Can Iran Restore Its Missile Mojo?

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Brief Analysis

Despite questions about the utility of its huge missile arsenal—whose importance has only increased since the collapse of the "axis of resistance"—Iran will likely double down on this capability to ensure the viability of its military strategy.

The outcome of Iran's massive April 13 and October 1 strikes on Israel has raised questions about the utility of its missile force and the military strategy built around it. In the April strike **(https://besacenter.org/operation-true-promise-irans-missile-attack-on-israel/)** , Iran launched an estimated 110-130 ballistic missiles at Israel. About half malfunctioned after launch, nearly half were intercepted, and around 7-9 got through, causing little damage and no deaths (185 drones and 6 cruise missiles were launched as well; all were downed en route). In October **(https://horsdoeuvresofbattle.blog/2024/10/27/nevatim-strike-accuracy-digestif/)** , Iran launched an estimated 200 ballistic missiles: 20 apparently failed after launch; more than 30 hit Israel, causing some damage to Nevatim Air Base and several residential areas; and an unknown number were destroyed en route. One Palestinian in the West Bank was killed by missile debris, and an Israeli died of a heart attack as a result of the strike. In short, the results of both attacks were relatively meager compared to the resources expended.

Ballistic Missiles: Backbone of Iran's Military Strategy

Since the Iran-Iraq War in the 1980s, ballistic missiles have been central to Tehran's military strategy, which is founded on a deterrent/warfighting triad composed of: (1) proxy armies capable of engaging in combat and undertaking terrorist acts far from Iran's borders; (2) long-range strike systems—primarily missiles and aerial drones—capable of hitting targets throughout the region; (3) an agile littoral navy that can threaten navigation through the Strait of Hormuz. (In addition, a nuclear hedging strategy **(https://www.washingtoninstitute.org/policy-analysis/irans-nuclear-hedging-strategy-shaping-islamic-republics-proliferation-calculus)** provides a degree of latent deterrence against threats to the regime.)

In recent months, however, the proxy pillar of this triad has been dealt severe blows. Hamas in Gaza is largely destroyed, and Hezbollah is greatly weakened (https://www.washingtoninstitute.org/policy-analysis/hezbollah-post-october-7-beaten-still-dangerous) in Lebanon, with little chance of near-term resupply (https://www.washingtoninstitute.org/policy-analysis/dont-assume-irans-supply-lines-hezbollah-are-cut). Iran will continue trying to arm radical Palestinian elements in the West Bank, but the fall of Syria's Assad regime will interfere with that supply line (https://www.washingtoninstitute.org/policy-analysis/hamas-and-iran-are-trying-ignite-israels-eastern-fronts) as well. Likewise, it will try to reinforce its militia proxies in Iraq and its Houthi partners in Yemen, but both are too far from Israel to pose a major threat. Tehran's ability to conduct terrorist operations has also diminished significantly in recent years due to improved interstate intelligence cooperation since the 9/11 attacks and a decline in the professionalism (https://www.washingtoninstitute.org/sites/default/files/pdf/PolicyFocus123.pdf) of its intelligence services and proxies.

The maritime pillar of the triad is a double-edged sword that can only be used in extremis. Closing the Strait of Hormuz would alienate China (the region's top oil customer), undermine efforts to drive a wedge between Saudi Arabia and the United States, and cripple Iran's already strained economy (https://www.washingtoninstitute.org/policy-analysis/mismanagement-makes-iran-vulnerable-different-type-us-pressure), as nearly all of its imports and oil exports pass through the strait.

By contrast, Iran's arsenal of ballistic missiles—which were estimated to number more than 3,000 prior to this year's strikes—can be put into action within hours of receiving an order and strike targets over great distances. If fired in numbers sufficient to penetrate enemy defenses, they could also have a much greater physical and moral effect than would terrorist attacks. But the April and October attacks have now raised questions about the usefulness of this pillar as well.

Despite Tehran's changing regional fortunes, its strategy will likely be defined by significant continuity, as inertia and constraints imposed by its force structure preclude dramatic departures from its current approach. As analyst Erik Olson has written (https://www.jstor.org/stable/26271505), Iran's large investment in ballistic missiles creates path dependencies that will be difficult to overcome. The regime is therefore likely to double down on missiles, seeking ways to enable them to penetrate enemy air and missile defenses and achieve greater accuracy.

Improved Missiles, Refined Tactics

Iran's missiles already incorporate design features that may have been intended to counter enemy defenses. Indeed, the April and October attacks demonstrate a trend toward continual technical and tactical innovation that will require constant innovation in response.

For instance, according to a 2010 assessment published by the International Institute for Strategic Studies, the triconic reentry vehicles (RVs) (https://books.google.com/books/about/Iran_s_Ballistic_Missile_Capabilities.html?id=2uIqAQAAMAAJ) fitted on some of Iran's missiles (Qiam-1/2, Ghadr, Emad, Khoramshahr-2, and Sejjil) enable greater terminal velocities via improved aerodynamics, making them harder to intercept. The airframes of the Qiam-1 and Khoramshahr lack tail fins, possibly to reduce their radar cross-section and make them more difficult to detect. Moreover, the RVs (and in some cases airframes) of certain Iranian missiles are made of advanced composite materials that could likewise make them more difficult to detect. And the Emad, Khoramshahr-2/4, Kheibar Shekan-1/2, and Fattah-1/2 (https://www.iiss.org/online-analysis/military-balance/2023/07/removing-the-hype-from-irans-hypersonic-conqueror/) have maneuverable reentry vehicles (https://www.washingtoninstitute.org/policy-analysis/next-generation-iranian-ballistic-missiles-technical-advances-strategic-objectives) that could enable them to evade interceptors and achieve greater accuracy.

Going forward, Iran will work to further enhance the effectiveness of its ballistic missile force by various means, including greater accuracy, refined tactics, improved penetration aids and countermeasures, and faster, more advanced RVs:

Greater accuracy. With this capability, missiles that get through enemy defenses would be more likely to hit their intended target. Although the accuracy of Iran's missiles has improved greatly in recent years, they have not achieved

(https://horsdoeuvresofbattle.blog/2024/10/27/nevatim-strike-accuracy-digestif/) their claimed capacity to hit within tens of meters of their target at longer ranges. Iran could achieve greater accuracy by supplementing the inertial navigation systems of its missiles with inputs from other sources. Dual guidance systems are already in use elsewhere—for instance, the U.S. Trident II (D5) submarine-launched ballistic missile uses inertial navigation with a stellar reference system.

Refined tactics. Having failed to cause substantial damage to military bases and intelligence headquarters with salvos of 100-200 missiles, Iran could try to overwhelm Israel's missile defenses with even larger salvos. Yet this tactic would burn through the regime's missile inventory very quickly, at a time when it cannot rapidly replenish expended stocks due to Israel's October 26 airstrike **(https://www.washingtoninstitute.org/policy-analysis/how-judge-iranian-response-options-against-israel)** against its solid-propellant missile production facilities. Moreover, further salvos may require Iran to supplement its recent reliance on missiles fired from transporter erector launchers with missiles fired from underground bases—which might betray the location of unidentified launch portals, facilitating their future targeting. It might also attack enemy missile defenses to clear the way for follow-on strikes on strategic targets (a tactic it **claims (https://en.mehrnews.com/news/222280/Iran-Fattah-2-hypersonic-missile-destroyed-Arrow-batteries)** to have used in October).

Penetration aids and countermeasures. These include chaff, jammers, and decoys to neutralize enemy missile defenses. Russia has reportedly **(https://www.nytimes.com/2022/03/14/us/russia-ukraine-weapons-decoy.html)** used 9B899 decoys **(https://www.twz.com/44760/russias-use-of-iskander-ballistic-missiles-in-ukraine-exposes-secret-decoy-capability)** with SS-26 Iskander-M missiles in Ukraine to jam and spoof enemy radars. If Iran is unsatisfied with its own penetration aids, Moscow (and, perhaps, North Korea) might help the regime improve them or develop new ones. Indeed, a mock-up of a Ghadr RV with a payload that reportedly **(https://www.tasnimnews.com/fa/news/1399/07/09/2359270/%D8%B3%D8%B1%D8%AC%D9%86%DA%AF%DB%8C-%D8%A8%D8%A7%D8%B1%D8%A7%D9%86%DB%8C-%D9%85%D9%88%D8%B4%DA%A9-%D9%87%D8%A7%DB%8C-%D8%A7%DB%8C%D8%B1%D8%A7%D9%86-%DA%86%DA%AF%D9%88%D9%86%D9%87-%D8%B9%D9%85%D9%84-%D9%85%DB%8C-%DA%A9%D9%86%D8%AF-%D8%AA%D8%AE%D8%B1%DB%8C%D8%A8-%D9%88%D8%B3%DB%8C%D8%B9-%D8%A8%D8%A7-%DA%A9%D9%84%D8%A7%D9%87%DA%A9-%D9%87%D8%A7%DB%8C-%D8%A7%D8%B1%D8%B2%D8%A7%D9%86-%D9%88-%DA%A9%D8%A7%D8%B1%D8%A2%D9%85%D8%AF-%D8%AA%D8%B5%D8%A7%D9%88%DB%8C%D8%B1)** consists of several different types of submunitions and penetration aids is on display in the Islamic Revolutionary Guard Corps (IRGC) Aerospace Force's permanent exhibition **(https://www.asriran.com/fa/news/958494/%D9%85%D9%88%D8%B4%DA%A9-%D9%87%D8%A7%DB%8C-%D8%A8%D8%A7%D9%84%D8%B3%D8%AA%DB%8C%DA%A9-%D8%B4%D9%84%DB%8C%DA%A9-%D8%B4%D8%AF%D9%87-%D8%A8%D9%87-%D8%A7%D8%B3%D8%B1%D8%A7%D8%A6%DB%8C%D9%84-%D8%AF%D8%A7%D8%B1%D8%A7%DB%8C-%DA%A9%D9%84%D8%A7%D9%87%DA%A9-%D8%A8%D8%A7%D8%B1%D8%A7%D9%86%DB%8C-%D8%A8%D9%88%D8%AF%D9%86%D8%AF-%D8%B9%DA%A9%D8%B3)** at Ashura Aerospace Science and Technology University in Tehran. Iranian media reports claim **(https://www.asriran.com/fa/news/958494/%D9%85%D9%88%D8%B4%DA%A9-%D9%87%D8%A7%DB%8C-%D8%A8%D8%A7%D9%84%D8%B3%D8%AA%DB%8C%DA%A9-%D8%B4%D9%84%DB%8C%DA%A9-%D8%B4%D8%AF%D9%87-%D8%A8%D9%87-%D8%A7%D8%B3%D8%B1%D8%A7%D8%A6%DB%8C%D9%84-%D8%AF%D8%A7%D8%B1%D8%A7%DB%8C-%DA%A9%D9%84%D8%A7%D9%87%DA%A9-%D8%A8%D8%A7%D8%B1%D8%A7%D9%86%DB%8C-%D8%A8%D9%88%D8%AF%D9%86%D8%AF-%D8%B9%DA%A9%D8%B3)** that RVs filled with decoys and submunitions were used in the recent attacks on Israel.

Maneuvering hypersonic RVs. Iran has made significant advances in fielding missiles with RVs that are capable of sustaining hypersonic speeds and conducting midcourse corrections or evasive maneuvers in the terminal flight phase (using rocket thrusters or moving aerodynamic surfaces, respectively). These include the Khoramshahr-4, Kheibar Shekan-1/2, and Fattah-1/2. Last year, the IRGC unveiled what Iranian media called a hypersonic cruise glide vehicle **(https://www.presstv.ir/Detail/2024/10/02/734387/explainer-which-missiles-iran-used-op-true-promiseII-israel)** as

the liquid-fueled second stage of the Fattah-2 **(https://www.memri.org/tv/iranian-supreme-leader-ayatollah-ali-khamenei-hajizadeh-fattah2-missile-hypersonic-global-hawk)** ballistic missile, which Tehran **claims (https://en.mehrnews.com/news/222280/Iran-Fattah-2-hypersonic-missile-destroyed-Arrow-batteries)** to have used in the October attack.

Multiple independently targetable reentry vehicles (MIRVs). Using a single missile to deliver several munitions against different aim points would greatly complicate the task of defending against Iranian attacks. Although Tehran has not yet developed a MIRVed warhead, Russia's new Oreshnik intermediate-range ballistic missile has showcased this capability in Ukraine and will likely inspire similar efforts by Iran.

The need to develop further counters to Israeli and U.S. missile defenses means that Tehran may have to retrofit modifications to its missiles to ensure their effectiveness. Some of these modifications may require design compromises that could affect the performance of its RVs. Moreover, some kinds of penetration aids may require a degree of insight into Israeli and U.S. defenses that Iran does not currently possess—although it undoubtedly learned important lessons from recent experience.

Policy Recommendations

Iran's efforts to restore the viability of its ballistic missile force will likely create new challenges for the United States and its allies, requiring a more integrated, risk-acceptant, and proactive approach to countering these missiles. This will become even more important **if Iran acquires nuclear weapons (https://www.washingtoninstitute.org/policy-analysis/if-iran-gets-bomb-weapons-force-posture-strategy)**. To meet these challenges, the United States, Israel, and other members of the emerging U.S.-led Middle East air and missile defense partnership will need to:

- Push for greater integration and digitization of existing air and missile defense partnerships to facilitate a more effective response to emerging missile threats, while ensuring that the effort is adequately resourced.
- Emphasize preemption and forward defense to destroy, when possible, Iranian missiles on the ground and to defeat attacks during the boost, ascent, and early midcourse phases of flight—that is, before advanced RVs and penetration aids are deployed.
- Develop and/or deploy in large numbers the following systems: ground-launched hypersonic missiles (e.g., the U.S. Army's **Dark Eagle (https://crsreports.congress.gov/product/pdf/IF/IF11991)**) and air-launched ballistic missiles to destroy Iranian ballistic missiles prior to launch; air-launched interceptors (e.g., the new AIM-174B air-to-air missile) to destroy missiles in flight; **boost-phase (https://www.csis.org/analysis/boost-phase-missile-defense)** interceptors (e.g., constellations of attack drones loitering over launch sites); and additional systems capable of midcourse, exo-atmospheric interception (e.g., the U.S. Navy's SM-3 missile).
- Further emphasize the targeting of Iran's missile production facilities, as Israel did in October.
- Develop the ability to discriminate between conventional and nuclear-armed RVs using AI capabilities to fuse intelligence, tracking data, and other signatures.
- Highlight, through public diplomacy, the huge waste of resources that Iran's missile force represents, noting how the costly program has been used to advance the regime's hegemonic ambitions at the expense of the people's needs.

By bolstering the effectiveness of their missile defense efforts through these and other means, the United States and its allies can undermine the central pillar of Iran's military strategy, enhance their ability to counter Tehran's most likely means of delivering a prospective nuclear weapon, and devalue the regime's massive investment of resources in missiles.

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