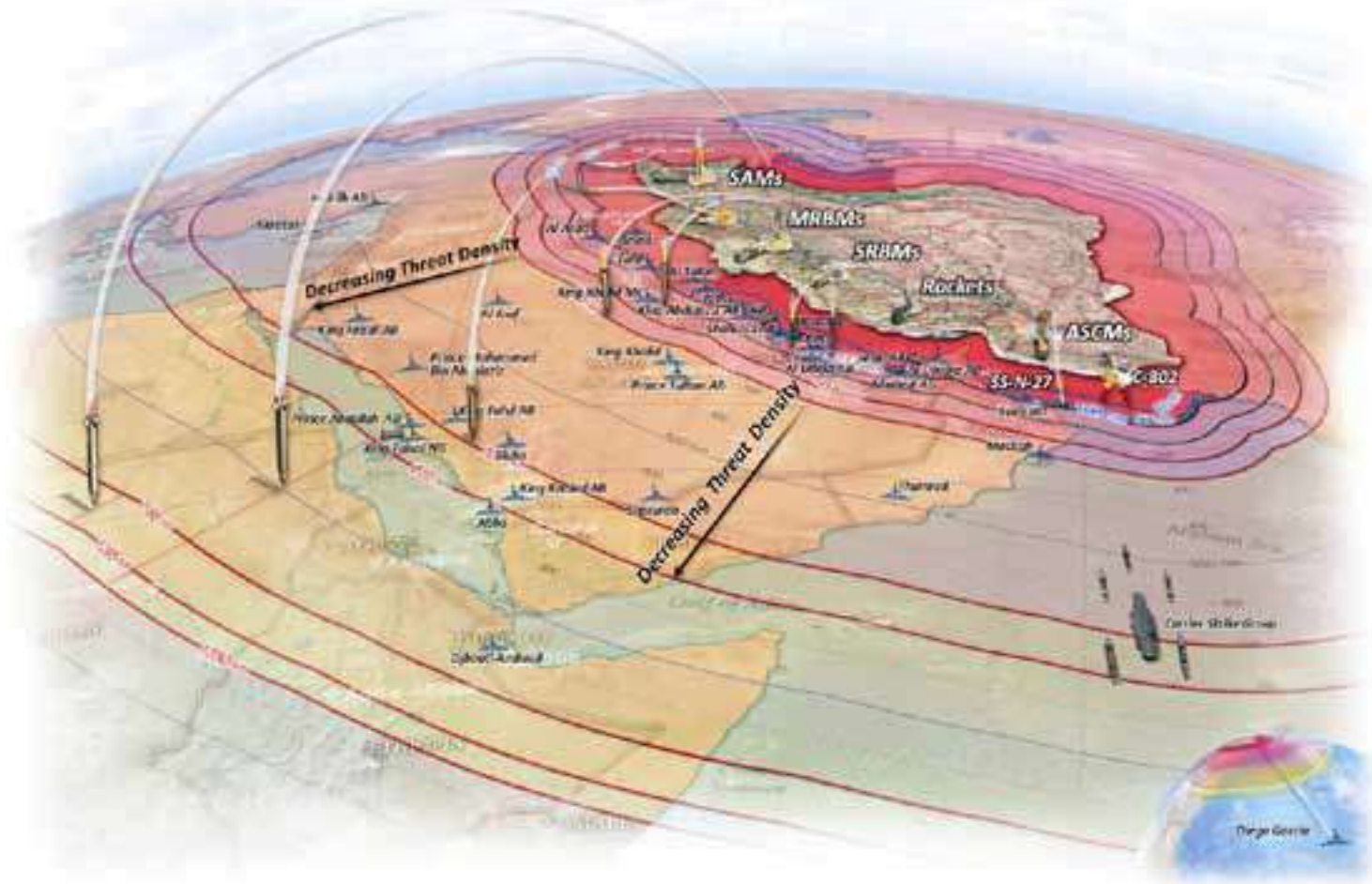
THE RANGE OF IRAN'S SHAHAB-3



Source: Stratfor,

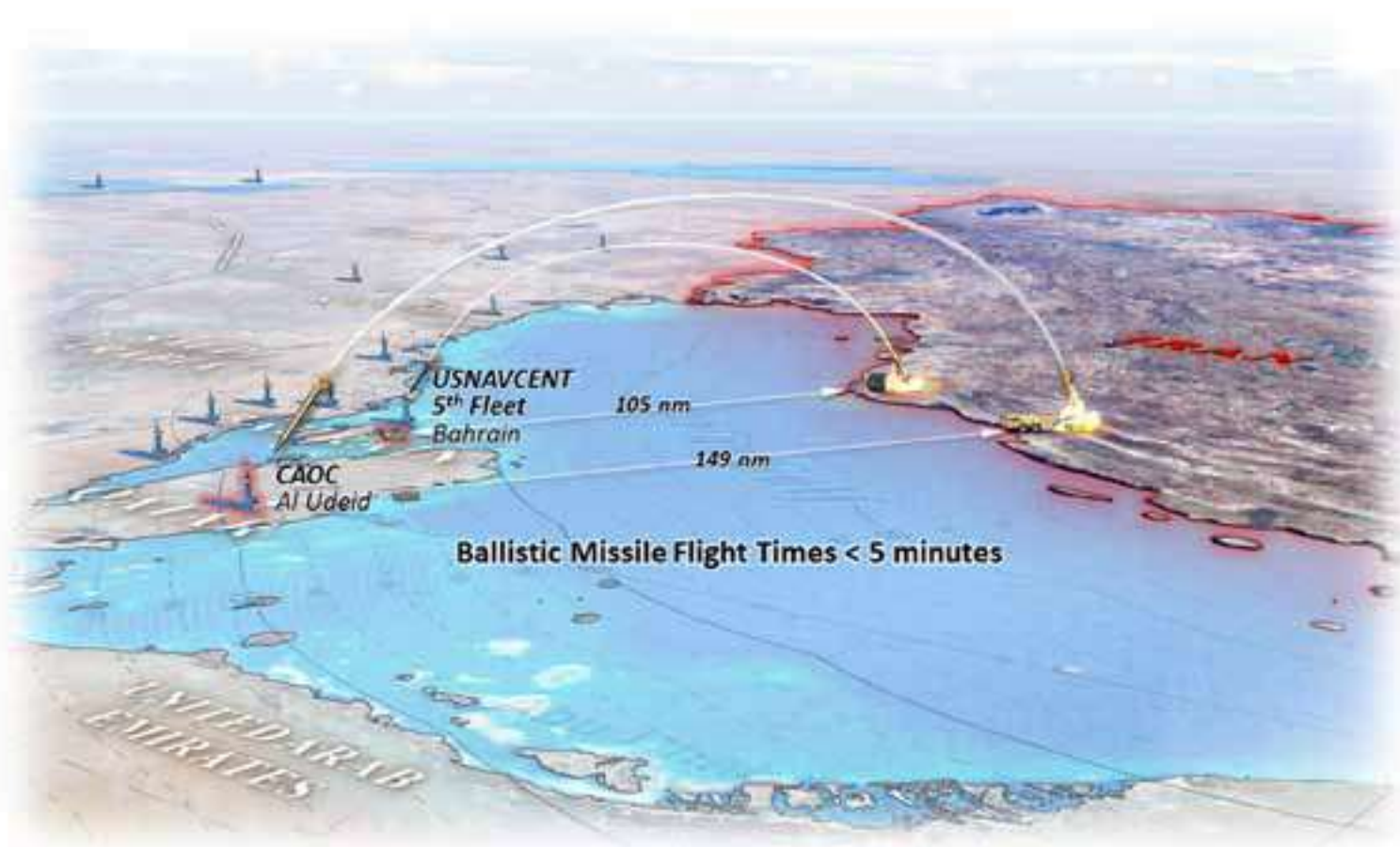
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Missile Attack Range and Density



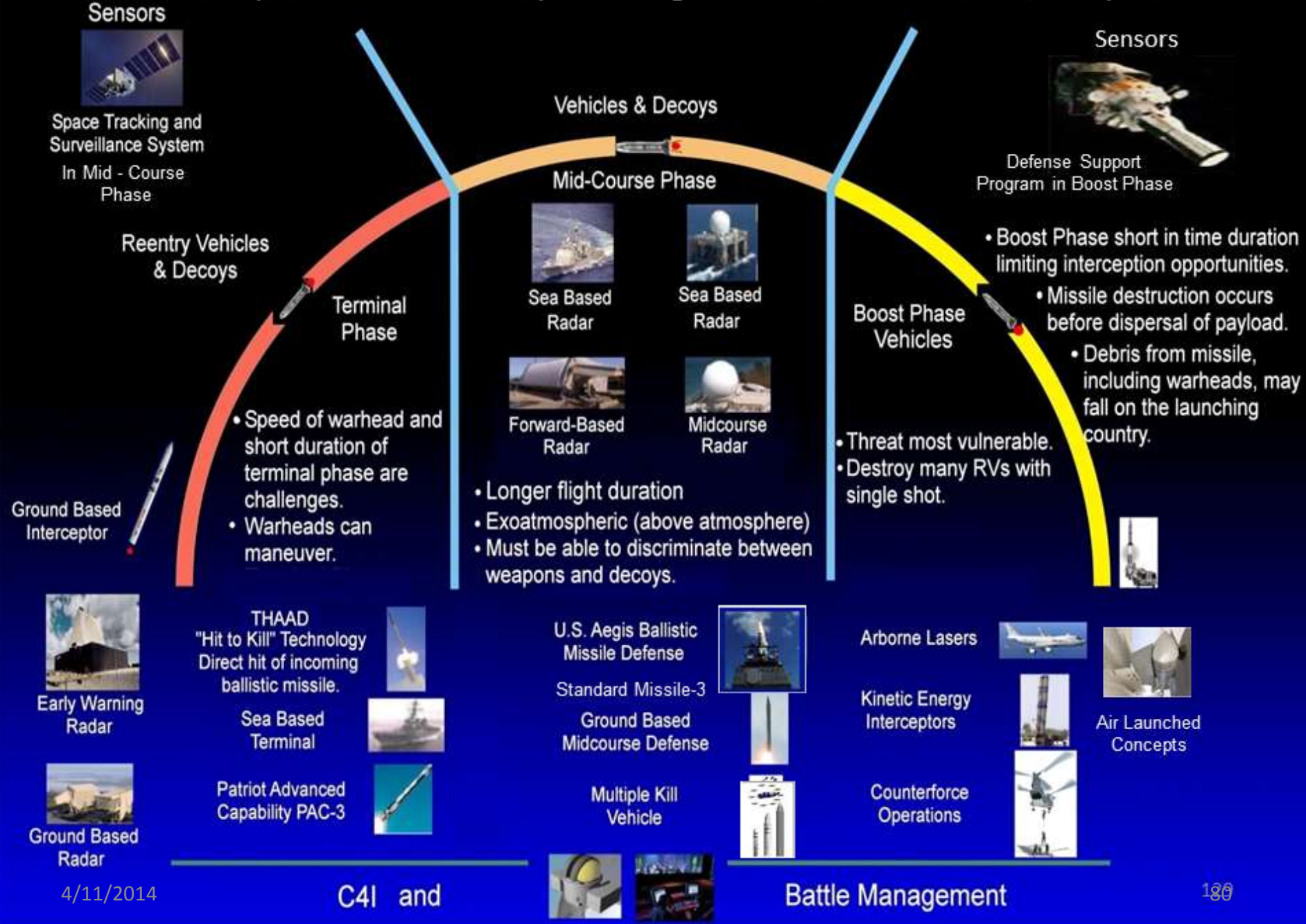
Source: Adapted from Mark Gunzinger and Christopher Dougherty, *Outside-In Operating from Range to Defeat Iran's Anti-Access and Area-Denial Threats*, CBSA, Washington DC, 2011..

Missile Attack Timing



Missile Defense and Missile Wars

Components of a multi-layered integrated Ballistic Missile Defense System



Sea Based Air Defenses

U.S. Navy's Role in Missile Defense Network

Role of the U.S. Navy Aegis System:

- Will provide an efficient and highly mobile sea-based defense against Short and Medium – Range Ballistic Missiles in their midcourse phase.
- The system will allow the BMD Command to move its defense capabilities close to the enemy sites.
- The system will have the Engagement & Long Range Tracking Capability
- Intercepting Short to Medium Range Ballistic Missiles in the midcourse phase of the flight with Standard Missile – 3.
- Serves as a forward deployed sensor, providing early warning and long range search & track capabilities for ICBMs and IRBMs.

Contributions:

- Will extend the battle space of the BMDs and contribute to an integrated layered defense. The Naval Aegis system extends the range of the Ground Missile defense (GMD) element by providing reliable track data used to calculate firing solutions.
- Aegis BMD will coordinate engagements of short and medium range ballistic missiles with terminal missile defense systems.
- As tracking information is shared among these systems, the BMDS will have the opportunity to follow the engagement of a target during the midcourse segment with coordinated terminal engagements.

Sea
Based
Radar



Sea
Based
Radar



Aegis
Ballistic
Missile



GCC Missile Defense Upgrades

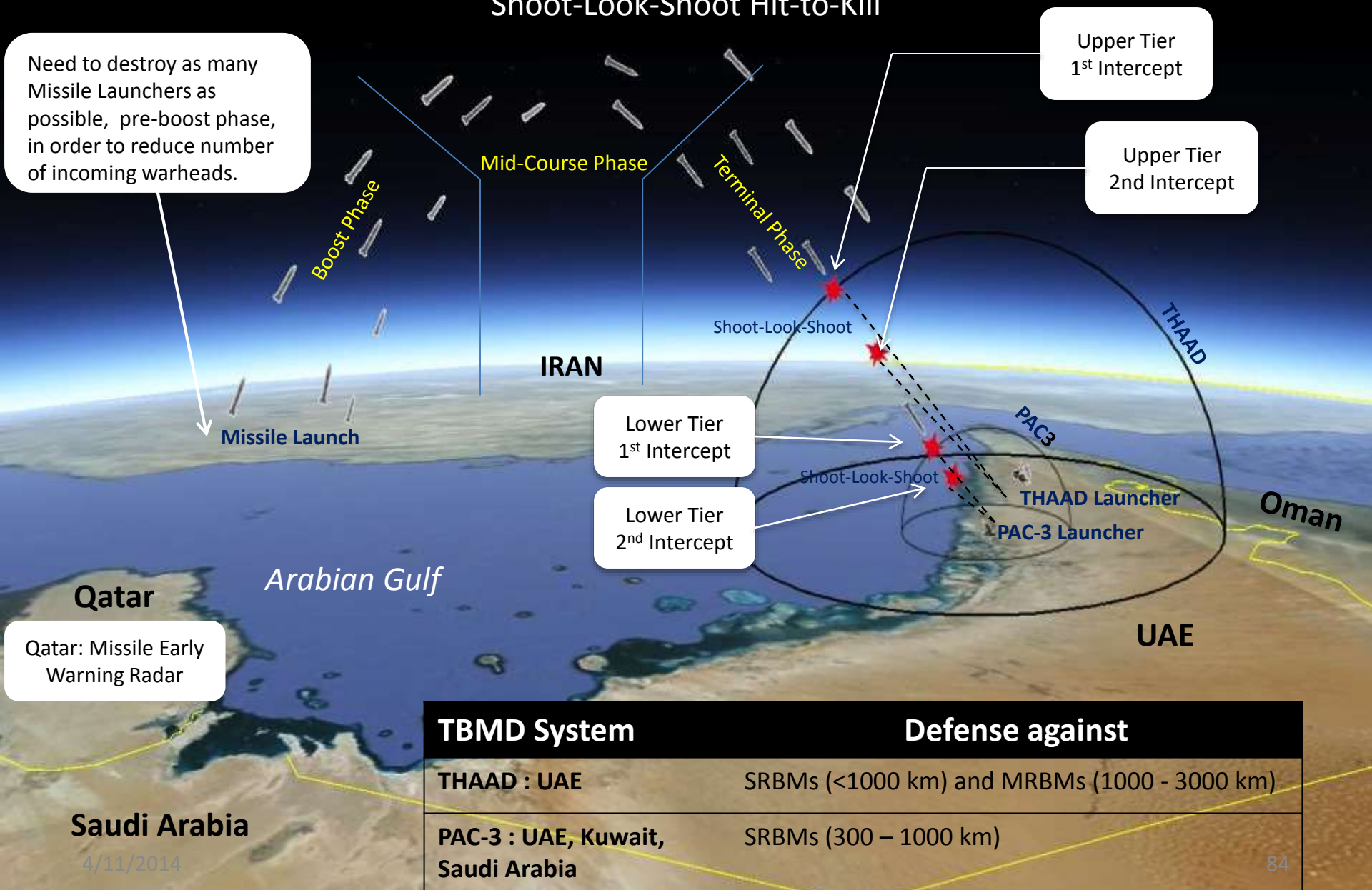
Country	TBMD System
UAE	<ul style="list-style-type: none"> • The UAE is so far the first GCC country to buy the Terminal High Altitude Air Defense (THAAD) missile system. • On Dec 31, 2011 Pentagon announced that the UAE will be buying 2 full THAAD batteries, 96 missiles, 2 Raytheon AN/TPY-2 radars, and 30 years of spare parts. Total Value \$3.34 billion. • In 2008 the UAE ordered Patriot PAC-3: 10 fire units, 172 missiles, First delivery 2009.
Kuwait	<p>July 2012, Pentagon informed Congress of a plan to sell Kuwait \$4.2 billion in weapon systems, including 60 PAC-3 missiles, 20 launching platforms and 4 radars. This will be in addition to the 350 Patriot missiles bought between 2007 and 2010. In 1992, Kuwait bought 210 of the earlier generation Patriots and 25 launchers. Kuwait bought a further 140 more in 2007.</p>
Saudi Arabia	<p>In 2011 Saudi Arabia signed a \$1.7 billion US contract to upgrade it's Patriot anti-missile system.</p>
Qatar	<p>The U.S. is building a Missile Warning Facility in Qatar that would utilize an AN/TPY-2-X Band Radar.</p>

(Source: Anthony Cordesman and Alexander Wilner, "Iran and the Gulf Military Balance -1" July 11, 2012)

Two Tier Theater Ballistic Missile Defense (TBMD) – THAAD & PAC 3

Endo and Exo-Atmospheric Engagements using Shoot-Look-Shoot Hit-to-Kill

Need to destroy as many Missile Launchers as possible, pre-boost phase, in order to reduce number of incoming warheads.



TBMD System

Defense against

THAAD : UAE

SRBMs (<1000 km) and MRBMs (1000 - 3000 km)

PAC-3 : UAE, Kuwait, Saudi Arabia

SRBMs (300 – 1000 km)

Visualizing the Nuclear Threat

300 miles
500 km

TURKEY

TURKMENISTAN

CASPIAN SEA

MIDDLE EAST

Sites circled in red
unknown pre-mid 2002

IRAQ

Lashkar A'bad

Tehran

Arak

Natanz

Isfahan

IRAN

Saghand

Ardekan

AFGHANISTAN

- MW Megawatts
- Uranium processing facility
- Uranium mines
- Heavy-water facility
- Research reactors / research facilities
- Uranium enrichment facility
- Light-water reactor (under construction)

PAKISTAN

KUWAIT

Bushehr

BAHRAIN

QATAR

Gachin

SAUDI ARABIA

Gulf of Oman

Iran: The Broader Target List: 54+

Nuclear-Conversion

- [Jabr Ibn Hayan Multipurpose Laboratories \(JHL\)](#)
- [Rudan Conversion Facility](#)
- [Uranium Conversion Facility \(UCF\)](#)

Nuclear-Education and Training

- [Amir Kabir University of Technology](#)
- [Imam Hussein University \(IHU\)](#)
- [Institute for Studies in Theoretical Physics and Mathematics \(IPM\)](#)
- [Malek Ashtar University \(MAU\)](#)
- [Sharif University of Technology \(SUT\)](#)
- [University of Tehran \(UT\)](#)

Nuclear-Enrichment

- [7th of Tir Industries](#)
- [Defense Industries Organization \(DIO\)](#)
- [Farayand Technique](#)
- [Fordow Fuel Enrichment Plant](#)
- [Fuel Enrichment Plant \(FEP\)](#)
- [Kalaye Electric Company](#)
- [Kaveh Cutting Tools Company/Abzar Boresh Kaveh Co](#)
- [Lashkar Ab'ad](#)
- [Natanz Enrichment Complex](#)
- [Pars Trash](#)
- [Pilot Fuel Enrichment Plant \(PFEP\)](#)
- [Tehran Nuclear Research Center \(TNRC\)](#)

Nuclear-Fuel Fabrication

- [Fuel Fabrication Laboratory \(FFL\)](#)
- [Fuel Manufacturing Plant \(FMP\)](#)
- [Zirconium Production Plant \(ZPP\)](#)

Nuclear-Heavy Water Production

- [Heavy Water Production Plant \(HWPP\)](#)

Nuclear-Mining and Milling

- [Ardakan Yellowcake Production Plant](#)
- [Bandar Abbas Uranium Production Plant \(BUP\)](#)
- [Saghand](#)

Nuclear-Power Reactors

- [Darkhovin Nuclear Power Plant](#)

Nuclear-Regulatory

- [Atomic Energy Organization of Iran \(AEOD\)](#)

Nuclear-Reprocessing

- [Tehran Nuclear Research Center \(TNRC\)](#)

Nuclear-Research Reactors

- [IR-40](#)
- [Miniature Neutron Source Reactor \(MNSR\)](#)
- [Tehran Research Reactor \(TRR\)](#)

Nuclear-Research and Development

- [Bonab Atomic Energy Research Center](#)
- [Graphite Sub-Critical Reactor \(ENTC GSCR\)](#)
- [Heavy Water Zero Power Reactor \(ENTC-HWZPR\)](#)
- [Isfahan \(Esfahan\) Nuclear Fuel Research and Production Center \(NFRPC\)](#)
- [Isfahan \(Esfahan\) Nuclear Technology Center \(INTC\)](#)
- [Karaj Agricultural and Medical Research Center](#)
- [Light Water Sub-Critical Reactor \(ENTC-LWSCR\)](#)
- [Plasma Physics Research Center](#)
- [Tehran Nuclear Research Center \(TNRC\)](#)
- [Yazd Radiation Processing Center \(YRPC\)](#)

Nuclear-Waste Management

- [Anarak Waste Storage Facility](#)
- [Isafan \(Esfahan\) Nuclear Waste Storage Facility](#)
- [Karaj Waste Storage Facility](#)
- [Qom Waste Disposal Site](#)

Nuclear-Weaponization

- [Institute of Applied Physics \(IAP\)](#)
- [Kimia Maadan Company \(KM\)](#)
- [Parchin Military Complex](#)
- [Physics Research Center \(PHRC\)](#)
- [Tehran Nuclear Research Center \(TNRC\)](#)

Natanz Upgrades in 2012



Source: Google <http://www.dailymail.co.uk/news/article-2060213/Google-releases-satellite-images-Iranian-cities-UN-says-used-nuclear-weaponisation.html/>

Vehicle Entrance Ramp
(before burial)

Bunkered underground
production halls



Admin/engineering
office area

DigitalGlobe Quickbird commercial satellite image

20 SEP 02

Vehicle Entrance Ramp
(after burial)

Bunkered underground
Centrifuge cascade halls

Helicopter
pads

New security
wall

Dummy building
concealing tunnel
entrance ramp

Admin/engineering
office area

DigitalGlobe Quickbird commercial satellite image

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Natanz: Effective Concealment



Getty Images

Heavy Water Reactor Facility at Arak in 2011



Source: Google <http://www.dailymail.co.uk/news/article-2060213/Google-releases-satellite-images-Iranian-cities-UN-says-used-nuclear-weaponisation.html/>

Fordow: 3,000 Centrifuges in a Mountain

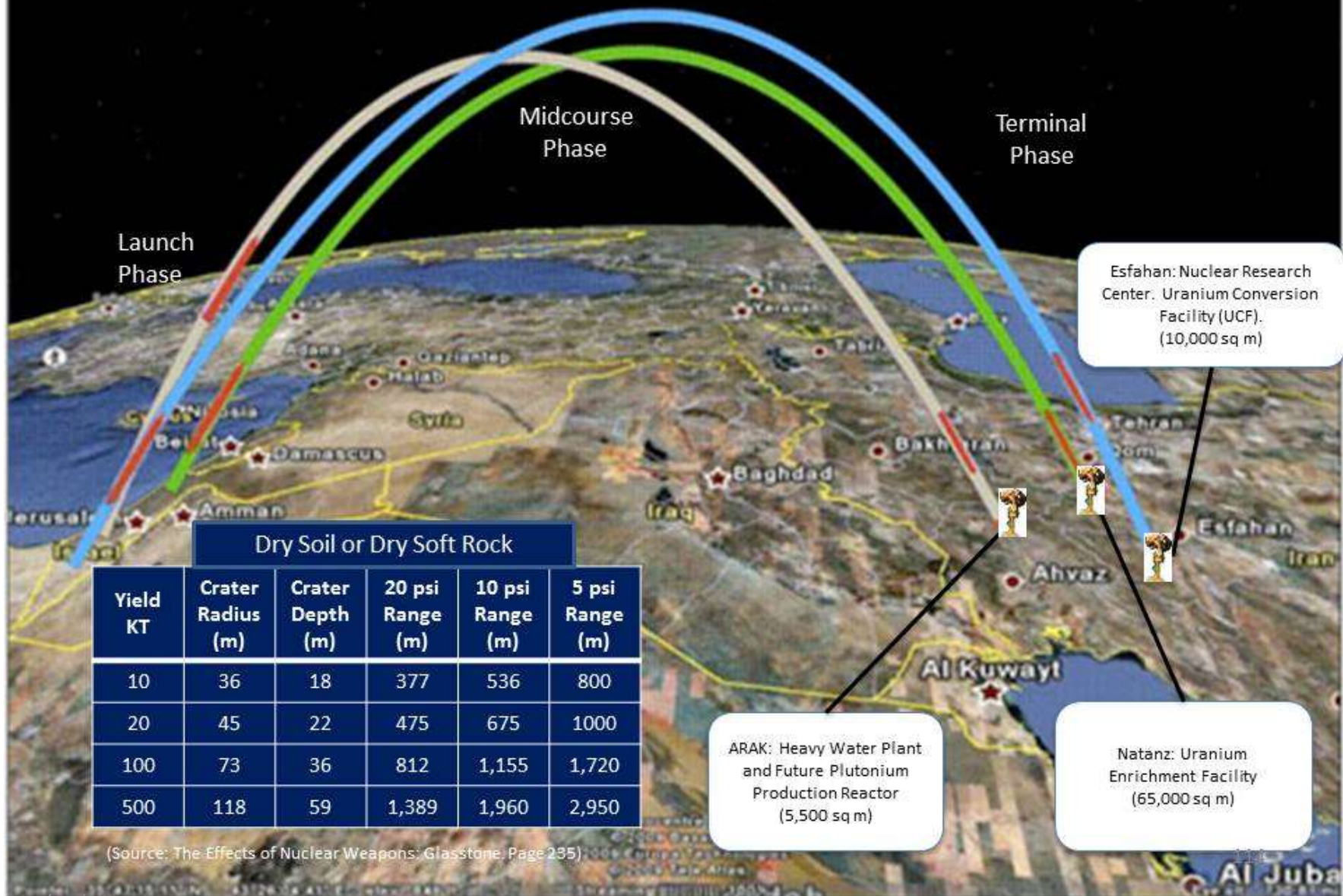


Source: Ynet News:http://www.google.com/imgres?imgurl=http://www.ynetnews.com/PicServer2/13062011/3669116/AFP0661600-01-08809249_wa.jpg&imgrefurl=http://www.ynetnews.com/articles/

Razed Test Site (?) At Parchin



Low – Yield Israeli Nuclear Strike on Iran's Nuclear Facilities



Iranian Counter Vulnerabilities:

- **Highly populated, state dominated, corrupt economy with high military spending and major state interference.**
- **Halting all oil exports critical to Iran. EIA reports that,**
 - **Pre-sanctions, Iran exported approximately 2.2 million bbl./d of crude oil. Iranian Heavy Crude Oil is Iran's largest crude export followed by Iranian Light. In 2011, Iran's net oil export revenues amounted to approximately \$95 billion. Oil exports provide half of Iran's government revenues, while crude oil and its derivatives account for nearly 80 percent of Iran's total exports.**
 - **Kharg Island, the site of the vast majority of Iran's exports, has a crude storage capacity of 20.2 million barrels of oil and a loading capacity of 5 million bbl./d. Lavan Island is the second-largest terminal with capacity to store 5 million barrels and loading capacity of 200,000 bbl./d. Other important terminals include Kish Island, Abadan, Bandar Mahshar, and Neka (which helps facilitate imports from the Caspian region).**
 - **Iran is the second-largest oil consuming country in the Middle East, second only to Saudi Arabia. Iranian domestic oil demand is mainly for diesel and gasoline. Total oil consumption was approximately 1.8 million bbl./d in 2010, about 10 percent higher than the year before. Iran has limited refinery capacity for the production of light fuels, and consequently imports a sizeable share of its gasoline supply (Imports 300,000 bbl of gasoline per day.). Iran's total refinery capacity in January 2011 was about 1.5 million bbl./d, with its nine refineries operated by the National Iranian Oil Refining and Distribution Company (NIORDC), a NIOC subsidiary.**
- **Refineries and gas distribution critical to economy. Are highly vulnerable.**
 - **Natural gas accounts for 54 percent of Iran's total domestic energy consumption.**
- **Key aspects of transportation and power grid are highly vulnerable. Today's precision strike assets allow to know out key, repairable links or create long term incapacity. They have become "weapons of mass effectiveness."**
 - **EIA reports Some power plants are running as low as 10 percent of their nameplate capacity as Iran's electricity infrastructure is largely in a state of dilapidation and rolling blackouts become endemic in summer months. The amount of generation lost in distribution is a central indicator of the disrepair of the electricity network, with upwards of 19 percent of total generation lost during transmission.**
- **Limited and vulnerable air defenses with only one modern and very short-range air and cruise missile defense system. Will remain vulnerable to stealth, cruise missiles, and corridor suppression of enemy air defenses unless can get fully modern mix of radars, C4I/BM assets, and S-300/400 equivalent.**
- **Needs imports of food and product.**
- **Rail system vulnerable. Can use smart mines on all ports.**
- **Naval embargo presents issues in maritime law, but can halt all Iranian traffic, "inspect" all incoming shipping.**
- **"No fly zone" would affect operations, especially if include helicopters. Warning could affect civil aviation.**

Source: See <http://www.eia.gov/countries/cab.cfm?fips=IR> & cabs/OPEC_Revenues/Factsheet.html for energy data.

BACK UP SLIDES

Gulf Military Balance Back Up

Air Bases and Air Force Order of Battle



	Combat A/C	Attack Helo's
Iran	319	95
Iraq	-	37
Kuwait	50	45
Bahrain	33	16
Qatar	18	25
UAE	184	67
Oman	64	41
Saudi Arabia	278	67
Yemen	79	18

Iran Airbases

Tabriz	F-5E/F, MiG-29
Hamadan	F-4E/D Su-24
Dezful	F-5E/F
Bushehr	F-4E/D F-14
Bandar Abbas	2 Helicopter Wings
Shiraz	Su-25 Su-24
Esfahan	F-5E Su-24
Tehran	MiG-29 Su-24
Zahedan	F-7M
Kermanshah	F-5E/F

Three Main Iranian Nuclear Facilities

- Natanz: Uranium Enrichment Facility
- Arak: Heavy Water Nuclear Reactor and Possible Future Plutonium Production Reactor
- Esfahan: Nuclear Research Center. Uranium Conversion Facility (UCF)

GCC Airforce Tactical Fighter Capabilities - 2012

Type	Order of Battle	Operational Ready %	Force Available	Force Total Sorties per Day	Postulated Employment
Tornado IDS	Saudi Arabia: 25	75	19	57	Deep Strike
Typhoon	Saudi Arabia: 22	75	16	48	FS, BAS, AD, Escort
Mirage 2000	UAE: 62 Qatar: 12 (Total: 74)	75	UAE: 46 Qatar: 9 (Total: 55)	UAE: 138 Qatar: 27 (Total: 165)	FS, BAS, AD, Escort
F-18	Kuwait: 39	75	29	87	FS, BAS, AD, Escort, CAS, BI, SEAD
F-16C/D	Bahrain: 21 Oman: 12 UAE: 80 (Total: 113)	75	Bahrain: 16 Oman: 9 UAE: 60 (Total: 85)	Bahrain: 48 Oman: 27 UAE: 180 (Total: 255)	FS, BAS, AD, Escort, CAS, BI
F-15C/D	Saudi Arabia: 84	75	63	189	FS, BAS, AD, Escort, CAS, BI
F-15S	Saudi Arabia: 71	75	53	160	Deep Strike, FS, AD, Escort, CAS, BI
Total	428		320	960	

FS: Fighter Sweep, BAS: Battlefield Air Superiority, AD: Air Defense,
CAS: Close Air Support (Air to Ground Role), BI: Battle Field Interdiction (Air to Ground Role)
SEAD: Suppression of Enemy Air Defense

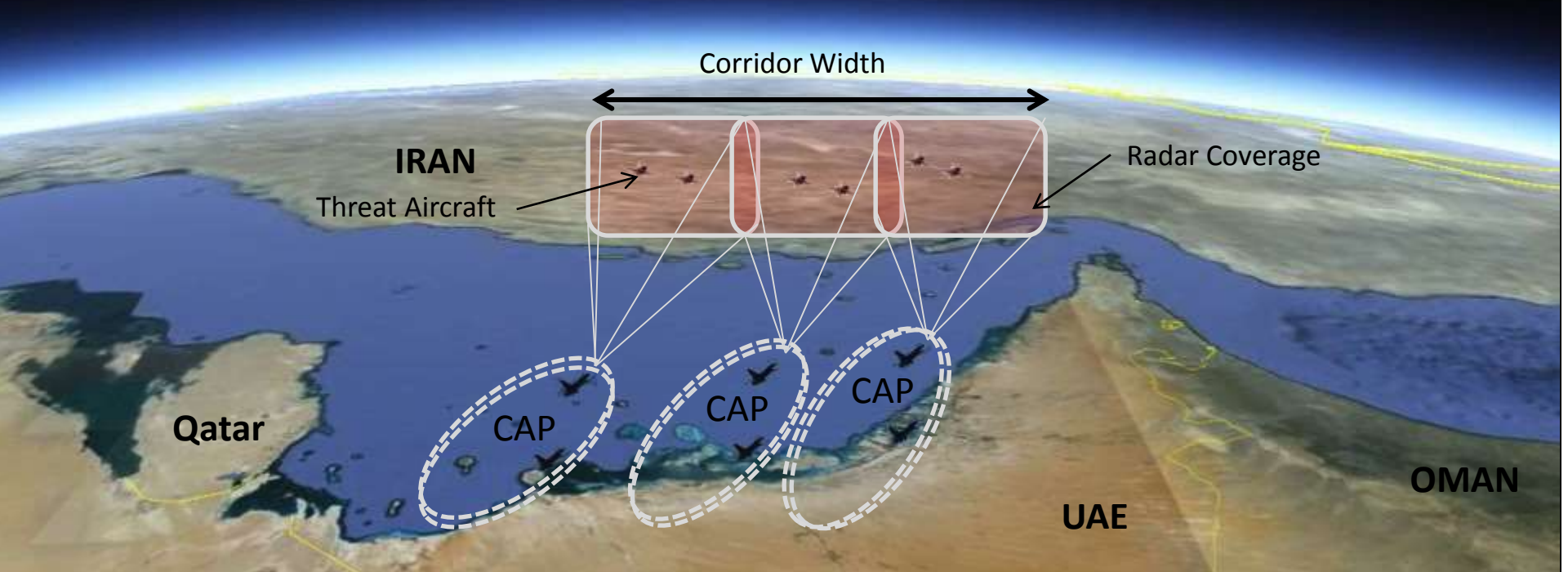
Sustained Conditions : 12 hr Operational Day

18 hr Maintenance Day

3 Sorties per aircraft per day

Typical GCC Combat Air Patrol Mission

Aircraft Required on CAP Stations	x	Number of Aircraft to Support Each CAP Station	=	Total Aircraft Required
(Number of CAP Stations) x 2	x	$\frac{\text{Operational Day 12 hrs}}{(\text{Sortie Rate}) \times (\text{Loiter Time})}$	=	(Aircraft Required on CAP) x (Aircraft Required to Support CAP)
$3 \times 2 = 6$	x	$12 / (3 \times 2) = 2$	=	$6 \times 2 = 12$



Saudi Arabia

Decreasing the Number of Aircraft Required Entails:

- Increasing Aircraft Sortie Rate & Time on Station (Loiter Time)
- Increasing Aircraft Radar Range & Time on Station (Loiter Time)

Iran Airforce Tactical Fighter Capabilities - 2012

Type	No	Operational Readiness (%)	Force Available	Total Sortie Per Day	Postulated Employment
MiG-29A	25	60	15	30	Air Defense/Escort/FS/BAS
Su-25	13	60	8	16	CAS/BI/Deep Strike
SU-24	30	60	18	36	CAS/BI/Deep Strike
F-14	25	60	15	30	Air Defense/FS CAS/BI/Deep
F-4E/D	65	69	39	78	Strike/SEAD
Total	158		95	190	

BAS: Battlefield Air Superiority

CAS: Close Air Support

BI: Battlefield Interdiction

DS: Defense Suppression

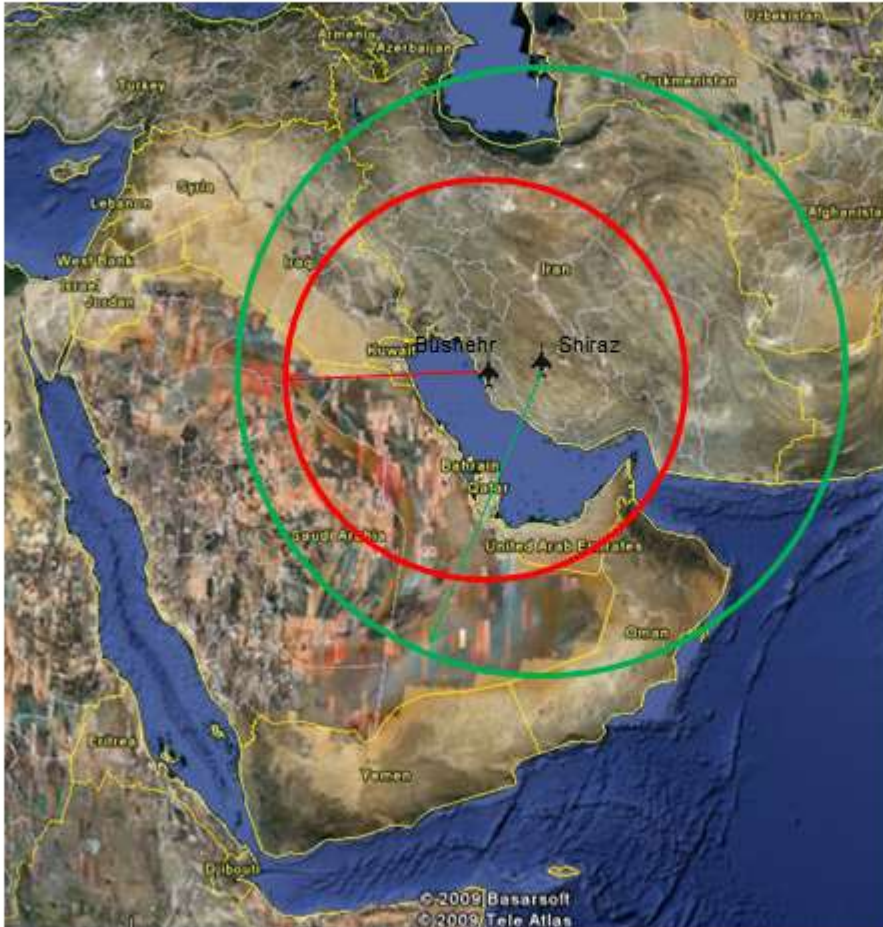
FS: Fighter Sweep

Sustained Conditions : 12 hr Operational Day

18 hr Maintenance Day

2 Sorties per Aircraft per day

Air to Ground Ranges of Iranian Air Force



Mission Profile: Hi-Lo-Hi

F-4E (Bushehr):
(4) MK83 1000lb Bombs
(1) 600 Gallon Fuel Tank
10 Minutes loiter time
Range = 400 nmi

SU-24 (Shiraz):
(4) 500 kg/1000 lb Bombs
(1) 400 gallon tank
10 minutes loiter time
Range = 590 nmi

SU-25 (Shiraz):
(4) 500kg/1000lb Bombs
(1) 400 gallon tank
(2) 10 minutes loiter time
Range = 600 nmi

What Iran lacks in Air Power:

The following are some general criteria that would be required for Iran to try and maintain a technological and qualitative edge over the GCC Airforces:

- **Aircraft:**

- Multi-mission capability.
- High Operational Readiness/Full Mission Capable state and high sortie rates.
- All weather day / night operational capability
- Quick response / ground launched interceptors against incoming intruders.
- High Endurance.
- Airborne Electronic Warfare (ESM/ECM/ECCM) survivability
- Detect track and engage multiple mobile ground targets as well as Hard and Deeply Buried Targets (HDBTs).
- Rapidly destroy advanced air defense systems.
- Capable of carrying out deep strike missions.
- Short C4I Early Warning delay time due to having antiquated System, semi-automated man in the loop, giving rise to long Response / Scramble Time by Combat Aircraft

- **Air to Air Missiles:**

- Aircraft to be capable of multiple target engagement. Fire and Forget/Launch and leave with high single shot kill capability.
- Good target discrimination and enhanced resistance to countermeasures.
- Increase in range of firing missile at the same time shortening the flight time to the target.
- low Loss Exchange Ratio in a Closing / BVR Environment and Visual Engagement Environment.

-

Iran's Current Land Based Air Defense Systems

- Iran has extensive surface-to-air missile assets, but most are obsolete or obsolescent. Iran's systems are poorly netted, have significant gaps and problems in their radar and sensor coverage and modernization, and a number of its systems are vulnerable to electronic warfare
- U.S. never delivered integrated system before fall of Shah so Iran never had a fully functioning air defense system.
- Iran has made many statements that it has upgraded and modernized many of the components of such its Air Defense systems using Russian, Chinese, US, European, and Iranian-designed and made equipment. But Iran does not have the design and manufacturing capability to create truly modern system, one that is immune to electronic warfare, and one that can function without become tactically vulnerable to anti-radiation weapons and other forms of active "suppression of enemy air defense" (SEAD) systems.
- Only modern short-range point defense system is TOR-M. Other short-range systems mix of older Russian system, SHORADs (Short Range Air Defense), and aging – possible inactive British and French systems.
- Medium to long-range systems are low capability or obsolescent. Iran has some 150 HAWKS and IHAWKs do not have capable ECM. Date back to 1960s and 1970s. It claims to be able to produce its own IHAWK missiles. Has various versions of SA-2 obsolete.
- Radar sensor and battle management/C4I systems have major limitations.
- Regardless of how much Iran states that it has made progress, it will still be vulnerable to the advanced technology U.S. combat aircraft as well as the electronic warfare and defense suppression weapon systems. This will give the U.S. Strike Force the freedom, if required after the first strike, to conduct a sustained campaign of strikes over a few days.

Gulf Land-Based Air Defense Systems in 2008

Country	Major SAM	Light SAM	AA Gun
Bahrain	(8) IHAWK	(60) RBS-70 (18) FIM 92A Stinger (7) Crotale	(26) Guns (15) Orlikon 35mm (12) L/70 40mm
Iran	(16/150) IHAWK (3/10) SA-5 (45) SA-2 Guideline	SA-7/14/16 HQ-7 (29) SA-15; Some QW-1 Misaq (29) TOR-M1; Some HN-5 (30) Rapier; Some FM-80 (Ch Crotale) 15 Tigercat; Some FIM-92A Stinger	(1,700) Guns ZSU-23-4 23mm ZPU-2/4 23mm ZU-23 23mm M-1939 37mm S-60 57mm
Kuwait	(4/24) IHAWK Phase III (5) Patriot PAC-2	(6/12) Aspide (48) Starbust	12 Oerlikon 35mm
Oman	None	Blowpipe; (2) Mistral SP (34) SA-7; (6) Blindfire (20) Javelin; (40) Rapier S713 Martello	(26) Guns (4) ZU-23-2 23mm (10) GDF-(x)5 Skyguard 35mm (12) L-60 40mm
Qatar	None	(10) Blowpipe (12) FIM-92A Stinger (9) Roland II (24) Mistral (20) SA-7	
Saudi Arabia	(16/128) IHAWK (4-6/16-24) Patriot (17/141) Shahine Mobile (2-4/160) PAC-2 Launchers (17) ANA/FPS-117 Radar (73/68) Crotale Shahine	(40) Crotale (500) Stinger (ARMY) (500) Mistral (ADF) (500) FIM-43 Redeye (ARMY) (500) Redeye (ADF) (73-141) Shahine Static (500) FIM-92A Stinger (ARMY) (400) FIM-92A Avenger (ADF)	(1,220) Guns (92) M-163 Vulcan 20mm (30) N-167 Vulcan 20mm (NG) (850) AMX-30SA 30mm (128) GDF Orlikon 35mm (150) L-70 40mm (store) (130) M-2 90mm (NG)
UAE	(2/31) IHAWK	20+ Blowpipe (20) Mistral Some Rapier/Crotale/ RB-70/Javelin/SA-18	(62) Guns (42) M-3VDA 20mm SP (20) GCF-BM2 30mm

(Source: Iranian Weapons of Mass Destruction. Anthony Cordesman CSIS)

Medium to Long Range Surface To Air Missile Systems

Air Defense System	Associated Early Warning/Acquisition Radars	Associated Tracking & Guidance Radars	Missile Ranges (km) Altitude (ft)	In Service Date
SA-2	Spoon Rest D (P-18) Flat Face A (P-15)	Fansong A/B	Max (km): 40 Min (km) : 8 Altitude (ft): 3,000 to 90,000	1971 Upgraded
SA-3	Flat Face B (P-19) Squat Eye	Low Blow	Max (km) : 30 Min (km) : 6 Altitude (ft): 150 to 160,000	1971
SA-6	Long Track (P-40) Height Finder: Thin Skin B (PRV-9)	Straight Flush	Max (km): 24 Min (km) : 4 Altitude (ft): 50 to 45,000	1973
SA-8	Flat Face B (P-19) Long Track (P-40) Height Finder: Thin Skin B (PRV-9)	Land Roll	Max (km) : 15 Min (km) : 0.2 Altitude (ft): 40 to 40,000	1982
SA-5	Back Trap (P-80) Tall King C (P-14) Spoon Rest D (P-18) Height Finder: Odd pair (PRV-13) Odd Group (PRV-16)	Square Pair	Max (km) : 250 Min (km) : 20 Altitude (ft): 1,500 to 130,000	1983
IHAWK	AN/MPQ-50 AN/MPQ-55(PIP II)/62 (PIP III) Range only Radar	AN/MPQ-57 (PIP II)/61 (PIP III)	Max (km): 35 Min (km): 3 Altitude (ft): 0 to 55,000 ft	1971
Patriot PAC-2	AN/MPQ-53 Phased-Array Radar Carries out Search, target detection, track and identification, missile tracking and ECCM functions	AN/MSQ-104 Engagement Control Station (ECS)	Max (km): 70 Min (km): 3 Altitude (ft): 80,000	1990

(Source: Iranian Weapons of Mass Destruction. Anthony Cordesman CSIS)

4/11/2014

US Preventive Strikes

Illustrative US Strike Mission

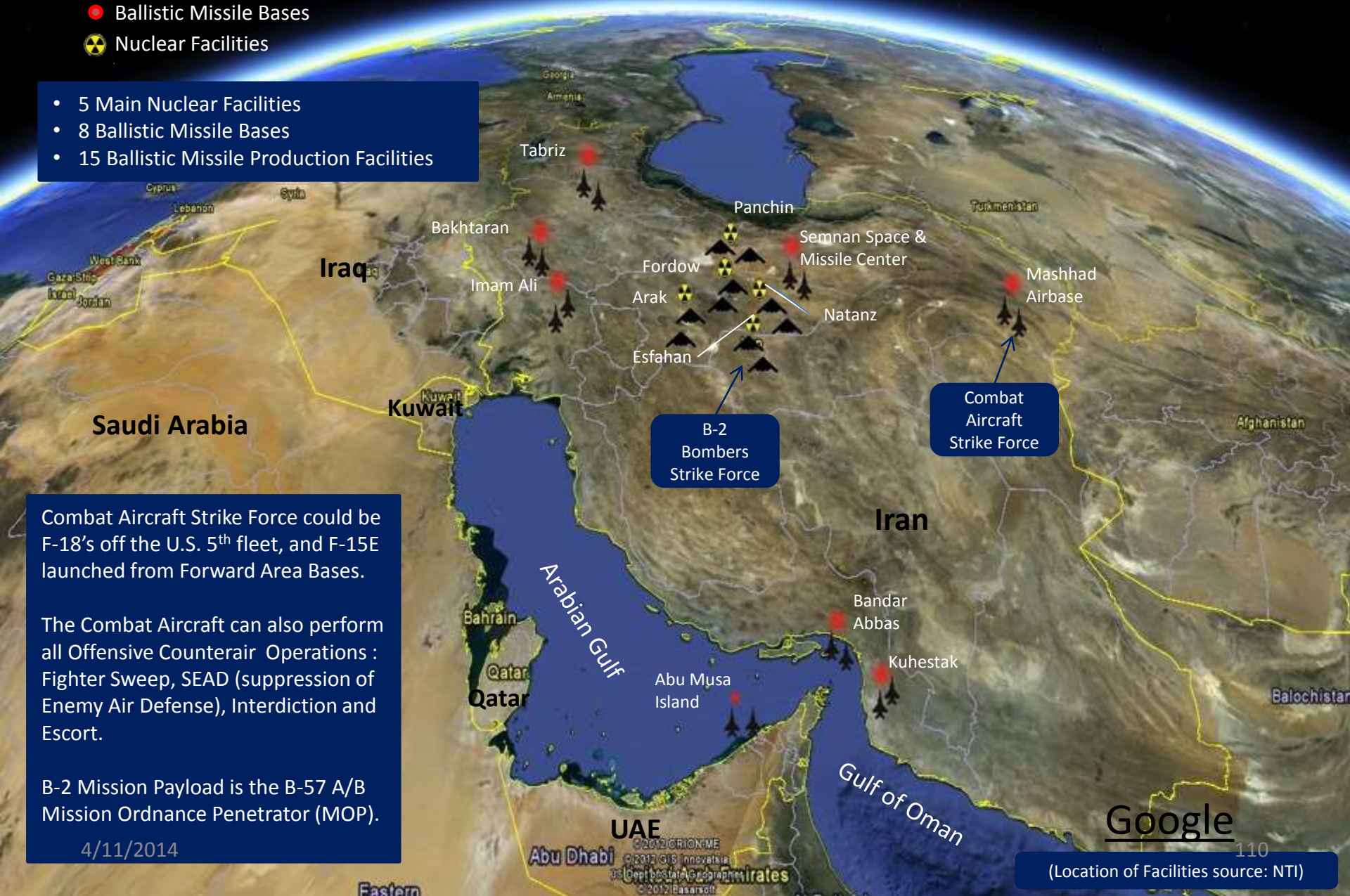
- B-2 bombers out of Diego Garcia, each carrying 2 GBU-57 MOP bombs.
- Mission can be achieved with a high success rate also maintaining a sustained strike over a couple of days.
- B-2 bombers escorted by F-18s from the 5th fleet stationed in the Gulf area, or F-15Es and F-16Cs from forward area air bases.
- United States and Western allies considered to be the only countries involved, no GCC or any Arab country involvement and especially no-Israeli direct involvement.
- Still though, Iran most probably will accuse Israel to be part of the Strike and will try to retaliate, either by launching a Ballistic Missile on Israel carrying conventional or WMD (chemical, biological, radiological) and activating Hezbollah to launch cross border attacks against Israel.
- Iran would also try to attack any U.S. military airbases that are active in the Gulf even if they are stationed in GCC countries.
- If Iran attacks any of the GCC countries, then they will have the right to self-defense. In addition the whole Arab Middle East will not accept an Iranian attack on any of the GCC countries.

US Preventive Military Strike against Iranian Nuclear Facilities and Ballistic Missile Bases

● Ballistic Missile Bases

☢ Nuclear Facilities

- 5 Main Nuclear Facilities
- 8 Ballistic Missile Bases
- 15 Ballistic Missile Production Facilities



Combat Aircraft Strike Force could be F-18's off the U.S. 5th fleet, and F-15E launched from Forward Area Bases.

The Combat Aircraft can also perform all Offensive Counterair Operations : Fighter Sweep, SEAD (suppression of Enemy Air Defense), Interdiction and Escort.

B-2 Mission Payload is the B-57 A/B Mission Ordnance Penetrator (MOP).

4/11/2014

Google

110

(Location of Facilities source: NTI)

The New York Times, March 19, 2012

“U.S. War Games Sees Perils of Israeli Strike Against Iran”

- A classified war simulation held this month to assess the repercussions of an Israeli attack on Iran forecasts that the strike would lead to a wider regional war, which could draw in the United States and leave hundreds of Americans dead, according to American officials.
- The officials said the so-called war game was not designed as a rehearsal for American military action — and they emphasized that the exercise’s results were not the only possible outcome of a real-world conflict.
- But the game has raised fears among top American planners that it may be impossible to preclude American involvement in any escalating confrontation with Iran, the officials said. In the debate among policy makers over the consequences of any Israeli attack, that reaction may give stronger voice to those in the White House, Pentagon and intelligence community who have warned that a strike could prove perilous for the United States.
- The results of the war game were particularly troubling to Gen. James N. Mattis, who commands all American forces in the Middle East, Persian Gulf and Southwest Asia, according to officials who either participated in the Central Command exercise or who were briefed on the results and spoke on condition of anonymity because of its classified nature. When the exercise had concluded earlier this month, according to the officials, General Mattis told aides that an Israeli first strike would be likely to have dire consequences across the region and for United States forces there.
- The two-week war game, called Internal Look, played out a narrative in which the United States found it was pulled into the conflict after Iranian missiles struck a Navy warship in the Persian Gulf, killing about 200 Americans, according to officials with knowledge of the exercise. The United States then retaliated by carrying out its own strikes on Iranian nuclear facilities.

- The initial Israeli attack was assessed to have set back the Iranian nuclear program by roughly a year, and the subsequent American strikes did not slow the Iranian nuclear program by more than an additional two years. However, other Pentagon planners have said that America's arsenal of long-range bombers, refueling aircraft and precision missiles could do far more damage to the Iranian nuclear program — if President Obama were to decide on a full-scale retaliation.
- The exercise was designed specifically to test internal military communications and coordination among battle staffs in the Pentagon; in Tampa, Fla., where the headquarters of the Central Command is located; and in the Persian Gulf in the aftermath of an Israeli strike. But the exercise was written to assess a pressing, potential, real-world situation. In the end, the war game reinforced to military officials the unpredictable and uncontrollable nature of a strike by Israel, and a counterstrike by Iran, the officials said.
- American and Israeli intelligence services broadly agree on the progress Iran has made to enrich uranium. But they disagree on how much time there would be to prevent Iran from building a weapon if leaders in Tehran decided to go ahead with one.
- With the Israelis saying publicly that the window to prevent Iran from building a nuclear bomb is closing, American officials see an Israeli attack on Iran within the next year as a possibility. They have said privately that they believe that Israel would probably give the United States little or no warning should Israeli officials make the decision to strike Iranian nuclear sites.
- Officials said that, under the chain of events in the war game, Iran believed that Israel and the United States were partners in any strike against Iranian nuclear sites and therefore considered American military forces in the Persian Gulf as complicit in the attack. Iranian jets chased Israeli warplanes after the attack, and Iranians launched missiles at an American warship in the Persian Gulf, viewed as an act of war that allowed an American retaliation.

The B-2 Bomber



Primary Function	Multi role heavy bomber
Engines:	Four GE F-118-GE-100 engines, each with a thrust of 17,300 pounds (7,847 kg)
Speed, Cruise:	High subsonic
Ceiling:	50,000 ft (15,000 meters)
Weight Takeoff, (typical):	335,500 – 350,000 pounds (152,600 – 159,000 kg)
Weight, Empty (typical):	125,000 – 160,000 pounds
Range:	6,000 nmi (9,600 km), unrefueled range for a Hi-Lo-Hi mission with 16 B61 nuclear free-fall bombs 10,000 miles with one aerial refueling.
Payload:	40,000 pounds (18,000 kg)
Crew:	Two pilots
Current Armament:	<p>Nuclear: 16 B61, 16 B83</p> <p>Conventional: 80 MK82 (500lb), 16 MK84 (2000lb), 34-36 CBU-87, 34-36 CBU-89, 34-36 CBU-97</p> <p>Precision: 216 GBU-39 SDB (250 lb), 80 GBU-30 JDAM (500 lb), 16 GBU-32 JDAM (2000 lb), GBU-27, GBU-28, GBU-36, GBU-37, AGM-154 HSOW, 8-16 AGM-137 TSSAM, 2 MOP / DSHTW/ Big BLU</p>

- In July 2009, verification of equipment required to integrate the MOP on the B-2 was complete - the hardware that holds the MOP inside the weapons bay. The MOP is a GPS-guided weapon containing more than 5,300 pounds of conventional explosives inside a 20.5 ft long bomb body of hardened steel. It is designed to penetrate dirt, rock and reinforced concrete to reach enemy bunker or tunnel installations. The B-2 will be capable of carrying two MOPs, one in each weapons bay.
- The B-2 currently carries up to 40,000 pounds of conventional ordnance. For example, it can deliver 80 independently targeted 500-lb class bombs from its smart bomb rack assembly; or up to 16 2,000-lb class weapons from its rotary launcher. Integration of the MOP on the B-2 is the latest in a series of modernization programs that Northrop Grumman and its subcontractors have undertaken with the Air Force to ensure that the aircraft remains fully capable against evolving threats.

GBU-57A/B Massive Ordnance Penetrator (MOP)	Specifications
Weight, total	13,600 kg (slightly less than 30,000 pounds)
Weight, explosive	2,700 kg (6,000 lb)
Length	6m / 20.5 feet
Diameter	31.5 in diameter
Control	Short-span wings and trellis-type tail
Penetration	60 meters (200ft) through 5,000 psi reinforced concrete 40 meters (125 ft) through moderately hard rock 8 meters (25 feet) through 10,000 psi reinforced concrete
Contractors	Boeing, Northrop Grumman
Platforms	B-52, B2
Guidance	GPS aided Inertial Navigation System

Priority Targets in addition to Iran's Main Nuclear Facilities

Ballistic Missiles Facilities

Missile Base	Missile Production Facility
Bakhtaran Missile Base	Fajr Industrial group
Abu Musa Island	Gostaresh Scientific Research Center
Bandar Abbas	Iran Aircraft Manufacturing Industries
Imam Ali Missile Base	Isfahan Missile Complex
Kuhestak Missile battery	Karaj Missile Development Complex
Mashad Airbase	Lavizan Technical and Engineering Complex
Semnan Space and Missile Center	Parchin Chemical Industries
Tabriz Missile Base	Qods Aeronautics Industries
	Semnan Missile Complex
	Shahid Bakeri Industrial Group
	Shiraz Missile Plant
	Sirjan Missile Plant

U.S. Military Strike Force Allocation against Iran’s Nuclear and Ballistic Facilities Offensive Counterair (OCA) Mission

Performance Criteria and Mission Parameters:

- A damage performance criteria above 75% for each target, nuclear and missile, resulting in a delay of at least 5 to 10 years in Iran’s Nuclear Program, and substantially weakening Iran’s ballistic missile retaliatory capability.
- Two aircraft are allocated to each target to maximize the damage on First Strike.
- Destroying the maximum number of Missile Bases, Mobile Launchers and Production Facilities during (boost Phase) or before Launch, thereby reducing the number of incoming missiles (warheads) and also reducing the number of shots defense needs to take at each Incoming warhead.

Iran Target	Number of Targets	Aircraft Allocated
Main Nuclear	5 Facilities	2 A/C per target resulting in 10 B-2 Bombers
Missiles Bases	8 Bases	2 A/C per base resulting in 16 Strike A/C
Missile Production	15 Facilities	2 A/C per target resulting in 30 Strike A/C
Mobile Missile Launchers	Assuming 22 Launchers in various locations	2 A/C per mobile launcher resulting in 44 A/C
TOTAL	50	10 B-2 Bombers 90 Strike Aircraft = 100

Additional requirements to increase Mission Effectiveness

The effectiveness of OCA operations depends on the availability of certain resources. System capabilities are influenced by the situation, threats, weather, and available intelligence. The following are some of the resources used to conduct OCA:

Aircraft:

Fighter and bomber aircraft provide the bulk of the weapon systems for OCA operations. Other types of aircraft and weapon systems are often critical enablers of counterair operations (e.g., electronic attack, electronic protection, and air refueling aircraft).

Missiles:

These weapons include surface-to-surface, air-to-surface, and air-to-air missiles, as well as air-, land-, and sea-launched cruise missiles. Many of these weapons have long ranges and some have very quick reaction times. These weapon systems can eliminate or reduce the risk of harm to friendly forces by destroying enemy systems in the air and on the ground.

ISR Systems:

ISR systems and resources may be used in counterair operations to provide intelligence, surveillance, reconnaissance, deception, and other effects against enemy forces and air defense systems. These activities include the use of airborne, space-borne, and ground (e.g., human intelligence) assets.

Unmanned Aircraft Systems (UAS):

UAS may be used in counterair operations to provide ISR, deception, jamming, harassment, or destruction of enemy forces and air defense systems. These systems may be preprogrammed or remotely piloted. They provide valuable intelligence to friendly forces and may now be used to attack some targets either too dangerous or risky for manned aircraft or where manned aircraft are not present or available to respond. They may also be used to help provide persistent air presence over enemy forces in situations where this may have important psychological effects upon an adversary (as part of OCA or other operations) if synergistically tasked to help provide persistent presence over adversary forces.

Special Operations Forces (SOF):

SOF can conduct direct action missions, special reconnaissance, and provide terminal guidance for attacks against valuable enemy targets. Planners in the AOC coordinate with the special operations liaison element to coordinate the use of special operations assets in support of the counterair mission.

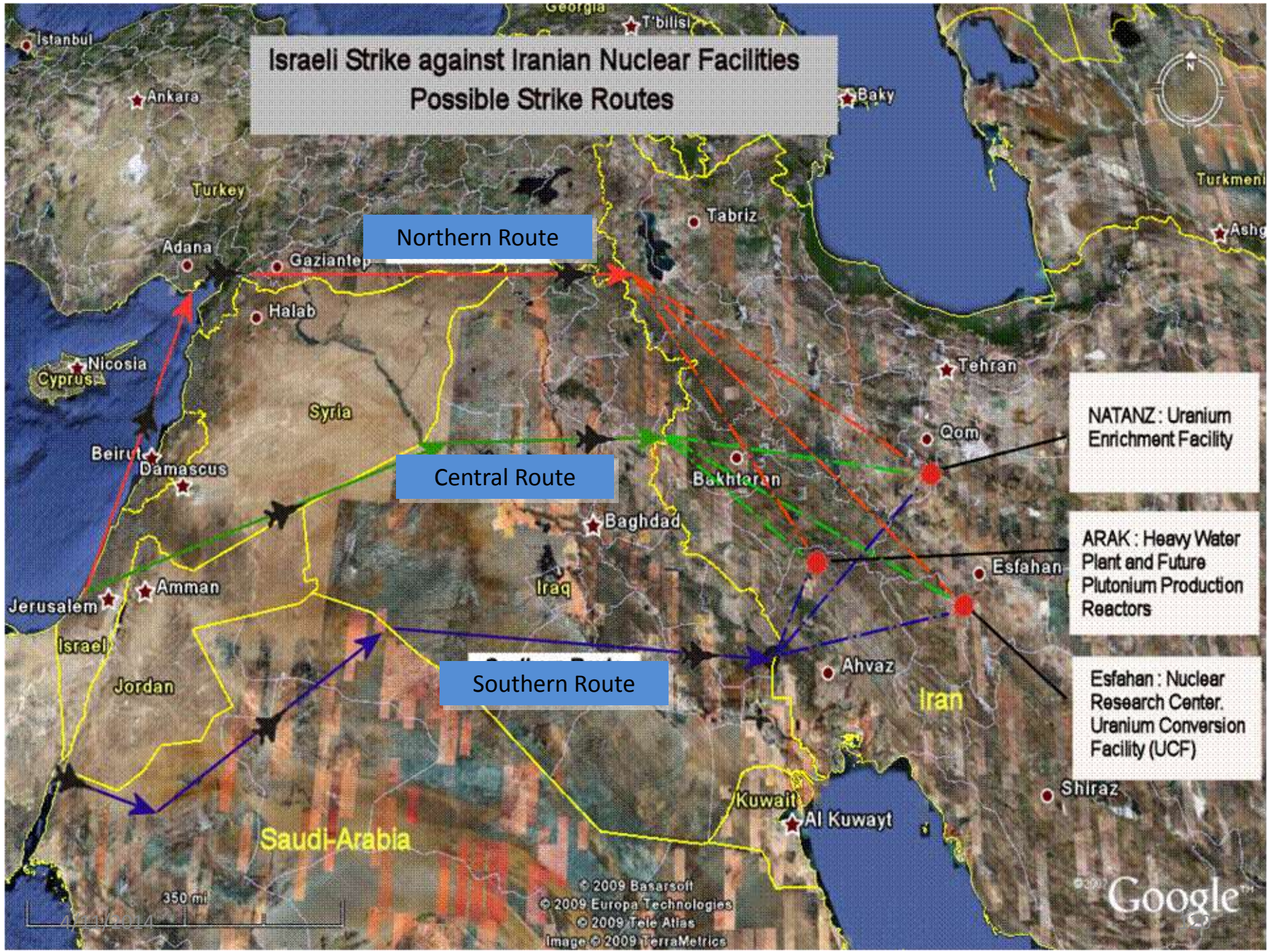
C2 Systems:

These systems enhance OCA operations by providing early warning, intelligence, identification, and targeting data, as well as C2 of friendly forces.

Israeli Preventive Strikes

Israeli Strike against Iranian Nuclear Facilities

Possible Strike Routes



Israeli Strike against Iranian Nuclear Facilities

Main Target Set

Turkey

Caspian Sea

Qum: Enrichment Facility with Tunnel Entrances

Tehran

Aerial Refueling during Ingress and Egress.

Natanz: Uranium Enrichment Facility (65,000 sq m)

Syria

Iraq

Iran

ARAK: Heavy Water Plant and Future Plutonium Production Reactor (5,500 sq m)

Esfahan: Nuclear Research Center. Uranium Conversion Facility (UCF). (10,000 sq m)

Jordan

Saudi Arabia

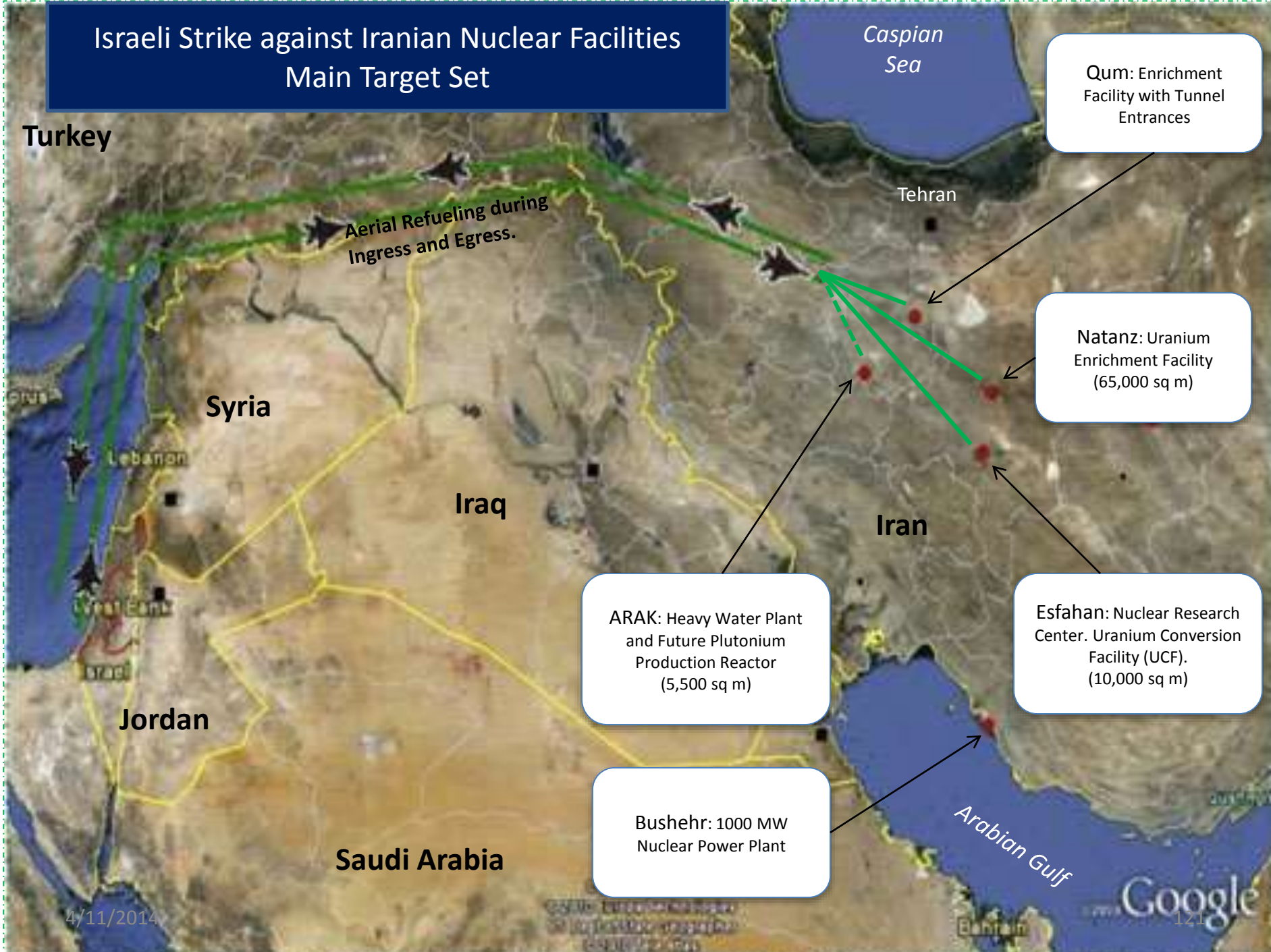
Bushehr: 1000 MW Nuclear Power Plant

Arabian Gulf

Google

4/11/2014

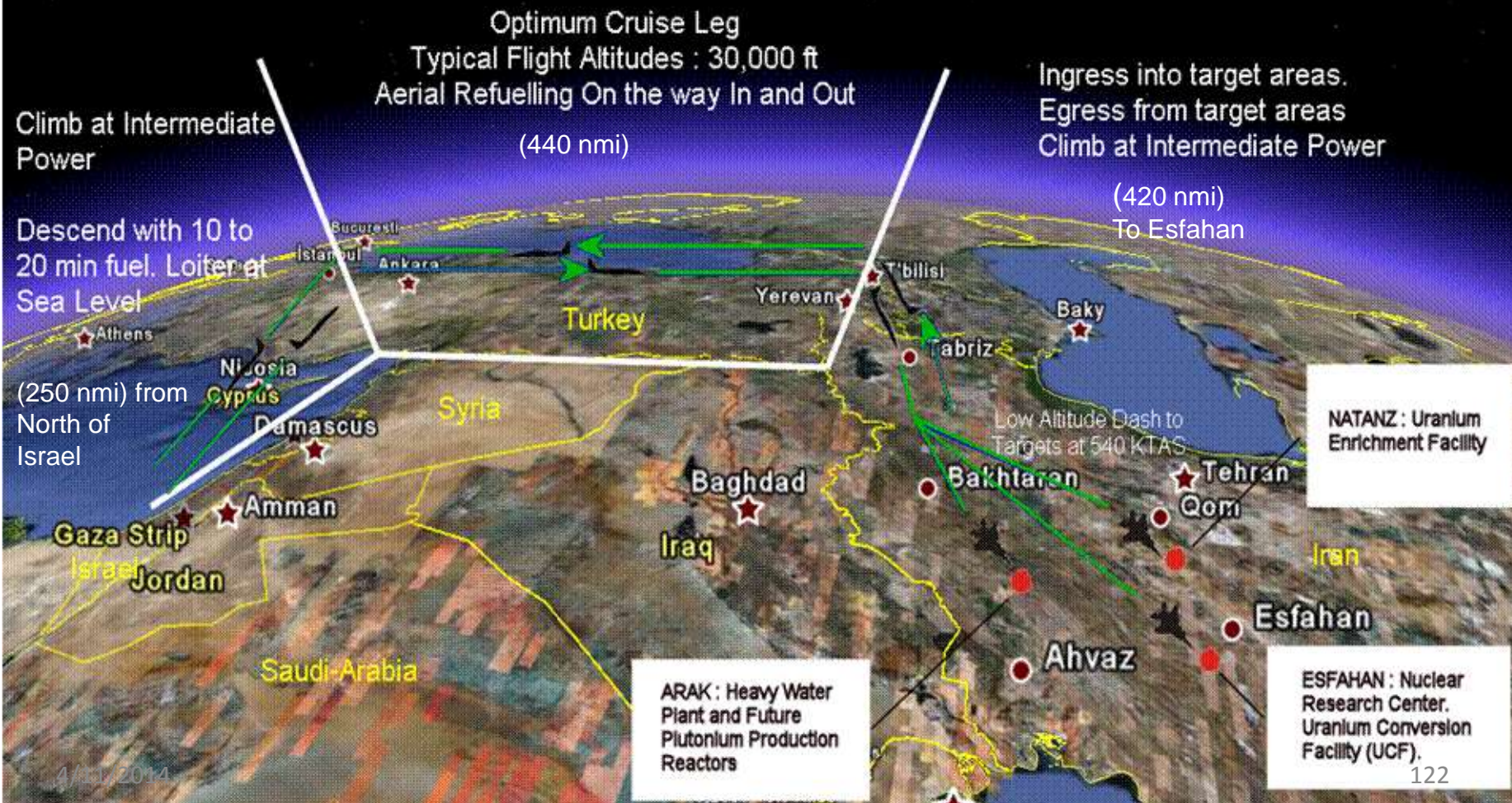
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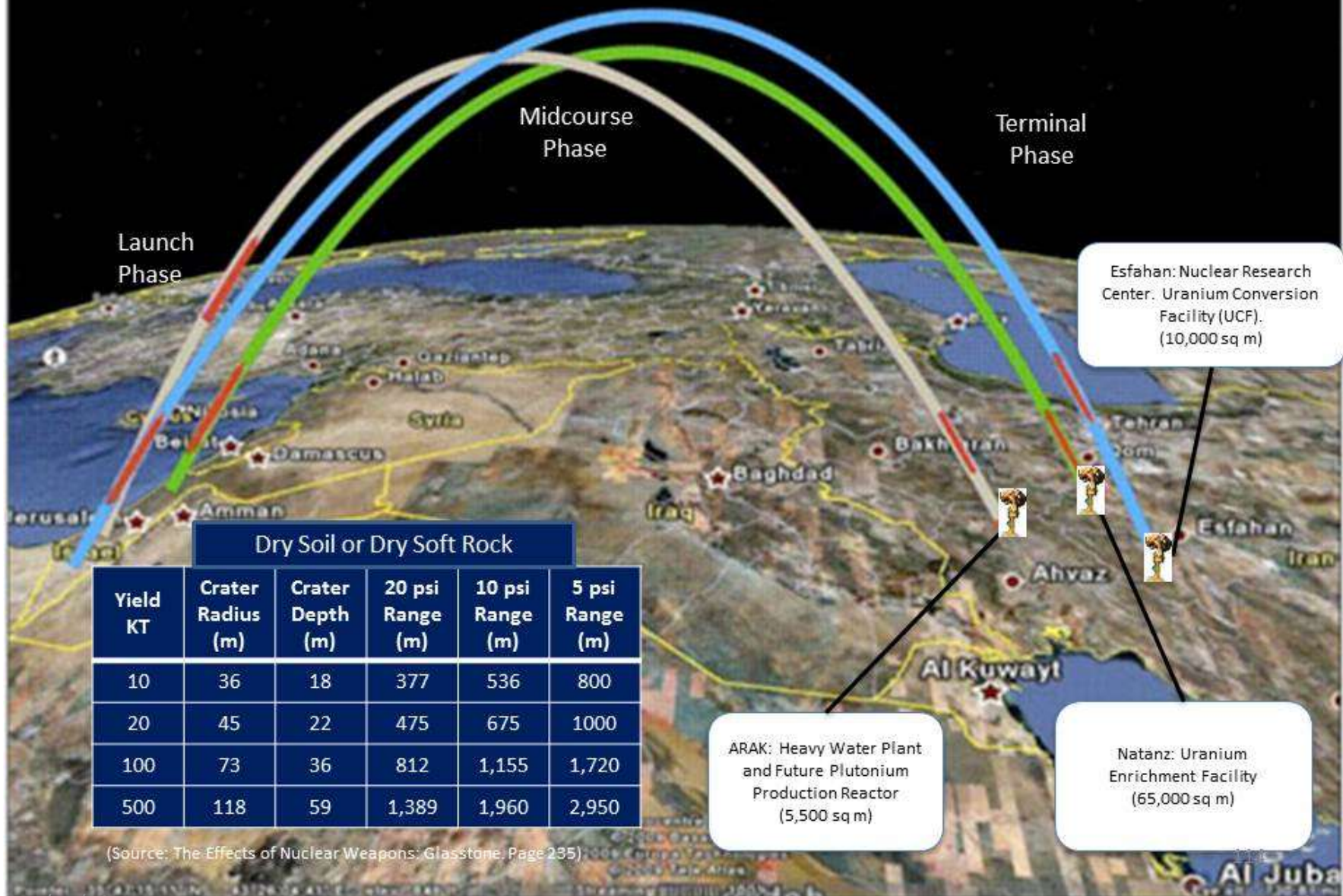
Israeli Strike against Iranian Nuclear Facilities

Air To Ground Mission Profile

Hi-Lo-Lo-Hi



Low – Yield Israeli Nuclear Strike on Iran's Nuclear Facilities



Low Yield Earth Penetrating Nuclear Weapons

- Another scenario is using these warheads as a substitute for conventional weapons to attack deeply buried nuclear facilities in Iran. Some believe that nuclear weapons are the only weapons that can destroy targets deep underground or in tunnels.
- The gun-type Uranium based nuclear bomb dropped on Hiroshima by the U.S. in August of 1945 was about 8,000 pounds in weight, and contained about 60 kg of weapons grade Highly Enriched Uranium (HEU), of which about 0.7 kg underwent fission producing a Yield of 12.5 kilotons. The Plutonium implosion bomb dropped on Nagasaki weighed about 10,800 pounds and contained about 6.4 kg of weapons-grade Plutonium PU-239. Producing a yield of 22 kilotons. In the subsequent years the U.S. was able to produce Plutonium-implosion nuclear bombs in the same yield range with weights down to 2,000 lbs and less.
- If Ballistic Missiles are used to carry out the mission, Israel has have a Ballistic Missile Defense System whereas Iran does not have one, such as the Russian S-300PMU2 “Favorit”, that was designed to intercept ballistic missiles as well as combat aircraft.

This report is based on a series of reports by Dr. Anthony Cordesman on Iran, published by the Burke Chair, CSIS. They can be found at:

- ***Iran and the Gulf Military Balance - I: Conventional and Asymmetric Forces***, available on the CSIS web site at <http://csis.org/publication/reassessing-gulf-military-balance-part-one-conventional-and-asymmetric-forces>.
- ***Iran and the Gulf Military Balance II: The Missile and Nuclear Dimensions***, available on the CSIS web site at <http://csis.org/publication/iran-and-gulf-military-balance-ii-missile-and-nuclear-dimensions>.
- ***Iran and the Gulf Military Balance III: Sanctions, Energy Arms Control, and Regime Change***, , available on the CSIS web site at http://csis.org/files/publication/130625_iransanctions.pdf
- ***Iran and the Gulf Military Balance IIV: The Gulf and the Arabian Peninsula***, available on the CSIS web site at http://csis.org/files/publication/120228_Iran_Ch_VI_Gulf_State.pdf
- ***Violence in Iraq***, available on the CSIS web site at https://csis.org/files/publication/120718_Iraq_US_Withdrawal_Search_SecStab.pdf

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