

Testimony of David Albright
Before the House Committee on Armed Services
Addressing the Iranian Nuclear Challenge:
Understanding the Military Options

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Military options, on balance, remain uncertain in their ability to end Iran's quest for nuclear weapons or even significantly delay their acquisition, absent sustained bombing of a wide range of military and nuclear targets. It is doubtful that a surgical strike against a few nuclear facilities can succeed in slowing an Iranian effort to obtain an atomic bomb. Military strikes invite retaliation and increase the chance of a regional military confrontation that risks severely damaging U.S. and its allies' interests. As such, military options are rightly viewed as a last resort. Despite their risks they have not been taken off the table by the U.S. government.

Increasing pressure with the aim of seeking negotiated concessions from Iran is the preferred route forward to prevent Iran from getting nuclear weapons. But in parallel to that strategy is the priority of efforts to detect, thwart, and deter Iran's acquisition of nuclear weapons. Iran also needs to understand that if it tries to build nuclear weapons, the United States will stop it by using a wide variety of means that include a U.S military response, despite the inherent risks of such strikes.

The factors influencing Israel's decision-making about if or when it would attack Iran's nuclear sites can complicate U.S. decision-making. Israel's military capabilities are far less extensive than those of the United States, and Israel worries more about Iran achieving a level of technical nuclear proficiency so robust that the elimination of this program would exceed Israeli military capabilities. As a result, Israel may preventively attack Iran militarily with the aim of pre-empting the emergence of the means for a rapid Iranian breakout. Such an attack could occur before Iran has made a decision to start construction of nuclear weapons.

Reconciling these two approaches to military options remains difficult. The United States should not encourage or aid Israel to attack Iran. The United States should also not expect any prior warning of such an attack, although clearly that would be desired.

In the near term, military options should be avoided; however, Iran should understand that a military strike is highly likely if it tries to acquire nuclear weapons. Iran's fear of military strikes helps to deter it from deciding to build nuclear weapons in the first place.

If military strikes do occur despite all attempts to avoid them, they should be accompanied by a clear, international strategy that would impose a robust inspection regime on Iran that can detect and dismantle any nuclear weapons efforts and provide assurance that such efforts will not occur in the future.

Iran's Shortening Breakout Times Do Not Necessitate Military Options

A central consideration in assessing the threat of Iran building nuclear weapons is the timeline for Iran to acquire them following a decision to do so. Overall, Iran would need about a year to build a crude nuclear explosive device and longer to build a warhead for a ballistic missile. The “long pole in the tent” of such an effort is Iran’s lack of sufficient weapon-grade uranium (WGU). It is assessed as not possessing weapon-grade uranium, and thus its priority would be the production of enough for a nuclear weapon, or more likely several nuclear weapons. Iran is also assessed as not yet having a secret centrifuge plant enriching uranium and it is unlikely to have one until at least the end of 2013.

In that light, Iran may seek to divert its existing stocks of low enriched uranium (LEU), enriching this material further up to weapon-grade as fast as it can. Iran’s goal would be to accumulate enough weapon-grade uranium before it was detected and the United States and other nations responded, likely militarily destroying the facilities doing the enrichment.

As Iran further develops its gas centrifuge capabilities, breakout times are shortening. However, they remain long enough to allow for detection and prevention. A breakout is very risky for Iran and the acquisition of a nuclear explosive would take time. An Iranian breakout would likely be detected before it could obtain enough weapon-grade uranium for a nuclear weapon and long before it could assemble one. During this period, it would be vulnerable to devastating consequences.

The estimated breakout times today and at least through next year are long enough that the United States need not concede Iran the ability to build nuclear weapons in secret, which would in essence be whenever it wants. Iran’s nuclear weapons capabilities are growing, but detection of a breakout is well within U.S. and International Atomic Energy Agency (IAEA) capabilities, as is the ability of the United States and its allies to respond. Nonetheless, despite existing detection capabilities, every effort should be taken to improve them, both through improved IAEA monitoring inside the facilities and U.S. and allied intelligence operations.

ISIS has estimated Iranian breakout times under a variety of circumstances with the aid of an U.S. centrifuge expert with decades of experience in modeling centrifuge operations. These estimates seek a minimum time for Iran to accumulate enough weapon-grade uranium for a nuclear weapon. In practice, breakout times may be even longer than predicted. For example, Iran may know in theory how to enrich to weapon-grade but in practice may encounter difficulties and unexpected inefficiencies. Iran has found enrichment very difficult and far more time consuming than expected. Regardless of the extent of its past or on-going nuclear weaponization activities, Iran has not made a bomb and has not likely mastered the technology to weaponize weapon-grade uranium. That process will likely go slower than expected too. Furthermore, Iran may want to achieve a high level of confidence about its ability to avoid detection prior to producing WGU

before it decided to break out. And it may want to produce more weapon-grade uranium than enough for a single nuclear weapon.

Sometimes military strikes are put forth as a way to conclusively solve the Iranian nuclear issue. But they can have serious negative repercussions for the United States if an attack does not go well. Today, Iran does not yet have a rapid, secret way to breakout and produce weapon-grade uranium and will not for some time. Iran is also deterred from breaking out, and the threat of military action plays an important role in creating that deterrence. Military options are at one end of a spectrum where the other end is diplomacy and sanctions. There are many tools in between, including denial of critical goods for its nuclear program, interdictions, enhanced intelligence surveillance, sabotage, and cyber attacks, which can slow or even stop Iran's nuclear progress. The focus should be to strengthen efforts along that spectrum, while ensuring that Iran perceives U.S. military strikes as credible.

Breakout Estimates in More Detail

Iran is currently assessed as not having decided to build a nuclear weapon but it could build a crude nuclear device in a year.

Although Iran is engaged in nuclear hedging, no evidence has emerged that the regime has decided to build nuclear weapons. Such a decision may be unlikely to occur until Iran is first able to augment its enrichment capability to a point where it would have the ability to make weapon-grade uranium quickly and perhaps secretly. Its efforts to master uranium enrichment have gone slower than it likely expected, and international pressure that delayed its progress has been greater than anticipated.

If Iran wanted to build nuclear weapons today, it could build a nuclear device suitable for underground detonation or crude delivery in 10-12 months. The weapon-grade uranium it requires would be derived from its gas centrifuge program, which is Iran's most advanced nuclear program capable of making nuclear explosive materials.

The IAEA has concluded that Iran has the know-how to build a crude nuclear explosive device that it could detonate underground or deliver by aircraft or ship. It would take Iran longer to build a deliverable warhead for its Shahab 3 or Sajiil 2 ballistic missiles because Iran is believed to require more time to master the construction of a reliable, miniaturized warhead for these missiles.

Iran has several paths to nuclear weapons if it decided to build them.

Given existing constraints, what are Iran's realistic options to get nuclear weapons over the next several years? Iran has essentially two broad sets of options to acquire nuclear weapons from the current period through 2015. The first involves a set of cheating scenarios, where Iran remains a member of the Nuclear Non-Proliferation Treaty (NPT) as long as possible while further developing its nuclear weapons capabilities. Hedging is a critical part of this strategy. The second is that Iran formally withdraws from the NPT

and then dedicates nuclear facilities to making nuclear weapons outside of the non-proliferation regime.

An [ISIS report](#) to the United States Institute of Peace released on March 5, 2012 discusses a range of options that Iran may pursue to obtain nuclear weapons. ISIS identified four main options that Iran may use during the next several years:

- Dash at a Declared Enrichment Site
- Dash at a Covert Enrichment Site
- Cheating in Plain Sight
- A Parallel Program

In all cases, these potential nuclear futures are not inevitable. International actions may delay or prevent them. Iran may decide that the potential costs are too high and choose not to pursue any of them. Despite the existing constraints, however, Iran may also decide that at some point obtaining nuclear weapons is worth the risk.

How quickly could Iran break out today at the Natanz Fuel Enrichment Plant?

The underground Natanz Fuel Enrichment Plant (FEP) is Iran's most significant capability to produce sufficient weapon-grade uranium for a bomb, which, as of the last IAEA safeguards report, contained about 9,000 enriching gas centrifuge machines. Iran is now capable of using the FEP to conduct a dash to the bomb using safeguarded low enriched uranium to produce weapon-grade uranium. It would be expected to use both its existing stock of over six tonnes of 3.5 percent LEU hexafluoride and a stock of about 100 kilograms of near 20 percent LEU hexafluoride.

In order to conduct a dash using LEU at Natanz, Iran would need to visibly violate its commitments under the NPT, including diverting the LEU from IAEA safeguards and likely ejecting IAEA inspectors from the country. Although only minor modifications may be necessary in the Natanz FEP infrastructure before Iran could start to enrich to weapon-grade levels, any dash using the FEP would not proceed quickly. Based on ISIS's most recent calculations, reflecting reduced performance of the centrifuges in the FEP over the last year, but more enriching centrifuges, Iran would need about four months to produce enough weapon-grade uranium for just one bomb.¹ And in undertaking such a risky effort in which its facilities could be destroyed by military strikes, Iran would likely want to be able to produce enough weapon-grade uranium to make several weapons.

¹ This estimate is a shorter breakout time than an earlier one published by ISIS, which was seven months. The reduction in time reflects the 9,000 IR-1 centrifuges now enriching at the FEP, compared to 4,000-6,000 when the first estimate was done. Theoretically, this newer estimate could be somewhat shorter, but on-going performance problems in FEP cascades and limitations imposed by the design of the facility lead to a longer breakout time than theoretically possible. These performance problems have in many cases exceeded those problems factored into this recent breakout estimate, which could result in a longer breakout time or the need for even more LEU feed.

Four months would provide more than enough time for the international community to impose draconian international sanctions against Iran. Despite the FEP's underground location, it is vulnerable to air strikes. Iran would likely fear that one or more countries would conduct military strikes that could effectively destroy this facility, long before it could use its centrifuges there to produce enough weapon-grade uranium for even a single bomb. It goes without saying that Iran takes seriously Israeli threats of military strikes. Iran may pause before inviting them by dashing to weapon-grade uranium at Natanz in blatant violation of the NPT.

What are the timelines and implications of Iran's continued production of near 20 percent low enriched uranium?

As Iran's stock of 19.75 percent enriched uranium increases, the amount of time it needs to produce weapon-grade uranium for nuclear weapons decreases significantly. At current rates of production of 19.75 percent LEU, Iran will have enough of this material by early next year, if further enriched to weapon-grade in a breakout, for a nuclear weapon. If Iran modestly expands its capability to make 19.75 percent LEU consistent with its existing plans, it could have enough for a nuclear weapon by the end of 2012. Production of enough for a second nuclear weapon would take many additional months. For more information about this estimate, see an [ISIS report from June 15, 2012](#).

Because the Fordow enrichment plant is so deeply buried, it raises concerns that Iran will try to break out at this site, believing that it is impervious to military strikes or that breakout can be achieved prior to a military strike. Predicting when or if Iran would break out at Fordow remains difficult, but it would likely want to have sufficient 19.75 percent LEU for more than one nuclear weapon and ensure it could break out rapidly after a decision to do so. However, regardless of an exact timeline, the dedication of this site to the production of 19.75 percent LEU and its extreme fortifications increase the chance of military strikes aimed at preempting the emergence of the means for a more rapid Iranian breakout.

The ability to fully destroy the Fordow site is open to debate, but nonetheless, the United States and Israel have the military capability to shut down operations at the facility for some period of time where the United States would likely be able to keep the facility closed longer. If Iran seeks to break out at Fordow only, once it has enough 19.75 percent LEU, the time to produce enough weapon-grade uranium for a nuclear weapon is estimated to be about 2.5 to 3.5 months. This is a lower bound estimate which assumes that the site is fully outfitted with IR-1 centrifuges which are all working well. Currently less than half this number of centrifuges are enriching uranium, and if this number were operating in a breakout, Iran would need roughly 4.5 to 6.5 months to break out. It is uncertain if the site will be fully outfitted by the time it accumulates enough 19.75 percent LEU hexafluoride for a nuclear weapon. In any case, there is adequate time for both the detection of a breakout and a U.S. response.

Iran could reduce the time it needs to break out using a stock of 19.75 percent LEU by using the relatively large numbers of centrifuges at the Natanz enrichment site to do the

enriching to weapon-grade. Breakout times could be as short as roughly one month, although practical difficulties would likely increase this time. In contrast, as discussed above, if Iran had to rely mainly on its stock of 3.5 percent LEU, breakout times are several months to obtain enough weapon-grade uranium for a nuclear weapon. But even with a relatively short breakout time of one month, the Natanz site is highly vulnerable to military strikes and regularly visited by IAEA inspectors. On balance, Iran is likely deterred from breaking out there.

But Iran's current trajectory at Fordow is increasing the chance of a military confrontation. To reduce the tensions caused by the Fordow site and Iran's increasing stocks of 19.75 percent LEU, a priority in the short term is obtaining an Iranian agreement to stop producing uranium enriched over five percent and freezing the number of centrifuges at the Fordow site to no more than a few hundred. It is in the interest of all concerned to avoid an escalation of the Iranian nuclear crisis by negotiating such an agreement, and then to negotiate agreements which ensure Iran will not build nuclear weapons.

Is Iran building a secret gas centrifuge plant?

The question of whether Iran is building a third enrichment plant in secret has been an open one since former Iranian nuclear chief Ali Akbar Salehi claimed on August 16, 2010 that "studies for the location of 10 other uranium enrichment facilities" had ended, and that "the construction of one of these facilities will begin by the end of the (current Iranian) year (March 2011) or start of the next year." Succeeding nuclear head Fereydoun Abbasi-Davani said in mid-2011 that construction on additional enrichment plants was delayed by two years. Now, one year later, is Iran adding a new centrifuge plant in addition to the Natanz and Fordow centrifuge plants? Or is the plant still deferred for another year? Iran in the past secretly constructed the Natanz centrifuge site, the Kalaye Electric centrifuge research and development plant, and the deeply buried Fordow centrifuge facility.

Since March 2007, Iran has taken the position that it does not have to notify the IAEA if it begins construction of a nuclear facility, but the IAEA says that Iran has a legal obligation to do so under its current safeguards agreement. Iran's provision of information about the construction of any new enrichment sites is pertinent to instilling confidence about the peaceful nature of its nuclear activities and satisfying international concern that it could decide to make weapon-grade uranium in secret.

ISIS has assessed in the U.S. Institute of Peace report that international concern over Iran's ability to breakout in secret should increase in 2013 due to the increased possibility of constructing a hidden centrifuge enrichment site and simultaneously growing stocks of 3.5 and 19.75 percent low enriched uranium that would allow Iran to produce WGU more quickly at a secret site. It remains for Iran to abide by the simple provision of its IAEA safeguards agreements, modified Code 3.1, to provide the IAEA with advance information about its construction of additional enrichment facilities and to explain any current construction of a third enrichment site. In avoiding its responsibility under its

safeguards agreement, Iran risks that any site subsequently discovered being built in secret will be viewed as a threat, increasing the risks of military confrontation. Greater IAEA transparency would help reduce international concern about a hidden, third enrichment site.

How significantly would the deployment of advanced centrifuges affect Iran's breakout times?

Iran may start deployment of advanced centrifuges at the Fordow enrichment plant or possibly at a third enrichment site next year. Its advanced centrifuges, namely the IR-2m and perhaps the IR-4 models, are expected to achieve about 3-4 times the enrichment output of the IR-1 centrifuges. Iran is currently testing both types in production-scale cascades at the Natanz Pilot Fuel Enrichment Plant, but making progress slower than expected. After completing this testing, Iran has indicated it would deploy the advanced centrifuges, although it has not stated where it would deploy them or in what numbers. It may be unsuccessful in deploying the IR-4 centrifuge and face problems in obtaining enough raw materials to build large numbers of IR-2m centrifuges. However, with advanced centrifuges, Iran could increase by several-fold the amount of 19.75 percent LEU it can produce and it could break out with far fewer machines. Thus, the deployment of advanced centrifuges will inevitably lead to increased tensions. The risk of their deployment in a secret enrichment site is a particular cause of concern in 2014 and afterwards, according to the ISIS study for the U.S. Institute of Peace.