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Iran's Missile Arsenal and the Nuclear Negotiations

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IN LATE NOVEMBER, Iran and its interlocutors in the P5+1 (Britain, China, France, Russia, United States, plus Germany) agreed to a seven-month extension in the nuclear talks. As the two sides continue pressing ahead toward a comprehensive deal, a lingering critical issue involves Iran's ballistic missile capability and what realistic approaches exist for addressing it without torpedoing the talks.

IRAN ALREADY POSSESSES the region's largest arsenal of ballistic missiles and rockets, and the Islamic Republic has developed the only satellite-launch capability in the Middle East besides Israel. Iran's missile program is relatively advanced and progressing, with a cadre of engineers and skilled technicians working under the politically powerful Iran Aviation Industries Organization (AIO), which has more than two dozen subsidiaries, since 1993. The Islamic Revolutionary Guard Corps (IRGC) is known to be the AIO's most prolific developer and end user, especially since eight years ago when it created its own missile and space research center to consolidate rocketry activities. The IRGC later merged the center into its Self-Sufficiency Jihad Organization. In addition, no fewer than twenty-four universities in Iran teach courses in advanced aerospace engineering. In fact, according to the scientific journal rankings (SJR) system, in 2013 Iranians produced more academic articles on aerospace engineering than Russians, despite Iran's rule barring researchers working on military projects from publishing articles in international journals.

Iran, with its waning air force and token blue-water naval capability, relies heavily on ballistic missiles for its long-range strike capability. So it was not surprising when, this past May, Iranian defense minister Hossein Dehghan ruled out any negotiations over Iran's "defensive, conventional, and deterrent" missile arsenal, a position that has been repeated by other IRGC commanders.

Considering these underlying factors, it would be unrealistic to expect Iran to unilaterally stop its missile program, or dismantle its arsenal, but the Iranians might still be encouraged or even compelled to undertake transparency measures and adhere to certain capping mechanisms. Pursuing such goals would require considering important issues such as the range, payload, accuracy, testing, and indigenous technological-development capabilities associated with Iran's missiles.

Range

Following the 1991 Gulf War, UN Security Council Resolution 687 restricted Iraq to producing and fielding

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surface-to-surface missiles with ranges not exceeding 150 km. The approach used for Iraq required an intrusive and extensive monitoring program that Iran simply would not accept, yet without a complex monitoring mechanism, this approach will not work for Iran. Nor can a range limitation alone mitigate the perceived threat from Iranian missiles, as the southern Gulf states and U.S. forces based around Iran are geographically close to potential launching sites—many within 150 km of Iranian shores or islands. Also, Iran could retain the technical know-how and equipment to extend the range of existing missiles or manufacture new longer-range versions as soon as any restriction regime breaks down.

Iran has publicly declared a 2,000 km range cap on its surface-to-surface missiles, supposedly ordered by Supreme Leader Ayatollah Ali Khamenei. That is well beyond the 1,200 km range needed to reach Israel from Iran's borders. Iran's prominent leaders have explicitly denied any interest in developing longer-range missiles, including intercontinental ballistic missiles (ICBMs) that can reach 5,500 km and beyond, on the grounds that these do not fit within Iran's defensive military doctrine. However, there are indications pointing the other way. The chief of the IRGC Aerospace Force (with "space" ostensibly added to denote the branch's expanded role), Brig. Gen. Amirali Hajizadeh, said recently that Iran had not stopped at 2,000 km and continued to develop missiles with longer ranges "without any limitations." He boasted on another occasion that the Aerospace Force would respond to any aggression against Iran not only by destroying Israel's major cities but by taking the war "within the borders of the United States."

Separately, the brother of Brig. Gen. Hassan Tehrani Moghaddam—who formerly headed Iran's missile and space launcher programs and was killed during a botched solid-motor test in November 2011—inadvertently alluded to an advanced ICBM development program under his deceased brother's direction, but his comments were quickly removed from Iranian news outlets. Some recent remarks by IRGC officers, including one by Fathollah Ommi, the science advisor to President Hassan Rouhani and a former colleague of Moghaddam, suggested the project on which Moghaddam was working is now complete, in the form of "the top secret deterrent Qaem four-stage solid fuel rocket [which is also] capable of lifting a satellite to a 1,000 km Earth orbit." Ommi's use of language seems to have been intentionally vague, and one notes the strangeness of identifying a space launch vehicle (SLV) as a "deterrent." This, if indeed materialized, could be the interim step the International Institute for Strategic Studies (IISS) had estimated Iran was unlikely to achieve before 2018 on its path to ICBM production.

To use an SLV as a "deterrent" would arguably require more than a payload switch, but given that Iran's secretive SLV program is fully manned and controlled by the military establishment, which recently announced further steps in reaching even higher orbits with heavier payloads, much room exists for suspicion. Not many essential differences exist between an SLV and a missile, and after establishing a common development path, only operational requirements separate the two. Iran has announced ambitious SLV plans—including the launch of a manned suborbital mission by 2016 and the rollout of SLVs capable of setting satellites into 36,000 km geosynchronous orbit—but Iran also has a long history of announcing satellite launch targets that it then fails to meet.

Iran may have or be able to develop the technology to convert an SLV to a makeshift ICBM, but increasing the versatility of such an ICBM through more-compact missile design, a new liquid propulsion system, or higher-grade and more efficient solid fuels, would be arguably more difficult.

Payload

The world wants to make sure the Islamic Republic do not arm a missile or any other platform with a nuclear warhead of any form or type. The International Atomic Energy Agency (IAEA) and the P5+1 have so far been unable to clarify reports of Iranian weaponization efforts, including the design of a nuclear warhead small enough to fit in a ballistic missile, and Iran's development of such a warhead is based on speculation and unverified evidence. To obtain such a capability, Iran would need to test several warhead designs weighing at least 1,000 kg and with dimensions suitable for missile carriage. This is a monumental undertaking that has prompted speculation Iran would forgo missile delivery entirely and instead use other means to deliver its future nuclear weapons.

Accuracy

Accuracy is another point of contention. In the unclassified world, the circular error probable (CEP) for Iran's medium-range missiles is not known authoritatively, but the Shahab-3's accuracy is thought to be much greater than the 2,500 meters speculated by Western sources—in fact, closer to 250 meters. Keeping in mind Iran's long history of unverified statements about its military hardware, Iran has claimed notable advances in guidance and control by combining inertial navigation systems (INS) with dynamically tuned gyros and GPS/GLONASS satellite navigation technology. Iran also claims to have designed and implemented different terminal guidance systems for its Fateh-110D/Khalij-e Fars/Hormuz family of missiles, reaching a possible CEP of less than 10 meters. Whether or not Iran has made the progress it declares, such claims suggest the country's ambitions. Iran is unlikely to accept limits on its ability to improve accuracy of its missile designs, and even if it did, monitoring compliance would be a considerable challenge.

Testing

Although Iran is generally believed not to have demonstrated the kind of flight-test program necessary to produce an ICBM, Iran has, one should remember, successfully launched two-stage SLVs on three occasions over the past six years, and demonstrated some competence in technologies such as engine integration, multistaging, orbital separation, and reentry. To fully develop a large, complex multistage rocket design for military purposes, according to experts' rule of thumb, Iran would need to conduct as many as forty test launches over a decade. However, this number arguably could be trimmed down by extensive use of computer simulation, use of specialized development rockets integrated in other programs, and large-scale ground tests. Iran seems to have been exercising these options. Iran also collaborates closely with North Korea on missile technology, and can be expected to outsource its missile tests to North Korea if necessary. Therefore, successfully implementing a test ban on missiles with ranges above a certain limit will also be a considerable challenge.

Indigenous Technology

The U.S. intelligence community assumes help from Russia or North Korea when assessing Iran's ICBM capability. However, Iran is likely to have already matched or even surpassed North Korea technologically, judging from a comparison of successful satellite launches by the two states. And it is highly improbable that Russia, or China for that matter, will provide Iran with any bottleneck technology needed to complete an ICBM.

Iran recently commemorated its now "fully indigenous" missile program with a ten-day conference. While Iran's level of technological expertise in ballistic missiles is debated, a history of Western doubting of Iranian capabilities bears mention. Examples include the dismissal of Iran's ability to operate and maintain its modern U.S.-made weapons systems after the 1979 revolution; the dismissal of Iran's first indigenous satellite launch as a failure; and the underestimation of Iran's ability to fabricate large numbers of centrifuges and produce significant quantities of low-enriched uranium (LEU). The mere fact of Iran's building a missile with 2,200 km range, along with fielding a successful SLV lineup and reentry capsules, shows the country's considerable progress.

Iran's intentions, meanwhile, might be inferred from the Shkval episode, whereby Iranian documents leaked online revealed a plan with Russia dating back to 2004 to test-launch deadly Shkval supercavitating high-speed rocket torpedoes in Persian Gulf waters. Documents also laid out in elaborate detail a 2009 Iranian plan for the AIO to study and ultimately reverse-engineer the sophisticated weapon. No clear evidence indicates Iran has yet achieved these ambitions, but the documents themselves show Iran's aims.

All such discussions must be grounded in an understanding of Iran's ballistic missile industry, which began in the late 1980s with the importing of assembly lines for Scud B and Scud C missiles from North Korea and China. Concurrently, the Iranians started a reverse-engineering program to internalize the associated technologies and processes. This path continued with the development of the liquid-fuel Shahab-3 MRBM but diverged with Moghaddam's decision to focus instead on multistage solid-fuel rockets. This decision entailed risks but seems to have led to Iran's most promising projects, namely the Sejjil and Fateh missiles. Having modeled its first Safir and Simorgh SLVs after the original liquid-fuel Shahabs, Iran has now apparently realigned with Moghaddam's vision by using a solid-fuel design for its latest Qaem SLV. Until at leasr the 2011 fatal accident, which killed other senior program officials alongside Moghaddam, Iran's program has had nearly three decades of stable leadership. Add to the equation Iran's effective employment of dual-use technological items, which can be more readily acquired these days, and one sees a robust military program that will be difficult to check with control measures.

Policy Options

Iran may well need many years to develop more-threatening missiles, but its leadership seems dedicated to pursuing these capabilities—not a hopeful portent for regional stability. Addressing this issue now is therefore essential.

The nuclear issue is undoubtedly at the center of the P5+1 negotiations, but privately pursuing missile "side deals" in this framework could be useful. Given the Republican takeover of the U.S. Senate, alleged missile activity may soon come under closer scrutiny, so the Iranians could be persuaded to act now—on the broader nuclear file and missiles in particular—while the climate is comparably sympathetic.

In 2010, the UN Security Council passed Resolution 1929, demanding broadly that Iran suspend developing and testing "nuclear capable" ballistic missiles. Even though Iran has so far rejected this and other similar resolutions, Resolution 1929 can still be used as a foundation for persuading the Islamic Republic to reconsider its basic assumptions and goals in developing long-range missiles. One effective step in this area could be to persuade Iran to place its SLV program fully and verifiably under civilian control and supervision, away from the military. Such an undertaking could at least bring some level of transparency to the program. In return, Iran can be offered assistance in certain areas of peaceful space exploration.

Other issues worth exploring include enshrining Iran's commitment to its proclaimed 2,000 km cap in missile ranges, as well as placing certain restrictions on testing. During the past year, Iran has shied away from publicly test-launching a new or updated medium-to-long-range missile, and unconfirmed reports suggest that President Rouhani has been enforcing a moratorium on high-profile space launches during this period, perhaps to avoid interference with the nuclear negotiations, although also possibly for technical reasons. Persuading Iran to continue this course of action, as well as to agree not to test in North Korea or elsewhere, would be useful. It should be impressed on Iran that any such agreements will apply to all parts of the country's ruling system, as some IRGC elements might be tempted to pursue a program hidden from certain parts of the civilian leadership. Such an approach would echo that taken by Argentinian air force officials, who in the 1980s concealed development of the Condor ballistic missile from other areas of the leadership.

In addition, the United States and EU can push for mandating a UN body such as the Office for Disarmament Affairs (UNODA) to continue negotiating with the Islamic Republic under a separate mandate, including for a regional pact on missile limitations. Iran also can be encouraged to subscribe to the Hague Code of Conduct Against Ballistic Missile Proliferation (HCOC) and to partner with the Missile Technology Control Regime (MTCR).

The international emphasis now should be on establishing a viable monitoring regime for Iranian missile efforts. Considering that the Iranians could well develop maximum-range IRBMs, and ICBMs, by the coming decade, such a step would be more effective than simply curbing Iranian access to internationally available components and materials, which can only delay the program. With oil prices falling, now is a good time to argue that rather than incur the huge risks associated with developing ICBMs, Iran could benefit by investing instead in the infrastructure and social and environmental areas in which it is obviously lagging.