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Iran, the Gulf, and Strategic Competition: Missiles and Weapons of Mass Destruction

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What Is The Threat?

- **Intimidation and Deterrence?**
- **Test, development, rolling future threat?**
- **Conventional Warhead, Uncertain Reliability, Poor CEP/Accuracy?**
- **Conventional Warhead, High accuracy, maneuvering capability?**
- **Chemical Warhead?**
- **Possible nuclear warhead?**
- **Tested Nuclear warhead?**
- **Ballistic + cruise threat?**
- **Volley or Limited Rate/numbers?**
- **Sheltered or mobile basing?**
- **Launch on warning (LOW), Launch under attack (LUA)?**

The Challenge of Missile Warfare

Iran's Ballistic Missiles: DNI Assessment - March 2010

Iran has continued to develop its ballistic missile program, which it views as its primary deterrent. Iran is fielding increased numbers of short-and medium-range ballistic missiles (SRBMs, MRBMs) and we judge that producing more capable MRBMs remains one of its highest priorities. Iran's ballistic missile inventory is one of the largest in the Middle East.

In late November 2007, Iran's defense minister claimed Iran had developed a new 2,000 km-range missile called the Ashura. Iranian officials on 12 November 2008 claimed to have launched a two stage, solid propellant missile called the Sejil with a range of 2,000 km. In 2009, Iran conducted three flight tests of this missile.

As early as 2005, Iran stated its intentions to send its own satellites into orbit. As of January 2008, Tehran reportedly had allocated \$250 million to build and purchase satellites. Iran announced it would launch four more satellites by 2010 to improve land and mobile telephone communications.

Iran's President Ahmadi Nejad also announced Tehran would launch a home- produced satellite into orbit in 2008, and several Iranian news websites released photos of a new rocket called "Safi."

In mid-August 2008, Iran first launched its Safir space launch vehicle, carrying the Omid satellite. Iran claimed the launch a success; however US officials believed the vehicle did not successfully complete its mission. Iran successfully launched the Omid satellite aboard the Safir 2 SLV in early February 2009 according to press reports.

Assistance from entities in China and North Korea, as well as assistance from Russian entities at least in the past, has helped Iran move toward self-sufficiency in the production of ballistic missiles. Iran still remains dependent on foreign suppliers for some key missile components, however. Iran also has marketed for export at trade shows guidance components suitable for ballistic missiles.

Iranian Missile Threat

Long-Range Ballistic Missiles

- New Intermediate Range Ballistic Missile or Space Launch Vehicle (SLV) in development
- Likely to develop ICBM/SLV ... could have an ICBM capable of reaching the U.S. before 2015



Shahab 3/3A

Range (km)	Payload (kg)
1,350	1,158
1,400	987
1,500	760
1,540	650
1,560	590.27
1,580	557.33
1,600	550
1,780	240
2,000	-

ms-1096738 / 061437

(Source: Missile Defense Program Overview for the European Union, Committee on Foreign Affairs, Subcommittee on Security and Defense. Dr. Patricia Sanders. Executive Director. Missile Defense Agency)

Iran's Ballistic Missiles - I

Liquid Propellant Missiles

- Has approximately 200-300 Shahab-1 and -2 missiles capable of hitting targets in neighboring countries
- Imported/assembled between 12 and 18 Shahab-1&-2 TELs. This number is growing to 24+
- Iran can hitting targets up to 900km from its borders using the Shahab-3 and Ghadr-1
 - Ghadr-1 began flight tests in 2004 – theoretically extends Iran's reach to about 1600km, but seems to have a smaller warhead – 750kg
- Iran has at least six Shahab-3/Ghadr-1 Transporter-Erector-Launcher (TEL) vehicles, and probably more. Silo option may be in development.

•Solid Propellant Missiles

- Sajjil-2 – potentially capable of delivering a 750kg warhead to a range of 2200km
- The only country to have developed this missile without first having nuclear weapons
 - Solid fuelled systems provide certain advantages
 - Less prone to pre-emptive attacks given shorter launch prep times
 - Successfully tested in November of 2008
 - Still AT LEAST 2 years away from being fully operational

Iran's Ballistic Missiles - II

• Impact

- **Estimated Casualties would still be low**
- **Iran must unleash its full missile arsenal and that the majority of the warheads penetrated missile defenses**
- **Due to the low accuracy of these warheads.**
- **The confident destruction of a fixed-point military would require a significant percentage at least of its missile inventory to complete a specific mission**
- **Currently able to conduct harassment attacks towards large airport bases however, nothing capable of shutting down military activities.**
- **Lacking high number of TELs and the delays occurring during reload procedures**

• Potential exists for chemical and biological warheads

- **Missiles still however could not reliably carry out and deliver enough agent over a wide enough area to stop an adversary's military capabilities indefinitely**

• Tehran's ballistic missiles are capable of loading nuclear warheads

- **Challenge is making a small enough bomb**
- **Most common delivery platforms would be Ghadr-1 and the Shahab-3**
- **Once the solid propellant Sajjil-2 becomes operational, this would be an option as well.**
 - **Offers greater flexibility and superior range-payload capacity**

Iran's Ballistic Missiles - III

•Ballistic Missile Industries

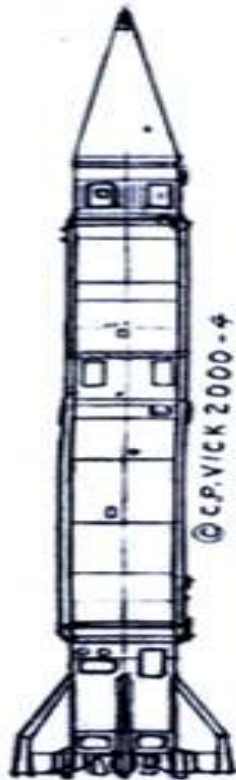
- Turning away from foreign aid/design, Iran redesigns of Shahab-3 resulted in longer-range Ghadr-1
- Continued efforts resulted in a modified Ghadr-1 which created the Safir space-launch vehicle – orbiting a small satellite in space.
- Unveiling of the two-stage Simorgh launch vehicle – comprised of 4 No-dong engines suggests that Iran plans to develop more powerful satellite carriers
- Iran has proven to have the capacity to successfully modify existing missiles and outfit them with the necessary components to become effective
- These efforts have strong political support given the financial services that have been allocated to the research and development efforts of these missiles
- However, this support still depends significantly on foreign aid, and availability and access to key materials

Images of Iranian Missile Program

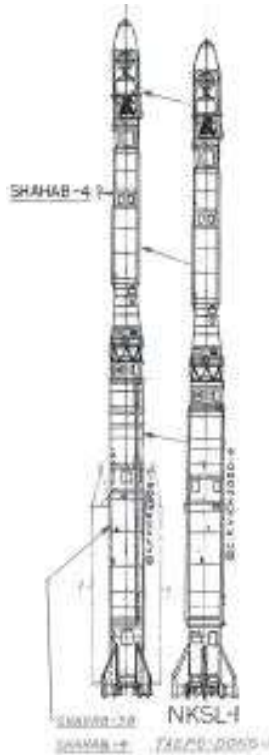
Shahab-3



No Dong



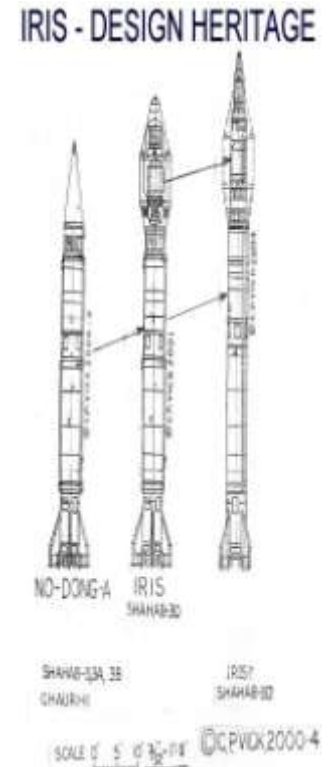
Shahab-4



Variant



IRIS

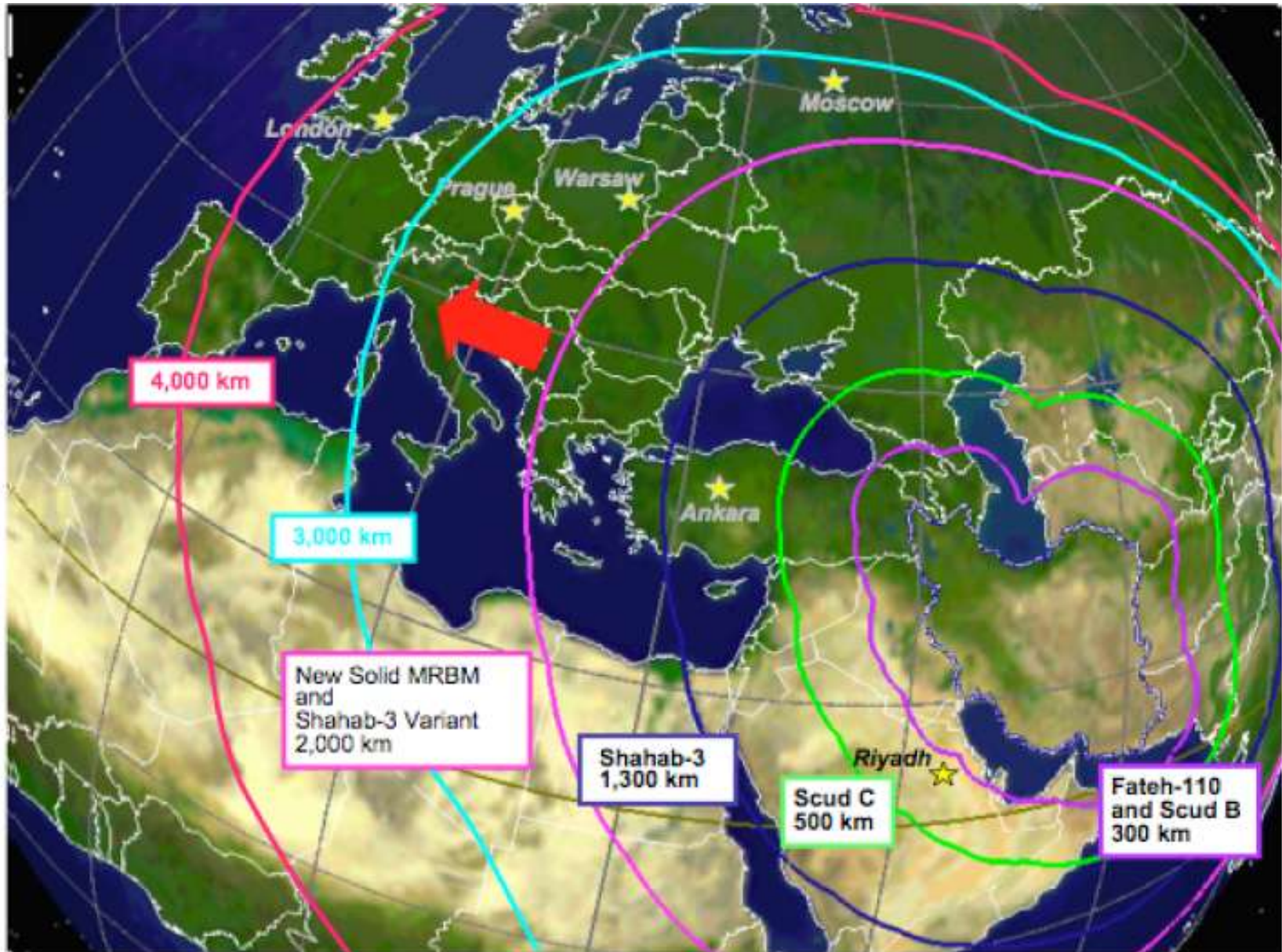


Range	1,300	1,300	2,000	2,000	3,000
Payload	~1,000	700-1000	?	700	~1,000
IOC	2002	?	?	?	2005

Ballistic and Cruise Missile Updates

- **Dec 16, 2009**
 - Iranian reporting shows an upgraded version of the Sejil-2 missile test was successful.
 - Defense Minister General Ahmad Vahidi stated that “it is impossible to destroy [Sejil-2] by anti-missile rockets”
 - He also stated that the launch prep time necessary is shorter than previous versions, for this missile. While further referring to the upgraded missile as a “great development in Iran’s defense industry increasing the country’s technical and tactical powers”
- **Jan 10, 2010**
 - General Ahmad Vahidi stated “Iran’s missile deterrent power is highly above the enemies’ imagination”
- **March 7, 2010**
 - Iranian reporting shows that Iran has started production on the Nasr-1 cruise missile.
 - Minister of Defense, General Ahmad Vahidi reports that the Nasr-1 cruise missile is “capable of destroying 3,000 ton targets”
 - According to the minister, the Nasr-1, “the short-range surface-to-surface missile will be capable of being fired from the air and underwater in the near future”
- **June 19, 2010**
 - General Ahmad Vahidi reports that “Iran’s missile capability is of a deterrent nature and poses no threats to others”
 - In response to Sec. Gates’ statement: “Iran could, if it wanted, launch scores, even hundreds of missiles into Europe”

“Guesstimated” Iranian Missile Ranges



Future Capabilities : Progress and Obstacles

Liquid Propellant

- **Some future advances will be governed by the fact that Iran will have to produce liquid propellant engines “in house”**
- **Fully functional Shahab-3 and Ghadr-1 require at least 3 to 5 years of prep and testing**
- **Performance analysis in the Shahab missiles compared to the Scuds previously acquired from the Soviet Union show a continued dependence on design and implementation with the Soviet framework.**
- **Speculation of foreign support in the form of technical assistance suggests that Iran may be able to establish a stand alone liquid-propellant engine production line of its own in the near future**

Solid Propellant

- **Iran has established a series of licensed solid-propellant production lines**
- **2 years or more for a functional Solid- propellant rocket**
- **These facilities have demonstrated the ability to develop rocket motors to be used potentially on the Sajjil-2 missile**
- **However much of the Iranian knowledge in dealing with design and implementation of these solid-propellant missiles depends much on the technical aid of Chinese experts, Iran is still between 2 to 3 years away from developing a stand-alone program**

Guidance Systems

- **While Iran still must import complete guidance units for its missiles, evidence indicates Iran has the knowhow to assemble basic units and modify them successfully to outfit custom missiles**
- **Minor improvements such as more robust GPS receivers to enhance accuracy**
- **Ability to incorporate Iranian created guidance packages (excluding actual units) improving inertial navigation units**
- **Provides short term advantages**
- **However, needs precise thrust terminations. Post Boost control systems**
- **Without these, Iranian missile accuracy will still fail to improve significantly**

Future Capabilities : Potential Outcomes

Iran still has to rely heavily on Foreign technical assistance (Russia and China) in developing Liquid-Propellant engines, and both of these countries are starting to adhere more closely to Missile Technology Control Regime guidelines. This will force Iran to rely more on its own technology and industrial base and/or less capable North Korean technology..

•As Iran seeks to develop missiles with a longer range, quicker set up and reaction times, and more reliability it will probably shift to solid fuel. It may develop and strengthen the Sajjil-2 or modify the Safir satellite launcher for military use. Iran has the ability, availability of resources, and expertise to implement this process.

•Implementing some TBM countermeasures seems likely.

•Effective cluster and CBW warheads are possible.

•Improved accuracy is uncertain without new technologies.

•Would require a far more intensive testing program to have credible reliability for longer range systems.

•Reports of terminal guidance capabilities seem doubtful through mid-term.

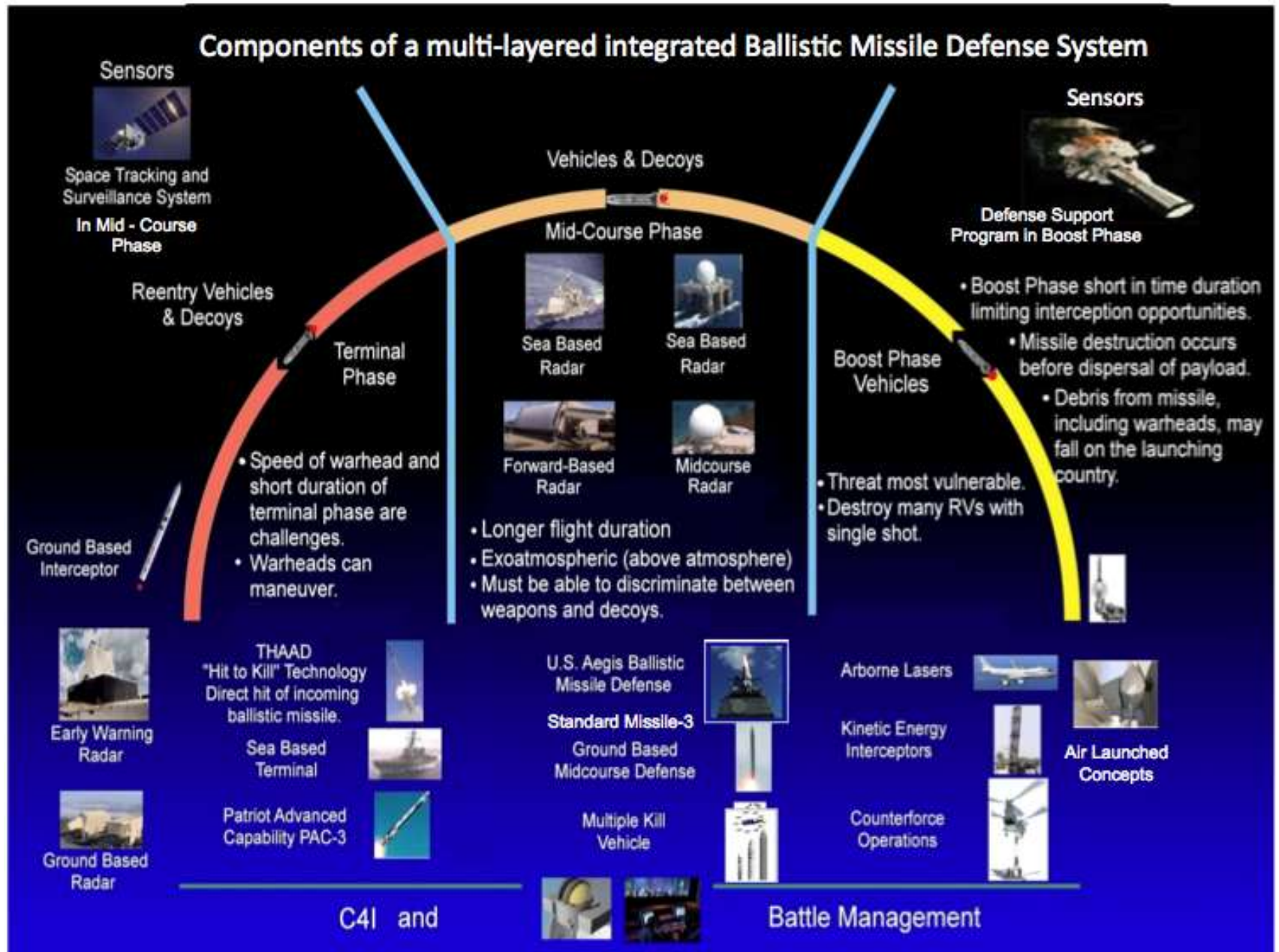
•Important caveats

- Still necessary to engage in multiple testing phases**
- Acquisition of tracking and telemetry systems that can be deployed on sea-based platforms**
- Tehran would have to develop and implement reliable technologies for all forms of advanced warheads that could withstand shock and re-enter the atmosphere**

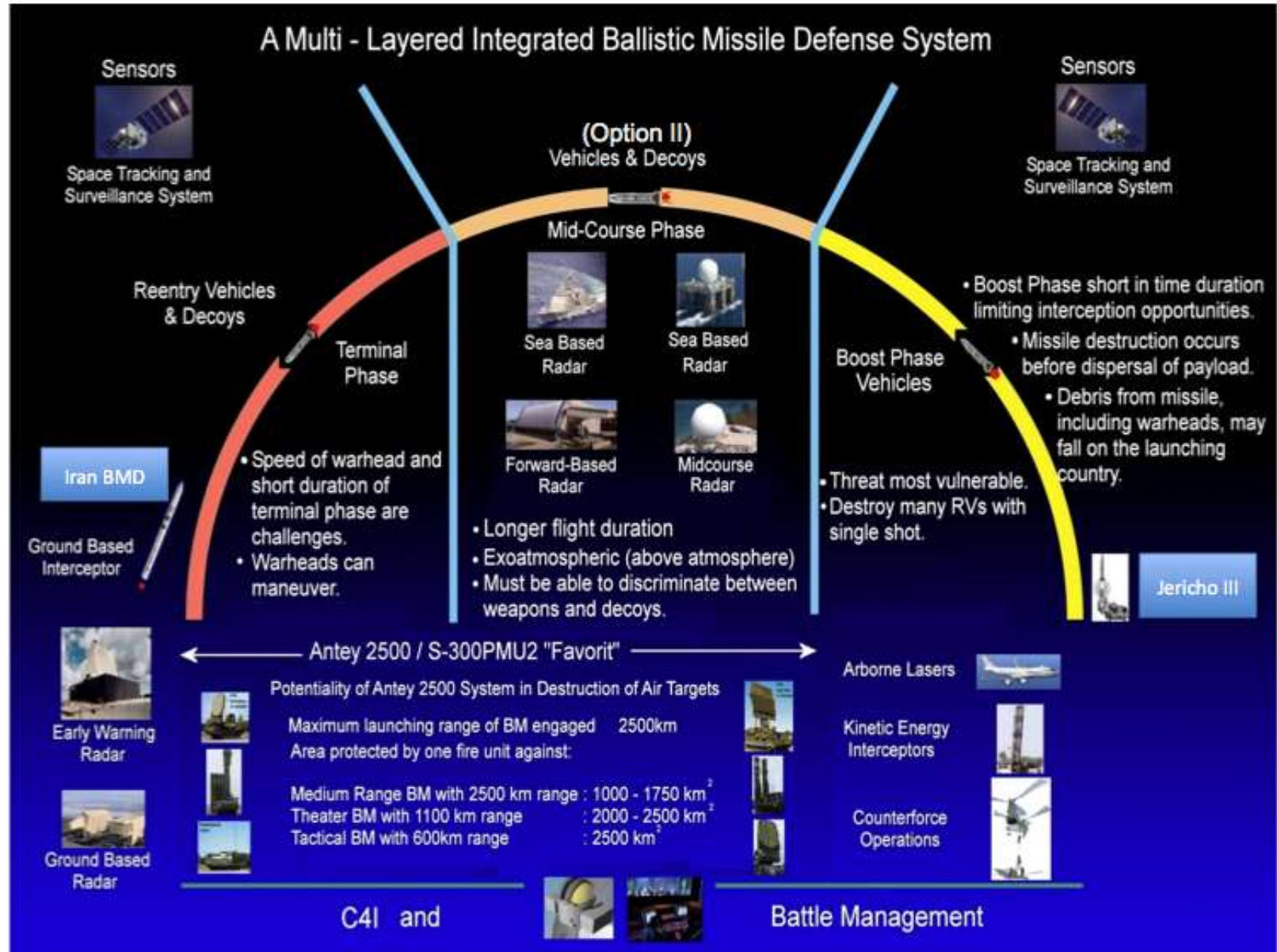
A Gulf Missile War



Gulf Integrated Missile Defenses



Iranian Integrated Missile Defenses



The Challenge of Nuclear Forces and Weapons of Mass Destruction

Current & Potential Nuclear Powers

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 II

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's Nuclear Programs: DNI Assessment - February 2010

The Iranian regime continues to flout UN Security Council restrictions on its nuclear program. There is a real risk that its nuclear program will prompt other countries in the Middle East to pursue nuclear options. We continue to assess Iran is keeping open the option to develop nuclear weapons in part by developing various nuclear capabilities that bring it closer to being able to produce such weapons, should it choose to do so. We do not know, however, if Iran will eventually decide to build nuclear weapons.

I would like to draw your attention to two examples over the past year that illustrate some of the capabilities Iran is developing.

First, published information from the International Atomic Energy Agency indicates that the number of centrifuges installed at Iran's enrichment plant at Natanz has grown significantly from about 3,000 centrifuges in late 2007 to over 8,000 currently installed. Iran has also stockpiled in that same time period approximately 1,800 kilograms of low-enriched uranium. However, according to the IAEA information, Iran also appears to be experiencing some problems at Natanz and is only operating about half of the installed centrifuges, constraining its overall ability to produce larger quantities of low-enriched uranium.

Second, Iran has been constructing—in secret until last September—a second uranium enrichment plant deep under a mountain near the city of Qom. It is unclear to us whether Iran's motivations for building this facility go beyond its publicly claimed intent to preserve enrichment know-how if attacked, but the existence of the facility and some of its design features raise our concerns. The facility is too small to produce regular fuel reloads for civilian nuclear power plants, but is large enough for weapons purposes if Iran opts configure it for highly enriched uranium production. It is worth noting that the small size of the facility and the security afforded the site by its construction under a mountain fit nicely with a strategy of keeping the option open to build a nuclear weapon at some future date, if Tehran ever decides to do so.

Iran's technical advancement, particularly in uranium enrichment, strengthens our 2007 NIE assessment that Iran has the scientific, technical and industrial capacity to eventually produce nuclear weapons, making the central issue its political will to do so. These advancements lead us to reaffirm our judgment from the 2007 NIE that Iran is technically capable of producing enough HEU for a weapon in the next few years, if it chooses to do so.

We judge Iran would likely choose missile delivery as its preferred method of delivering a nuclear weapon. Iran already has the largest inventory of ballistic missiles in the Middle East and it continues to expand the scale, reach and sophistication of its ballistic missile forces— many of which are inherently capable of carrying a nuclear payload.

We continue to judge Iran's nuclear decisionmaking is guided by a cost-benefit approach, which offers the international community opportunities to influence Tehran. Iranian leaders undoubtedly consider Iran's security, prestige and influence, as well as the international political and security environment, when making decisions about its nuclear program.

Iran's growing inventory of ballistic missiles and its acquisition and indigenous production of anti-ship cruise missiles (ASCMs) provide capabilities to enhance its power projection. Tehran views its conventionally armed missiles as an integral part of its strategy to deter—and if necessary retaliate against—forces in the region, including US forces. Its ballistic missiles are inherently capable of delivering WMD, and if so armed, would fit into this same strategy.

Iran's Nuclear Programs: DDNI Assessment - March 2010

We continue to assess Iran is keeping open the option to develop nuclear weapons though we do not know whether Tehran eventually will decide to produce nuclear weapons. Iran continues to develop a range of capabilities that could be applied to producing nuclear weapons, if a decision is made to do so.

During the reporting period, Iran continued to expand its nuclear infrastructure and continued uranium enrichment and activities related to its heavy water research reactor, despite multiple United Nations Security Council Resolutions since late 2006 calling for the suspension of those activities. Although Iran made progress in expanding its nuclear infrastructure during 200[1, some obstacles slowed progress during this period.

In 2009, Iran continued to make progress enriching uranium at the underground cascade halls at Natanz with first-generation centrifuges, and in testing and operating advanced centrifuges at the pilot plant there.

As of mid-November, Iran had produced about 1,800 kilograms of low-enriched uranium hexafluoride (LEUF6) gas product at Natanz, compared to 555 kilograms of LEUF6 in November 2008. Between January and November 2009, Iran increased the number of installed centrifuges from about 5,000 to about 8,700, but the number reported to be operating remains at about 3,~100.

In September, Iran disclosed that it was constructing a second gas-centrifuge uranium enrichment plant near the city of Qom that is designed to house approximately 3,000 centrifuges.

Iran in 2009 continued construction of the IR-40 Heavy Water Research Reactor. Iran during National Nuclear Day inaugurated its fuel manufacturing plant and claimed to have manufactured a fuel assembly for the IR-40.

Iran's CBW Programs: DDNI Assessment - March 2010

We assess that Iran maintains the capability to produce chemical warfare (CW) agents and conducts research that may have offensive applications. Tehran continues to seek dual-use technologies that could advance its capability to produce CW agents. We judge that Iran is capable of weaponizing CW agents in a variety of delivery systems.

Iran probably has the capability to produce some biological warfare (BW) agents for offensive purposes, if it made the decision to do so. We assess that Iran has previously conducted offensive BW agent research and development. Iran continues to seek dual-use technologies that could be used for BW.

What Does Iran Mean by “100% Enrichment”

On July 31, according to Iran's semiofficial Mehr News Agency, presidential chief of staff Esfandiar Rahim Mashai claimed that the West had raised no objections to President Mahmoud Ahmadinezhad's open proclamation that the Islamic Republic could build a nuclear bomb...Mashai's statement reportedly came as he was addressing the assembly of young advisors to the Ministry of Education. Rooz Online, a Britain-based website detested by the regime, analyzed reports on the speech from various semiofficial Iranian news outlets, such as Fars, the Iranian Students News Agency, and the Islamic Republic News Agency. Rooz noted that while other agencies reported rather bland comments, Mehr News Agency -- connected to the Supreme Leader's Islamic Propagation Organization -- gave a much blunter account.

According to Mehr's website, Mashai discussed Ahmadinezhad's February 7, 2010, speech at the National Center for Laser Science and Technology. Mashai reportedly said, "One of the points Dr. Ahmadinezhad announced during his visit to this center was the possibility of enriching to 100 percent, which means building an atom bomb [ke maani an sakht-e bomb-e atomi ast]. But it was interesting that not even one foreign media made a hullabaloo or an uproar. And this shows that they are not worried about an atom bomb. And essentially Dr. Ahmadinezhad had said this to test them in order to see what degree of worry they have about Iranian production of an atom bomb" (translation by the author).

...Interestingly, the week after Ahmadinezhad's February 7 speech, another important Iranian official publicly referred to 100 percent enrichment. On February 15, a government-connected website (dolat.ir) posted a long interview with Ali Akbar Salehi, director of the Atomic Energy Organization of Iran and former ambassador to the International Atomic Energy Agency. Near the end of the interview, Salehi repeatedly claimed that Iran has the legal right to enrich to 100 percent....

Nuclear Uncertainty

- **Must plan to deal with possible Iranian force with unknown weapons characteristics, delivery systems, basing, and timelines.**
 - **Technology base now exists, enrichment to fissile levels is only limiting factor.**
- **Already a key factor in Iranian capability to conduct “wars of intimidation.”**
- **Clear Iran proceeding with extensive ballistic missile program regardless of whether it pursues the nuclear option.**
- **Cannot predict timeframe for nuclear threat. Worst case is 2009, but could well be 2015.**
 - **Break out, bomb in basement, tested, deployed, serious numbers, mobile, sheltered, LUA/LOW? Fission, boosted, thermonuclear?**
- **Chemical and biological options as well.**

IAEA Report of May 31, 2010

Iran's total LEU production at the Natanz fuel enrichment plant (FEP): to date is reported to be 2,427 kg of low enriched uranium, including 362 kg estimated by Iran to have been produced from January 30, 2010 to May 1, 2010. The average monthly production of LEU at the FEP has increased slightly to 120 kg per month (for the last reporting period we noted it was 117 kg of LEU).

Activity at the Pilot Fuel Enrichment Plant: Iran has designated two cascades at the smaller, above-ground pilot fuel enrichment plant (PFEP) for the production of LEU enriched to 20 percent U235 for the Tehran Research Reactor.

Enhanced safeguards at the PFEP: enhanced safeguards were installed in late April 2010. The Agency noted however, that the modification of the PFEP to produce 20 percent enriched uranium "was not notified to the Agency by Iran with sufficient time for the Agency to adjust its safeguards procedures" as required by Iran's existing safeguards agreement.

Continued R&D of advanced centrifuges, but no indication of timing of deployment: Between February 3, 2010 and May 21, 2010, Iran introduced 74 kg of UF6 into a 20-machine cascade of IR-4 centrifuges, a 20-machine cascade of IR2 centrifuges and into single IR-1, IR-2 and IR-4 machines. These quantities of UF6 feed and the number of centrifuges involved indicate that this effort is still at the R&D stage.

No progression IAEA requests for Fordow design information: Iran "referred to its earlier answers on this subject and indicated that 'the Agency is not mandated to raise any question beyond the Safeguards Agreement.'"

No cooperation on centrifuge production, R&D, uranium mining and milling: Iran replied only that it was "continuing to cooperate with the Agency in accordance with its Safeguards Agreement" but did not provide the requested information.

Bushehr fuel loading set: Iran informed the IAEA that it will perform a technical examination of the fuel assemblies" for the Bushehr reactor prior to loading them into the reactor's core in Jun 2010. No specific date for the loading or official start of the reactor was provided.

Pyroprocessing R&D underway; equipment moved: Iran informed the IAEA in January 2010, during a design inspection of the Jabr Ibn Hayan Multipurpose Research Laboratory (JHL) in Tehran, that "pyroprocessing R&D activities had been initiated at JHL to study the electrochemical production of uranium metal." Iran subsequently informed that IAEA that such work was purely research related and aimed at studying the electrochemical behavior of uranyl ion in ionic liquid." It is not clear in the report whether and to what extent this work is related to Iran's weaponization research. During the IAEA's second visit to JHL which sought to clarify the nature of the work, inspectors found that the electrochemical cell had been moved.

No progression weaponization issues: No progress made on resolving what the IAEA terms "possible military dimensions" to Iran's nuclear program. Iran continues to refuse IAEA requests to discuss such issues and insists that the documentation on which such allegations are based are forgeries. The Agency reports that it "remains concerned about the possible existence in Iran of past or current undisclosed nuclear related activities, involving military related organizations, including activities related to the development of a nuclear payload for a missile. There are indications that certain of these activities may have continued beyond 2004."

Why the US Did Not Accept the Turkish-Brazilian Proposal

- The proposed agreement did not take into account the major changes on the ground related to the Iranian nuclear program because of the Iranian actions in October 2009, at the forefront of which is the fact that Iran enriched uranium to the level of 20 percent. However, this is not the only reason.
 - Iran is ignoring its commitments to the nuclear non-proliferation agreement, and over the last six months:
 - It concealed the Qom facility;
 - Did not fully responded to questions by the IAEA regarding the possibility of there being a military side to the Iranian nuclear program.
- Iran has also almost doubled the amount of enriched uranium it has from Natanz [nuclear enrichment facility].
- When former IAEA chief Muhammad ElBaradei moved diagonally last autumn to lead negotiations in Vienna and came up with an excellent proposal that states that Iran should send uranium abroad in order to transform it into nuclear energy to use in its research facilities in Tehran to produce isotopes for medical uses. This took place and Iran possessed 1,600 kg of low-enriched uranium. However, from that point until now Iran speeded up the level of its nuclear program and produced, although it is hard to accurately determine the amount, around a further 1,000 kg of uranium.
- This is a change in circumstances on the ground. With Iran returning to the October 2009 agreement, the question was raised: What is the problem with the agreement now one year after agreeing to it? This does not take into consideration many of the changes on the ground. Also there are a number of points in the Tehran declaration that did not take into account the details that came in the agreement supervised by ElBaradei last October; for example details about protecting the stockpiles of Iranian fuel and the conditions for returning the uranium. Practically, all the details.

300 miles
500 km

TURKEY

TURKMENISTAN

CASPIAN SEA

Lashkar A'bad

Tehran

Sites circled in red
unknown pre-mid 2002

IRAQ

Arak

Isfahan

Natanz

IRAN

Saghand

Ardekan

AFGHANISTAN

MIDDLE EAST

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

KUWAIT

1000 MW

Bushehr

BAHRAIN

QATAR

Gachin

PAKISTAN

SAUDI ARABIA

Gulf of Oman

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

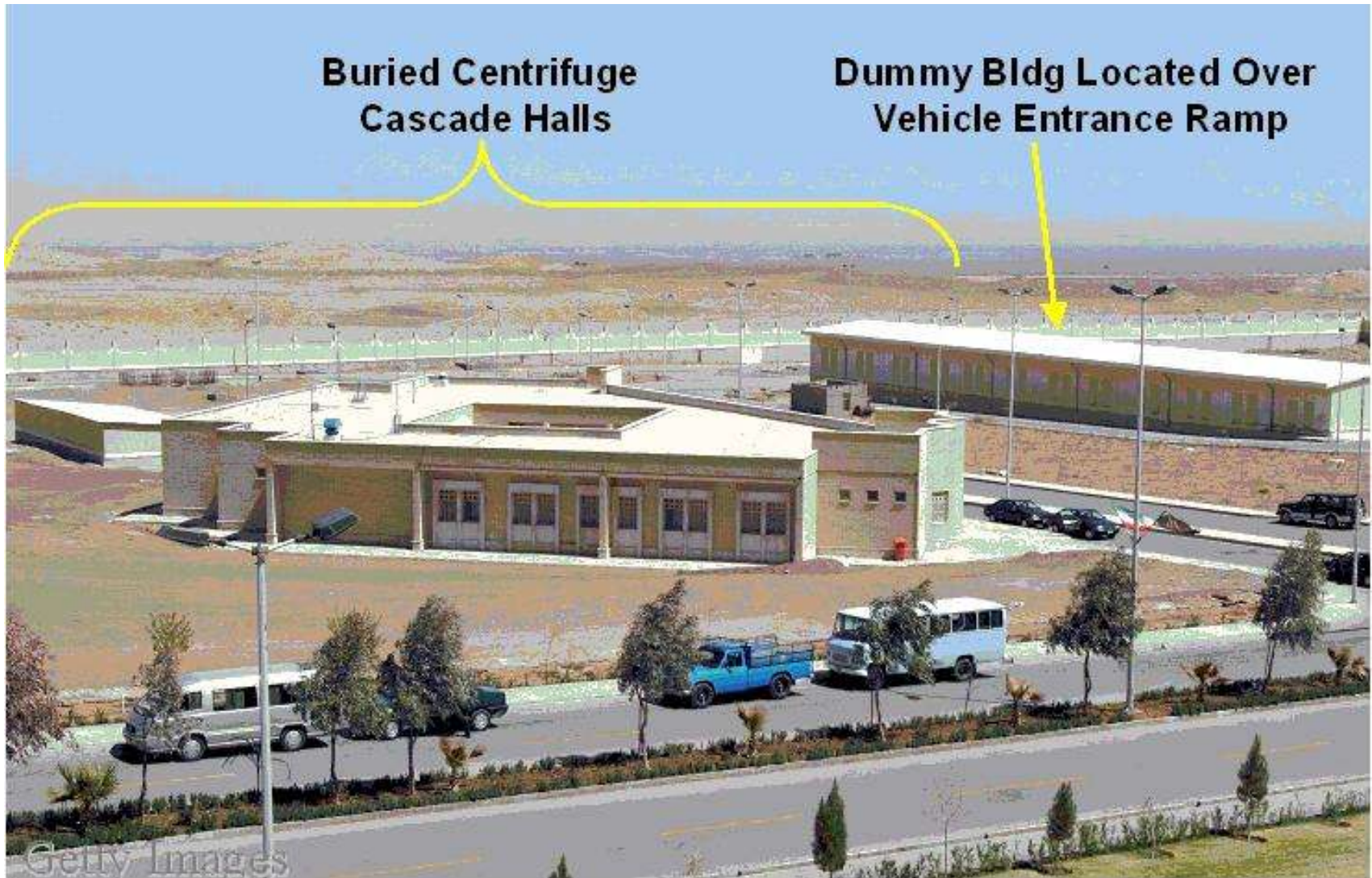
Dummy building
concealing tunnel
entrance ramp

Admin/engineering
office area

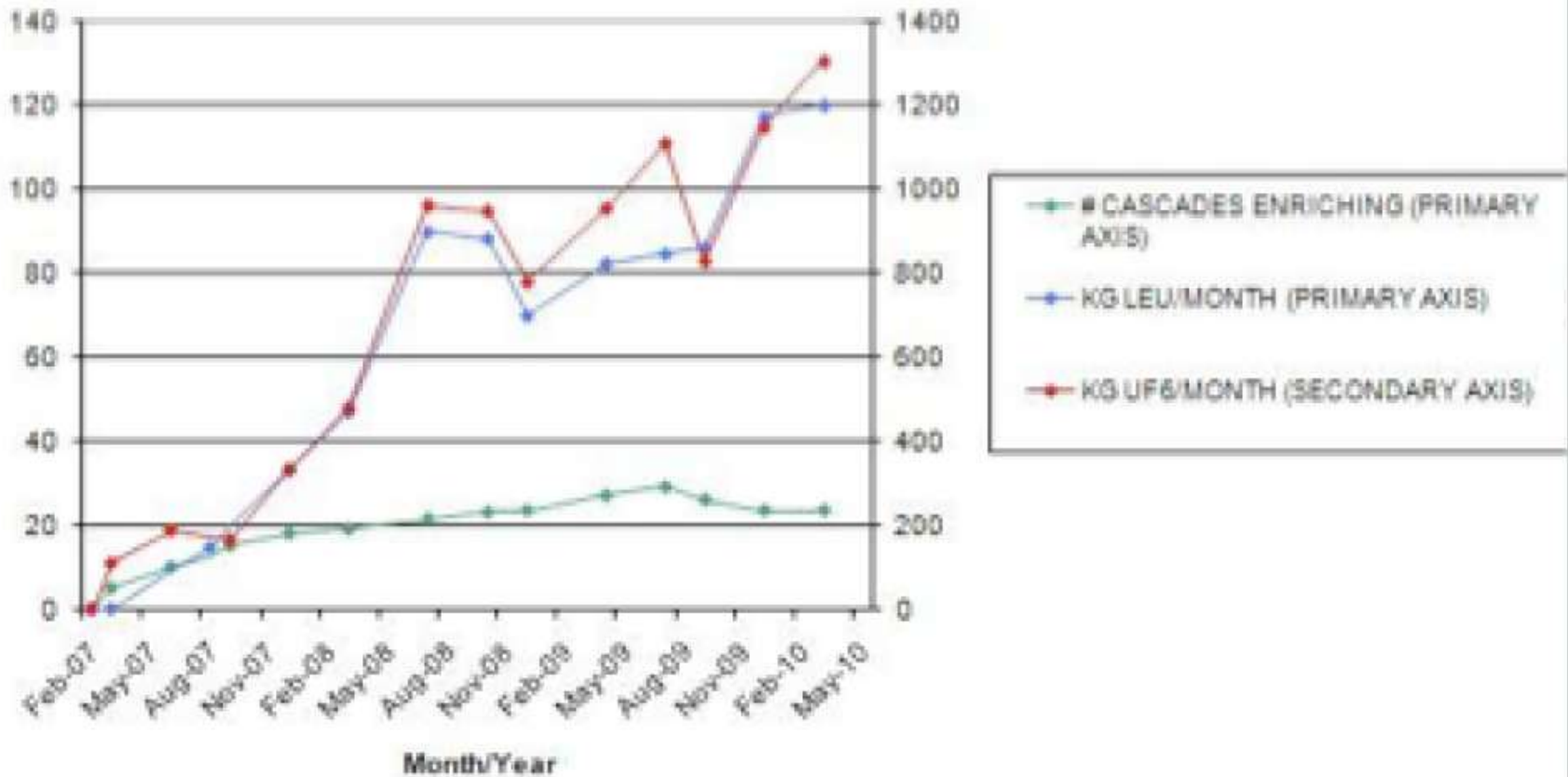
DigitalGlobe Quickbird commercial satellite image

21 JUL 04

Seeking Effective Concealment



ISIS Estimate of Trends at Natanz



ISIS, IAEA Iran Report: Enrichment increases slightly; lack of adequate safeguards, David Albright and Jacqueline Shire, Charts prepared by Christina Walrond, May 31, 2010, <http://www.isisnucleariran.org/reports/>

20% Enrichment to Weapons Production?

- May 31 IAEA safeguards report on Iran is the first to contain any data on the production of 19.75 percent enriched uranium in IR-1 centrifuges at the Natanz Pilot Fuel Enrichment Plant (PFEP).
- The Natanz PFEP is configured to hold six 164-centrifuge cascades in total. Iran uses one of these cascade bays to test several more advanced types of centrifuges configured in 10, 20 and single unit cascades for R&D purposes. When Iran started making 19.75 percent enriched uranium, the PFEP held only one 164-centrifuge cascade, called cascade 1. It has now reinstalled a second cascade, called cascade 6, also designated for production of LEU enriched up to 20 percent. As of late May, cascade 6 had been prepared for enrichment but was not enriching pending the application of more sophisticated safeguards arrangements.
- Iran informed the IAEA that it planned to connect the two cascades, feeding the waste stream, or tails, of the first one into the second one. ...Iran stated in early 2010 that it intends to produce the 19.75 percent enriched uranium at a rate of 3 to 5 kilograms per month. Using the Iranian figures of 5.7 kilograms of 19.75 percent LEU, a 3.5 percent feed assay, and a 2 percent tails assay, the total annualized enrichment output, measured in separative work units (swu) per year, is almost 120 swu per year.
- Based on the experience at the FEP, a more realistic estimate for production in one cascade 25-50 kilograms per year of 19.75 percent LEU, or about 2.1-4.2 kilograms per month, where the tails assay is fixed at 2 percent.⁶ This value reflects reliability problems similar to those encountered at the FEP and is more conservative than Iran's goal of 3-5 kilograms per month.
- How quickly Iran might produce 19.75 percent enriched uranium will depend on whether it uses only one cascade or decides to use more cascades at the PFEP. Although Iran has said that it will expand the enrichment effort beyond a single cascade, it has not revealed the enrichment level of the product of the second cascade.
- **...if Iran installs more cascades at the PFEP, it can speed up its production of 19.75 percent LEU. Nonetheless, ...one or two cascades would require several years to have enough 19.75 percent LEU to then further enrich and have sufficient weapon-grade uranium for a nuclear weapon. If Iran deploys five cascades it would produce this material in 0.5-1.7 years.**
- Iran has not stated how much 19.75 percent LEU it plans to produce or, for that matter, how many cascades it will ultimately devote to the production of this material. .
- .As long as Iran maintains its centrifuge capability, it can incrementally strengthen its nuclear weapons capabilities under the guise of “peaceful” declarations, and shorten the time needed to make enough weapon-grade uranium for a nuclear weapon.

More Iranian Reactors?

- **Iran's announces in June 2010 that it wants to build four new nuclear research reactors. Such announcements can shroud other intentions, in this case an attempt by Iran to lay the basis for continued or even increased enrichment of 20 percent enriched uranium at the Natanz centrifuge plant.**

On June 16, Ali Akbar Salehi, the head of Iran's Atomic Energy Organization announced that Iran would begin work on four new research reactors for the production of medical isotopes.

- **The reactors' planned locations were not announced, but Salehi stated that they would be constructed in different parts of the country to serve medical centers. According to Salehi, the first reactor would replace the aging 5-megawatt Tehran Research Reactor (TRR), which has an estimated life span of fifteen more years.**
- **He said the new reactor would be more powerful, operating at 20 megawatts-thermal, and that design work would start immediately and the reactor would start in five years.**
- **Given that Iran has not built a reactor, and the Arak heavy water reactor construction project is delayed, this schedule is highly optimistic. This plan also raises questions about Iran's ability to meet minimal safety and environmental concerns about a new reactor and its fuel.**
- **Iran has still not learned to make research reactor fuel for the TRR. Salehi said the production of experimental fuel elements is slated for completion in March 2011. Iran hopes to produce the TRR's first batch of fuel elements by September 2011.**
- **Given the unrealistic nature of Iran's announcement, the question is whether it is a pretext for a claim that it must continue producing 20 percent enrichment to fuel these new research reactors. Iran could also use its latest announcement as justification for employing additional cascades for the production of 20 percent enriched uranium at Natanz, thereby further entrenching its enrichment capability by creating additional "facts on the ground" and exacerbating tensions with the UN Security Council.**

How Close Is Iran to Enough Material?

No clear picture. Can only make estimate on basis of Natanz and know centrifuge activity. Ali Akbar Salehi, head of the Atomic Energy Organization of Iran, has reportedly stated that Iran has a new centrifuge with an enrichment output of 10 separative work units (swu) per machine per year.¹ He said that the P1 centrifuge has an output of 1.8 swu per year per machine.

Ali Akbar Salehi, head of the Atomic Energy Organization of Iran announced July 12, 2010 that Iran intends on producing 120 kilograms of 19.75 percent uranium by September 2011, purportedly for use in the Tehran Research Reactor (TRR). Salehi also announced that Iran is working on producing fuel plates. .

If Iran stockpiles this amount of 19.75 percent enriched uranium, it could have nearly the amount needed to produce subsequently enough weapon-grade uranium for a bomb. Once it has enough 19.75 percent LEU, it is 90 percent of the way to weapon-grade uranium, meaning Iran could go from 19.75 percent to 90 percent in as little as one-tenth the time needed to go from natural uranium to weapon-grade uranium.

Iran could continue producing more 19.75 percent LEU once it reaches that initial September 2011 target of 120 kilograms. Iran could also cite this goal as the basis for enriching up to 19.75 percent in an increasing number of cascades and eventually surpass its target quantity.

Based on its own statements, Iran appears to be implementing a way to more efficiently use the tails and reduce the amount of 3.5 percent LEU feed it requires. Instead of storing the 2 percent enriched tails, it has stated it will further enrich them in a second cascade, in a recycling process. The final tails would be 0.7 percent and reusable in the cascades that make 3.5 percent LEU. By doing so, Iran could significantly reduce the amount of 3.5 percent LEU feed needed to make 19.75 percent material.

Such recycling would be particularly useful to a state attempting breakout with limited amounts of enriched uranium. For example, without recycling, Iran might need about 2,000 kilograms of 3.5 percent LEU to produce 25 kilograms of weapon-grade uranium, where weapon-grade is achieved in three steps. But by simultaneously enriching the tails in other cascades (and reducing the tails in those parallel cascades), Iran could reduce by half the amount of 3.5 percent LEU it would need to produce 25 kilograms of weapon-grade uranium. Although this recycling would require Iran to dedicate more centrifuge cascades to a breakout, it would allow for a smaller initial stock of 3.5 percent enriched LEU.

Salehi claims in today's statement that Iran is "now producing fuel plates." This is likely an exaggeration of Iran's capabilities. Today's statement demonstrates that Iran continues to make increasing amounts of 19.75 percent enriched uranium, but it still likely lacks the ability to manufacture fuel for the TRR. This paradox indicates that there is still time for an LEU fuel swap deal, where Iran halts further production of 19.75 percent LEU and sends this material out of the country with 3.5 percent LEU. This deal would be in Iran's interest if it intends on fueling the TRR in September of next year.

DNI on Qom

...Iran has been constructing -- in secret until last September -- a second uranium enrichment plant deep under a mountain near the city of Qom. It is unclear to us whether Iran's motivations for building this facility go beyond its publicly claimed intent to preserve enrichment know-how if attacked, but the existence of the facility and some of its design features raise our concerns.

The facility is too small to produce regular fuel reloads for civilian nuclear power plants, but is large enough for weapons purposes if Iran opts configure it for highly enriched uranium production.

It is worth noting that the small size of the facility and the security afforded the site by its construction under a mountain fit nicely with a strategy of keeping the option open to build a nuclear weapon at some future date, if Tehran ever decides to do so.

IAEA on Qom

10. The DIV included a detailed visual examination of all areas of the plant, the taking of photographs of cascade piping and other process equipment, the taking of environmental samples and a detailed assessment of the design, configuration and capacity of the various plant components and systems. Iran provided access to all areas of the facility. The Agency confirmed that the plant corresponded with the design information provided by Iran and that the facility was at an advanced stage of construction, although no centrifuges had been introduced into the facility. Centrifuge mounting pads, header and sub-header pipes, water piping, electrical cables and cabinets had been put in place but were not yet connected; the passivation tanks, chemical traps, cold traps and cool boxes were also in place but had not been connected. In addition, a utilities building containing electricity transformers and water chillers had also been erected.

"As a result of the augmentation of the threats of military attacks against Iran, the Islamic Republic of Iran decided to establish contingency centers for various organizations and activities ...The Natanz Enrichment Plant was among the targets threatened with military attacks. Therefore, the Atomic Energy Organization requested the Passive Defence Organization to allocate one of those aforementioned centers for the purpose of [a] contingency enrichment plant, so that the enrichment activities shall not be suspended in the case of any military attack. In this respect, the Fordow site, being one of those constructed and prepared centers, [was] allocated to the Atomic Energy Organization of Iran (AEOI) in the second half of 2007. The construction of the Fordow Fuel Enrichment Plant then started. The construction is still ongoing. Thus the plant is not yet ready for operation and it is planned to be operational in 2011."

16. Iran stated that it did not have any other nuclear facilities that were currently under construction or in operation that had not yet been declared to the Agency. Iran also stated that any such future facilities would "be reported to the Agency according to Iran's obligations to the Agency". In a letter dated 6 November 2009, the Agency asked Iran to confirm that it had not taken a decision to construct, or to authorize construction of, any other nuclear facility which had not been declared to the Agency.

35. Iran has not suspended its enrichment related activities or its work on heavy water related projects as required by the Security Council.

36. ...Iran has neither implemented the Additional Protocol nor cooperated with the Agency in connection with the remaining issues of concern, which need to be clarified to exclude the possibility of military dimensions to Iran's nuclear programme. It is now well over a year since the Agency was last able to engage Iran in discussions about these outstanding issues. Unless Iran implements the Additional Protocol and, through substantive dialogue, clarifies the outstanding issues to the satisfaction of the Agency, the Agency will not be in a position to provide credible assurance about the absence of undeclared nuclear material and activities in Iran.

ISIS on Qom

ISIS has obtained commercial satellite imagery from DigitalGlobe that narrows the time frame during which Iran would have begun construction of the gas centrifuge uranium enrichment plant near Qom. The satellite imagery indicates that Iran began construction of the enrichment facility after January 2006 but before June 2007. This time frame is consistent with a Reuters report that construction began in 2006.

ISIS previously assessed that the June 2004 and March 2005 satellite imagery seen on GoogleEarth depict the future site of the enrichment plant construction, but at the time show tunnel entrances that were likely not yet associated with the uranium enrichment construction project). The Atomic Energy Organization of Iran could have chosen among existing tunnel facilities throughout the country, and settled on this one near Qom, to site the covert enrichment plant. The January 2006 DigitalGlobe image of the site is very similar to the 2004 and 2005 imagery, which indicates that construction of the uranium enrichment plant had still not yet commenced as of that date.

The June 2007 image shows notable differences from the three previous images. A large amount of construction materials is visible next to the two tunnel entrances and at one of the adjacent construction staging areas, and possible cement storage is visible at another nearby construction staging area. ISIS assesses that construction associated with the covert gas centrifuge uranium enrichment facility had begun by this June 2007 image and that the construction materials seen in the image were then used in the transformation from what was likely a smaller tunnel facility into a much larger industrial facility, the gas centrifuge hall, built inside the mountain.

The January 2009 image shows a large amount of construction and excavation activity, and the September 27, 2009 still shows a large amount of construction activity, though the tunnel entrances and another excavation have been covered. A February 2000 image from GeoEye shows that the initial tunnel entrances were not yet present at that date

Images of Qom



ISIS on the “Neutron Initiator”

ISIS’s assessment...is that the document describes a plan to develop a very specialized neutron initiator likely for use in a nuclear explosion. There has been considerable analysis of this document. ISIS encourages discussion and scrutiny of this document, including over the issue of its authenticity, and wants to add some additional information to its earlier assessment of this document.

ISIS understood at the time it received the English translation of the Farsi document that the Times’ source removed headings from the original Farsi-language document and retyped the text in order to protect intelligence-sensitive information. The source made it clear that it had taken these steps to protect its sources and methods and made no attempt to conceal such steps from the Times. The Times’ subsequent publication of both the Farsi document and its translation was not opposed by the source. ISIS understood that the source provided the document to relevant governments and the International Atomic Energy Agency (IAEA) in a different form. Nevertheless, the lack of an original document obviously complicates public assessments of the authenticity of the document. It also calls for the IAEA and governments to share their analysis of this document and how it fits into the other information they possess about Iran’s nuclear efforts.

If the document is forged or otherwise tampered with, the source risks a severe blow to its credibility in both the short and medium term. Likewise, if the documents had been forged and subsequently obtained by the Times’ source, the source’s credibility would still be considerably damaged. In discussions with officials from several governments prior to the publication of the Times article, ISIS found that these officials unanimously believed that the source was unlikely to take such a risk. But because of the seriousness of the implications of the document, thorough vetting of the document should continue.

What does this document describe?

If the document is genuine, it concerns the design of an experiment to develop a neutron initiator set off by high explosives. The document describes an experiment to calibrate neutron detectors to measure pulsed neutrons from an experiment. The document is not, as some have suggested, about developing ordinary pulsed neutron sources called “neutron generators” (NG) or “dense plasma focus” (PF) devices. The document acknowledges that Iran already has these devices and that they will be used for calibration in an experiment to detect pulsed neutrons from a “hot” source. The paper states that there are existing sources, namely NG and PF that will be used to calibrate the experiment and that there will then be a new experiment using a “hot source”, which is a hydrodynamic device. The hot source is assessed to be an implosion device that generates neutrons via D-D reactions (see figure 1).

The next few lines in the excerpt from the document ...tell us the purpose is to do a calibration experiment for the “hot source” using conventional NG and PF devices. The purpose of the project outlined in the document is making pulsed neutrons and preparing an experiment to prove that the hot source will work as planned, using a hydrodynamic device at a location that requires mobile labs.

That the experiment is hydrodynamic in nature, a reference to shock compression which has nothing to do with NG and PF devices and the need for mobile laboratories, implies that the hot experiments involve tens of kilograms of high explosives.

This paper is not about developing pulsed laboratory sources such as neutron generators and dense plasma focus devices. It describes using those devices to calibrate a hot experiment to see if a nuclear weapon will work using a technology developed by the United States and China to produce neutrons for initiation of a fission nuclear explosive.

How Much is Enough?

Amount of Fissile Material Need to Build a Basic Fission (Non-Boosted) Weapon

Highly Enriched Uranium

HEU (90% U-235)

Simple gun-type weapon	90-110 lbs/40-50 kg
Simple implosion weapon	33lbs/15 kg
Sophisticated implosion weapon	20-26lbs/9-12kg

Weapons Grade Plutonium

Simple implosion weapon	14lbs/6 kg
Sophisticated implosion weapon	4.5-9lbs/2-4 kg

Extract from the unclassified estimates in Union of Concerned Scientists, "Preventing Nuclear Terrorism Fact Sheet," April 2004, and work by Abdullah Toucan

*The Current State of UN Sanctions:
“Sticks and Carrots”*

The New UN Sanctions: Overview - I

- 1. Ban on Iranian certain nuclear and missile investment abroad.** Iran is prohibited from investing in sensitive nuclear activities abroad, like uranium enrichment and reprocessing activities, where it could acquire nuclear technology and know-how, as well as activities involving ballistic missiles capable of delivering nuclear weapons. The ban also applies to investment in uranium mining.
- 2. Conventional arms ban.** States are prohibited from selling or in any way transferring to Iran eight broad categories of heavy weapons (battle tanks, armored combat vehicles, large caliber artillery systems, combat aircraft, attack helicopters, warships, missiles or missile systems). States are similarly prohibited from providing technical or financial assistance for such systems, or spare parts. States are also to exercise vigilance and restraint in supplying any other arms or related materiel to Iran.
- 3. Ban on ballistic missile activities.** Iran is prohibited from undertaking any activity related to ballistic missiles capable of carrying nuclear weapons and States are required to take all necessary measure to prevent the transfer of related technology or technical assistance.
- 4. Additional items banned for transfer.** The resolution updates and adds to the list of technical items related to nuclear and missile proliferation that are banned for transfer to and from Iran.
- 5. New cargo inspection framework.** Iran is subject to a new regime for inspection of suspicious cargo to detect and stop Iran's smuggling. States should inspect any vessel on their territory suspected of carrying prohibited cargo, including banned conventional arms or sensitive nuclear or missile items. States are also expected to cooperate in such inspections on the high seas.
- 6. New procedures to deal with contraband items.** Once prohibited items are found, States are now obligated to seize and dispose of the items.
- 7. Ban on bunkering services.** States are required not to provide critical support services (e.g., fuel, water) to ships suspected of carrying prohibited cargo.
- 8. Measures to restrict the Islamic Republic of Iran Shipping Lines (IRISL) and Iran Air's cargo division.** States must require their nationals to exercise vigilance over IRISL, a known sanctions violator. Three IRISL-

The New UN Sanctions: Overview - II

related companies will have their assets frozen. States are requested to report any information on activities by IRISL and Iran's Air's cargo division to evade sanctions, including by renaming vessels.

9. **New tools to block proliferation finance.** States are called upon to prevent any financial service -- including insurance or reinsurance -- and freeze any asset that could contribute to Iran's proliferation. This broad language will help states take action when there are suspected financial links to Iran's banned nuclear activities.

10. **Vigilance over all Iran's companies.** States are required to ensure their nationals exercise vigilance when doing business with any Iranian firm, including IRGC and IRISL, to make sure such business does not contribute to Iran's proliferation.

11. **New banking measures.** States are called upon to prohibit on their territories new banking relationships with Iran, including the opening of any new branches of Iranian banks, joint ventures and correspondent banking relationships, if there is a suspected link to proliferation. States also should prohibit their own financial institutions from opening branches in Iran if there is a suspected link to proliferation.

12. **New measures to limit the role of the Islamic Revolutionary Guard Corps (IRGC).** The resolution highlights the IRGC's role in proliferation and requires states to mandate that businesses exercise vigilance over all transactions involving the IRGC. Fifteen IRGC-related companies linked to proliferation will have their assets frozen.

13. **Targeted sanctions on specific individuals and entities.** Forty Iranian companies and one individual will be subject to an asset freeze. The individual -- the head of a critical nuclear research program -- will also be subject to a travel ban. Thirty-five additional individuals previously subject to "travel vigilance" will now be subject to a travel ban.

14. **Appointment of a UN sanctions monitoring panel.** A UN "Panel of Experts" will be established to monitor states' implementation of the sanctions, report on sanctions violations and recommend ways to continually improve enforcement.

UNSCR 1929 (2010) Sanctions on Iran: Part One

“5. *Decides* that Iran shall without delay comply fully and without qualification with its IAEA Safeguards Agreement, including through the application of modified Code 3.1 of the Subsidiary Arrangement to its Safeguards Agreement, *calls upon* Iran to act strictly in accordance with the provisions of the Additional Protocol to its IAEA Safeguards Agreement that it signed on 18 December 2003, *calls upon* Iran to ratify promptly the Additional Protocol, and *reaffirms* that, in accordance with Articles 24 and 39 of Iran’s Safeguards Agreement, Iran’s Safeguards Agreement and its Subsidiary Arrangement, including modified Code 3.1, cannot be amended or changed unilaterally by Iran, and *notes* that there is no mechanism in the Agreement for the suspension of any of the provisions in the Subsidiary Arrangement

“6. *Reaffirms* that, in accordance with Iran’s obligations under previous resolutions to suspend all reprocessing, heavy water-related and enrichment-related activities, Iran shall not begin construction on any new uranium-enrichment, reprocessing, or heavy water-related facility and shall discontinue any ongoing construction of any uranium-enrichment, reprocessing, or heavy water-related facility;

“7. *Decides* that Iran shall not acquire an interest in any commercial activity in another State involving uranium mining, production or use of nuclear materials and technology as listed in INFCIRC/254/Rev.9/Part 1, in particular uranium-enrichment and reprocessing activities, all heavy-water activities or technology-related to ballistic missiles capable of delivering nuclear weapons, and *further decides* that all States shall prohibit such investment in territories under their jurisdiction by Iran, its nationals, and entities incorporated in Iran or subject to its jurisdiction, or by persons or entities acting on their behalf or at their direction, or by entities owned or controlled by them;

“8. *Decides* that all States shall prevent the direct or indirect supply, sale or transfer to Iran, from or through their territories or by their nationals or individuals subject to their jurisdiction, or using their flag vessels or aircraft, and whether or not originating in their territories, of any battle tanks, armoured combat vehicles, large calibre artillery systems, combat aircraft, attack helicopters, warships, missiles or missile systems as defined for the purpose of the United Nations Register of Conventional Arms, or related materiel, including spare parts, or items as determined by the Security Council or the Committee established pursuant to resolution 1737 (2006) (“the Committee”), *decides* further that all States shall prevent the provision to Iran by their nationals or from or through their territories of technical training, financial resources or services, advice, other services or assistance related to the supply, sale, transfer, provision, manufacture, maintenance or use of such arms and related materiel, and, in this context, *calls upon* all States to exercise vigilance and restraint over the supply, sale, transfer, provision, manufacture and use of all other arms and related materiel;

“9. *Decides* that Iran shall not undertake any activity related to ballistic missiles capable of delivering nuclear weapons, including launches using ballistic missile technology, and that States shall take all necessary measures to prevent the transfer of technology or technical assistance to Iran related to such activities;

“10. *Decides* that all States shall take the necessary measures to prevent the entry into or transit through their territories of individuals designated in Annex C, D & E of resolution 1737 (2006), Annex I of resolution 1747 (2007), Annex I of resolution 1803 (2008) and Annexes I and II of this resolution, or by the Security Council or the Committee pursuant to paragraph 10 of resolution 1737 (2006), except where such entry or transit is for activities directly related to the provision to Iran of items in subparagraphs 3(b)(i) and (ii) of resolution 1737 (2006) in accordance with paragraph 3 of resolution 1737 (2006), *underlines* that nothing in this paragraph shall oblige a State to refuse its own nationals entry into its territory, and *decides* that the measures imposed in this paragraph shall not apply when the Committee determines on a case-by-case basis that such travel is justified on the grounds of humanitarian need, including religious obligations, or where the Committee concludes that an exemption would otherwise further the objectives of this resolution, including where Article XV of the IAEA Statute is engaged;

UNSCR 1929 (2010) Sanctions on Iran: Part Two

“11. *Decides* that the measures specified in paragraphs 12, 13, 14 and 15 of resolution 1737 (2006) shall apply also to the individuals and entities listed in Annex of this resolution and to any individuals or entities acting on their behalf or at their direction, and to entities owned or controlled by them, including through illicit means, and to any individuals and entities determined by the Council or the Committee to have assisted designated individuals or entities in evading sanctions of, or in violating the provisions of, resolutions 1737 (2006), 1747 (2007), 1803 (2008) or this resolution;

“12. *Decides* that the measures specified in paragraphs 12, 13, 14 and 15 of resolution 1737 (2006) shall apply also to the Islamic Revolutionary Guard Corps (IRGC, also known as “Army of the Guardians of the Islamic Revolution”) individuals and entities specified in Annex II, and to any individuals or entities acting on their behalf or at their direction, and to entities owned or controlled by them, including through illicit means, and *calls upon* all States to exercise vigilance over those transactions involving the IRGC that could contribute to Iran’s proliferation-sensitive nuclear activities or the development of nuclear weapon delivery systems;

“13. *Decides* that for the purposes of the measures specified in paragraphs 3, 4, 5, 6 and 7 of resolution 1737 (2006), the list of items in S/2006/814 shall be superseded by the list of items in INFCIRC/254/Rev.9/Part 1 and INFCIRC/254/Rev.7/Part 2, and any further items if the State determines that they could contribute to enrichment-related, reprocessing or heavy water-related activities or to the development of nuclear weapon delivery systems, and further *decides* that for the purposes of the measures specified in paragraphs 3, 4, 5, 6 and 7 of resolution 1737 (2006), the list of items contained in S/2006/815 shall be superseded by the list of items contained in S/2010/263;

“14. *Calls upon* all States to inspect, in accordance with their national authorities and legislation and consistent with international law, in particular the law of the sea and relevant international civil aviation agreements, all cargo to and from Iran, in their territory, including seaports and airports, if the State concerned has information that provides reasonable grounds to believe the cargo contains items the supply, sale, transfer, or export of which is prohibited by paragraphs 3, 4 or 7 of resolution 1737 (2006), paragraph 5 of resolution 1747 (2007), paragraph 8 of resolution 1803 (2008) or paragraphs 8 or 9 of this resolution, for the purpose of ensuring strict implementation of those provisions;

“15. *Notes* that States, consistent with international law, in particular the law of the sea, may request inspections of vessels on the high seas with the consent of the flag State, and *calls upon* all States to cooperate in such inspections if there is information that provides reasonable grounds to believe the vessel is carrying items supply, sale, transfer, or export of which is prohibited by paragraphs 3, 4 or 7 of resolution 1737 (2006), paragraph 5 of resolution 1747 (2007), paragraph 8 of resolution 1803 (2008) or paragraphs 8 or 9 of this resolution, for the purpose of ensuring strict implementation of those provisions;

“19. *Decides* that the measures specified in paragraphs 12, 13, 14 and 15 of resolution 1737 (2006) shall also apply to the entities of the Islamic Republic of Iran Shipping Lines (IRISL) as specified in Annex III and to any person or entity acting on their behalf or at their direction, and to entities owned or controlled by them including through illicit means, or determined by the Council or the Committee to have assisted them in evading the sanctions of, or in violating the provisions of, resolutions 1737 (2006), 1747 (2007), 1803 (2008) or this resolution;

UNSCR 1929 (2010) Sanctions on Iran: Part Three

“20. *Requests* all Member States to communicate to the Committee any information available on transfers or activity by Iran Air’s cargo division or vessels owned or operated by the Islamic Republic of Iran Shipping Lines (IRISL) to other companies that may have been undertaken in order to evade the sanctions of, or in violation of the provisions of, resolutions 1737 (2006), 1747 (2007), 1803 (2008) or this resolution, including renaming or re-registering of aircraft, vessels or ships and requests the Committee to make that information widely available;

“21. *Calls upon* all States, in addition to implementing their obligations pursuant to resolutions 1737 (2006), 1747 (2007), 1803 (2008) and this resolution, to prevent the provision of financial services, including insurance or re-insurance, or the transfer to, through, or from their territory, or to or by their nationals or entities organized under their laws (including branches abroad), or persons or financial institutions in their territory, of any financial or other assets or resources if they have information that provides reasonable grounds to believe that such services, assets or resources could contribute to Iran’s proliferation-sensitive nuclear activities, or the development of nuclear weapon delivery systems, including by freezing any financial or other assets or resources on their territories or that hereafter come within their territories, or that are subject to their jurisdiction or that hereafter become subject to their jurisdiction, that are related to such programmes or activities and applying enhanced monitoring to prevent all such transactions in accordance with their national authorities and legislation;

“22. *Decides* that all States shall require their nationals, persons subject to their jurisdiction and firms incorporated in their territory or subject to their jurisdiction to exercise vigilance when doing business with entities incorporated in Iran or subject to Iran’s jurisdiction, including those of the IRGC and IRISL, and any individuals or entities acting on their behalf or at their direction, and entities owned or controlled by them, including through illicit means, if they have information that provides reasonable grounds to believe that such business could contribute to Iran’s proliferation-sensitive nuclear activities or the development of nuclear weapon delivery systems or to violations of resolutions 1737 (2006), 1747 (2007), 1803 (2008) or this resolution;

“23. *Calls upon* States to take appropriate measures that prohibit in their territories the opening of new branches, subsidiaries, or representative offices of Iranian banks, and also that prohibit Iranian banks from establishing new joint ventures, taking an ownership interest in or establishing or maintaining correspondent relationships with banks in their jurisdiction to prevent the provision of financial services if they have information that provides reasonable grounds to believe that these activities could contribute to Iran’s proliferation-sensitive nuclear activities or the development of nuclear weapon delivery systems;

“24. *Calls upon* States to take appropriate measures that prohibit financial institutions within their territories or under their jurisdiction from opening representative offices or subsidiaries or banking accounts in Iran if they have information that provides reasonable grounds to believe that such financial services could contribute to Iran’s proliferation-sensitive nuclear activities or the development of nuclear weapon delivery systems;

Resolution Annex I: Individuals and entities involved in nuclear or ballistic missile activities

Resolution Annex II: Entities owned, controlled, or acting on behalf of the Islamic Revolutionary Guard Corps

Resolution Annex III: Entities owned, controlled, or acting on behalf of the Islamic Republic of Iran Shipping Lines (IRISL)

Resolution Annex IV: Proposal to the Islamic Republic of Iran by China, France, Germany, the Russian Federation, the United Kingdom of Great Britain and Northern Ireland, the United States of America and the European Union

UNSCR 1929 (2010) Incentives to Iran: Part One

Agree to:

- Recognize Iran's right to develop research, production and use of nuclear energy for peaceful purposes in conformity with its NPT obligations;
- Treat Iran's nuclear program in the same manner as that of any Non-nuclear Weapon State Party to the NPT once international confidence in the exclusively peaceful nature of Iran's nuclear program is restored.

Nuclear Energy

- Reaffirmation of Iran's right to nuclear energy for exclusively peaceful purposes in conformity with its obligations under the NPT.
- Provision of technological and financial assistance necessary for Iran's peaceful use of nuclear energy, support for the resumption of technical cooperation projects in Iran by the IAEA.
- Support for construction of LWR based on state-of-the-art technology.
- Support for R&D in nuclear energy as international confidence is gradually restored.
- Provision of legally binding nuclear fuel supply guarantees.
- Cooperation with regard to management of spent fuel and radioactive waste.

Political

- Improving the six countries' and the EU's relations with Iran and building up mutual trust.
- Encouragement of direct contact and dialogue with Iran.
- Support Iran in playing an important and constructive role in international affairs.
- Promotion of dialogue and cooperation on non-proliferation, regional security and stabilization issues.
- Work with Iran and others in the region to encourage confidence-building measures and regional security.
- Establishment of appropriate consultation and cooperation mechanisms.
- Support for a conference on regional security issues.
- Reaffirmation that a solution to the Iranian nuclear issue would contribute to non-proliferation efforts and to realizing the objective of a Middle East free of weapons of mass destruction, including their means of delivery.
- Reaffirmation of the obligation under the UN Charter to refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any State or in any other manner inconsistent with the Charter of the United Nations.
- Cooperation on Afghanistan, including on intensified cooperation in the fight against drug trafficking, support for programs on the return of Afghan refugees to Afghanistan; cooperation on reconstruction of Afghanistan; cooperation on guarding the Iran-Afghan border.

Economic

- Steps towards the normalization of trade and economic relations, such as improving Iran's access to the international economy, markets and capital through practical support for full integration into international structures, including the World Trade Organization, and to create the framework for increased direct investment in Iran and trade with Iran.

UNSCR 1929 (2010) Incentives to Iran: Part Two

Energy Partnership

- Steps towards the normalization of cooperation with Iran in the area of energy: establishment of a long-term and wide-ranging strategic energy partnership between Iran and the European Union and other willing partners, with concrete and practical applications/measures.

Agriculture

- Support for agricultural development in Iran. Facilitation of Iran's complete self-sufficiency in food through cooperation in modern technology.

Environment, Infrastructure

- Civilian Projects in the field of environmental protection, infrastructure, science and technology, and high-tech:
- Development of transport infrastructure, including international transport corridors.
- Support for modernization of Iran's telecommunication infrastructure, including by possible removal of relevant export restrictions.

Civil Aviation

- Civil aviation cooperation, including the possible removal of restrictions on manufacturers exporting aircraft to Iran:
- Enabling Iran to renew its civil aviation fleet;
- Assisting Iran to ensure that Iranian aircraft meet international safety standards.

Economic, social and human development/humanitarian issues

- Provide, as necessary, assistance to Iran's economic and social development and humanitarian need.
- Cooperation/technical support in education in areas of benefit to Iran:
- Supporting Iranians to take courses, placements or degrees in areas such as civil engineering, agriculture and environmental studies;
- Supporting partnerships between Higher Education Institutions e.g. public health, rural livelihoods, joint scientific projects, public administration, history and philosophy.
- Cooperation in the field of development of effective emergency response capabilities (e.g. seismology, earthquake research, disaster control etc.).
- Cooperation within the framework of a "dialogue among civilizations".

Implementation mechanism

- Constitution of joint monitoring groups for the implementation of a future agreement.

US Goals for UNSCR 1929 (2010)

The United States is determined to prevent Iran from developing nuclear weapons. Over the past 18 months, we have pursued our broad policy goals that have been principally focused on tough-minded diplomacy – including both engagement and pressure. We have sought to sharpen the choices now before the Iranian leadership. We have sought to demonstrate the benefits to Iran and the Iranian people if Iran adheres to its international obligations. And we have sought to intensify the costs of continued defiance, and to show Iran that pursuit of nuclear weapons will make it less secure, not more.

Last year, we embarked on an unprecedented effort to engage with Iran. We did so without any illusions about whom we were dealing with, or the scope of our differences over the past thirty years. Engagement is both a test of Iranian intentions, and an investment in a partnership with a growing coalition of countries deeply concerned about Iran’s nuclear ambitions. We have sought, and continue to seek, opportunities for Iran to demonstrate convincingly that its nuclear program is intended entirely for peaceful purposes. These opportunities have not been embraced by Iran. In Geneva last October, we supported a creative proposal by the International Atomic Energy Agency (IAEA) to provide fuel for the production of medical isotopes at the Tehran Research Reactor. Unfortunately, what appeared to be a constructive beginning in Geneva was later spurned by the Iranian leadership. Instead, since October, Iran has failed to cooperate fully with the IAEA regarding the previously covert enrichment facility near Qom; announced plans for ten new enrichment facilities; refused to continue discussions with the P5+1 regarding international concerns about its nuclear program; provocatively announced that it would boost enrichment to 20 percent, in further violation of UN Security Council resolutions; and continued its refusal to cooperate with the IAEA’s investigation into its nuclear program, drawing new rebukes from the IAEA Director General in his most recent reports.

Iran’s intransigence has left the international community no choice but to employ a second tool of diplomacy: pressure. The adoption of UNSCR 1929 was an essential first step in that effort, building upon and strengthening previous sanctions resolutions:

- It bans transfers of major conventional weapon systems to Iran;
- It bans all Iranian activities related to ballistic missiles that could deliver a nuclear weapon;
- It establishes a framework for cargo inspections to detect and stop Iran’s smuggling and acquisition of illicit items;
- It prohibits Iran from investing abroad in sensitive nuclear activities, such as uranium mining;
- It creates important new tools to help block Iran’s use of the international financial system to fund and facilitate its nuclear and other destabilizing weapons programs;
- It targets directly the role of the Islamic Revolutionary Guard Corps (IRGC) in Iran’s proliferation efforts, adding fifteen specific IRGC entities to the list of designations for asset freeze;
- And for the first time, the Security Council highlighted formally in UNSCR 1929 the potential links between Iran’s energy sector and its nuclear ambitions.

Our goal now is to ensure the most aggressive implementation of these sanctions as possible. We are not alone. The European Union has acted strongly to follow up by endorsing a series of significant steps, including a prohibition on new investment in Iran’s energy sector, bans on the transfer of key technology, and tough measures against Iranian banks and correspondent banking relationships, including closer monitoring of Iranian banks operating in the EU. On July 26, Canada announced its supplement to UNSCR 1929, the Special Economic Measures Act, which incorporates restrictions similar to those in recent U.S. and EU sanctions.

The Potential Nuclear/ Missile Arms Race

Iran's Hypothetical Forces in 2020

- **Less than 50 nuclear weapons, most fission, possibly some boosted. 30 Nuclear warheads, 20 bombs.**
 - **Most 20-30 Kt, some 100 KT**
- **100 Shahab 3 and 3 ER on mobile TELs. 60 TELs.**
- **Su-24, F-14 convert, and Su-37 strike aircraft.**
- **Reverse engineered KH-55 cruise missiles.**
- **Mustard and persistent nerve gas, stable bombs, bombs and warheads with cluster munitions.**
- **Limited satellite targeting and damage assessment capability.**
- **Limited ballistic missile point defense capability with SA-300/SA-400**
- **Meaningful civil defense? No.**

Guesstimates of Israel's Nuclear Forces

- **Israel almost certainly has a significant, if undeclared, inventory of nuclear weapons.**
- **Reports were manufactured at the Negev Nuclear Research Center, outside the town of Dimona.**
- **Based on estimates of the plutonium production capacity of the Dimona reactor, Israel has approximately 100-200 advanced nuclear explosive devices but such estimates are based on nominal production figures and very uncertain estimates of the material required for a given number of nuclear weapons. They do not address yield, design, or the mix of fission, boosted, and thermonuclear weapons,**
- **Global Security estimates that the total could be as high as 375 to 500 weapons. No reliable unclassified data on Israel mix of nuclear weapons, but Israel did obtain substantial amounts of nuclear weapons design and test data from France before 1968, and probably has a stock of both tactical and thermonuclear weapons.**

Guesstimates of Israel's Missile Forces

Virtually any Israeli fighter could be equipped with nuclear bombs or stand off weapons, but its F-15s and F-16s seem the most likely delivery platforms.

No reliable unclassified reports on Israel's ballistic missile holdings, but **unclassified sources speculate Israel has the following capabilities:**

Jericho I: Range of 500 km (310 mi) and a nominal CEP of 1,000 m (3,300 ft), with a payload of 400 kilograms (880 lb). It seems to be close or identical to the Dassault MD-620, which was test fired in 1965. IAI produced such missiles at its Beit Zachariah facility. It also reports that that around 100 missiles of this type were produced, although there were some problems with its guidance systems. It also reports that The Jericho I is now considered obsolete and was taken out of service during the 1990s.

Jericho II: Solid fuel, two-stage medium-range ballistic missile system tested in launches into the Mediterranean from 1987 to 1992. Reports that the longest was around 1,300 km, and fired from the facility at Palmachim, south of Tel Aviv. Jane's reports that a test launch of 1,400 km is believed to have taken place from South Africa's Overberg Test Range in June 1989, but other sources indicate that this was part of a series of launches of a system using a larger booster. reports that it has a 1,000 kg payload, capable of carrying a considerable amount of high explosives or a 1 MT yield nuclear warhead. It uses a two-stage solid propellant engine with a separating warhead. It also reports that the missile can be launched from a silo, a railroad flat truck, or a mobile vehicle. This gives it the ability to be hidden, moved quickly, or kept in a hardened silo, ensuring survival against any attack.

Jericho III: Estimates differ sharply. It may have entered service in the late 1990s, but some put it in the late 2006-2008 period. It is reported to be a three-stage solid propellant and a payload of 1,000 to 1,300 kg. Wikipedia reports it may have a single 750 kg nuclear warhead or two or three low yield MIRV warheads; an estimated launch weight of 30,000 kg and a length of 15.5 m with a width of 1.56 m. Some reports indicate that Jericho III has a radar guided, terminal homing warhead in addition to inertial guidance, and silo-based with road and rail mobility. No reliable estimate of its range exists. It may have maximum range of about 7,800 km with a smaller 500 kg payload. This could hit any target in the Middle East and targets as far away as Pakistan and Russia,

Israel's Hypothetical Forces in 2020

- **200-400 boosted and fusion weapons.**
 - **Most 20-100 Kt variable yield, some 1 Megaton.**
- **100 Jericho 1 and 2.**
- **30-100 Jericho 3/ER.**
- **JSF, F15I, F-16I with nuclear-armed cruise missiles, advanced conventional precision strike capability.**
- **3 Dolphin submarines with nuclear armed SLCMs.**
- **High resolution satellite targeting and damage assessment capability.**
- **Moderate ballistic missile point and area defense capability with Arrow IV/V and Patriot PAC-3 TMD.**
- **CW? Assume Yes. BW? Assume No.**
- **Meaningful civil defense? CW only.**

Strike on Iran?

- **Timelines: Acquisition? Deployment? Modernization?**
- **Targeting intelligence?**
- **Dispersal, hardening, concealment?**
- **Hardening vs. Attack Lethality**
- **SEAD: Penetration? Suppression? Kill?**
- **Range-payload, refuel, recovery**
- **Restrike? Penetration corridor enforcement?**
- **LOW? LUA? Covert?**

Post-Strike on Iran/ Parallel Iranian Options

- **IR-2, IR-3, IR-3 “cooled,” IR-4**
- **Folded centrifuge**
- **Concealed heavy water reactor**
- **LWR cannibalization**
- **LWR download**
- **Dirty weapons**
- **Basic biological**
- **Genetic engineered weapons**

Key Force Posture Decisions

- **US and/or Israel**
 - **Prevent, preempt**, contain, deter, retaliate, mutual assured destruction.
- **Iran and Israel:**
 - In reserve (secure storage), launch on warning (LOW), launch under attack (LOA), ride out and retaliate
 - Continuous alert, dispersal
 - Point, wide area defense goals
- **Israel:**
 - Basing mode: sea basing, sheltered missiles.
 - Limited strike, existential national, multinational survivable.
- **US:**
 - Level of defensive aid.
 - Ambiguous response
 - Clear deployment of nuclear response capability.
 - Extended deterrence. Assured retaliation.
- **Gulf:**
 - Passive (wait out), defensive, or go nuclear.
 - Ballistic, cruise missile, air defense.
 - Seek extended deterrence from US

Key Force Posture Decisions - II

- **Syria:**
 - **Link or decouple from Iran.**
 - **Passive (tacit threat) or active (clear, combat ready deployment).**
- **Non-State Actor:**
 - **Tacit or covert capability.**
 - **Proven capability.**
 - **Deployment mode: Hidden, dispersed, pre-emplaced**