Iranian Ballistic Missile Tests Since the Nuclear Deal – 2.0

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Executive Summary

• The Foundation for Defense of Democracies (FDD) has identified as many as 23 ballistic missile launches by Iran since the conclusion of the July 2015 nuclear deal known as the Joint Comprehensive Plan of Action (JCPOA).

• This calculation is the result of a comprehensive review of open-source material in both Persian and English, building on a February 2017 review by FDD which was the first of its kind.

• Such an assessment is necessary because of the limited U.S. and UN reporting on Tehran’s post-deal missile launches. A reliable count of launches remains essential for assessing both the Iranian missile threat as well as Tehran’s compliance with relevant UN Security Council Resolutions (UNSCRs).

• Iran has apparently launched only one medium-range ballistic missile (MRBM) since February 2017. Between July 2015 and February 2017, Iran launched as many as nine MRBMs, more than any other type of missile tested. All of Iran’s MRBMs are nuclear-capable, and can strike U.S. bases and partners in the region when fired from Iranian territory.

Introduction

Since the conclusion of the JCPOA, Iran has launched as many as 23 ballistic missiles. This number is based on aggregated open-source reporting, since neither the U.S. government nor the UN have issued an official statement on the total number of post-deal missile launches. Although the JCPOA did not itself impose any restrictions on Iran’s ballistic missiles¹ – which past and present U.S. Directors of National Intelligence (DNI) have assessed to be Iran’s most likely delivery vehicle for a nuclear weapon² – UNSCR 2231, which codifies the JCPOA, contains prohibitions on the testing and transfer of these munitions.³

¹ Updated January 26, 2018.


This memo builds on an earlier FDD product from February 2017, which determined that Iran conducted 14 post-JCPOA launches. FDD was the first organization to provide a number explicitly for post-deal launches, contributing to the public debate over Iran’s ballistic missile capabilities and intentions. Like the previous memo, this document explains how FDD determined the number of missile tests and explores the implications.

**Why Having an Accurate Count Matters for U.S. Policy**

The Islamic Republic has invested considerable time, energy, resources, and prestige into its ballistic missile program. For three reasons, Americans need a clear understanding of the number and type.

First, missile launches mark Iran’s commitment to a functioning delivery vehicle for a nuclear weapon. The Islamic Republic has promised to grow its missile power considerably, so knowing what systems it tests, when it tests them, as well as the success/failure rate offers insight into the regime’s long-term strategic intentions and capabilities. Second, knowing what Iran has and has not tested since agreeing to the JCPOA, which was enshrined by UNSCR 2231, matters a great deal for discerning the nature of Iran’s adherence to this UNSCR and the spirit of the JCPOA more generally. And lastly, for those concerned with Iran’s nuclear-capable and conventional missile force, more data on Iran’s missile tests will aid in devising policies that can impede the growth, modernization, lethality, and readiness of that force.

**What Iran Has Reportedly Tested Since the Last Memo**

The following is a list of reported Iranian ballistic missile launches since February 2017. Note, the Hormuz-2 launch in March 2017 does not count toward the 23 post-JCPOA launches identified by FDD, because it was an anti-ship ballistic missile (ASBM).


Hormuz-2

- **Reported launch date:** March 2017
- **Type:** Solid-fueled ASBM
- **Number:** 2

**Source and comments:** Both Iranian\(^9\) and Western\(^10\) outlets reported that between March 4-5, Iran fired two missiles at its own barges in the Persian Gulf, with one of them missing its target.\(^11\) While it turned out the missile was the Hormuz-2 ASBM,\(^12\) unnamed U.S. officials initially called the missiles the Fateh-110, which is the original surface-to-surface missile (SSM) upon which the Hormuz-2 is based.\(^13\) Iranian media has reported that the Hormuz-2 can travel up to 300 km and can carry a payload of 450–600 kg.\(^14\)

Zulfiqar (aka Zolfaghar)

- **Reported launch date:** June 2017 (part of Operation Laylat al-Qadr)
- **Type:** Single-stage, solid-fueled short-range ballistic missile (SRBM)
- **Number:** At most 5

**Source and comments:** Israeli sources initially claimed that Iran had fired the Shahab-3 MRBM\(^15\) at Islamic State positions in eastern Syria.\(^16\) Iranian outlets attest that a mix of the Zulfiqar and Qiam-1 SRBMs were launched, for a total of six missiles,\(^17\) while an Iranian infographic from a semi-official news outlet reported that six Zulfiqar SRBMs were fired.\(^18\) FDD estimates that at most five Zulfiqars were launched, accounting for reports of another missile being fired among the six. Despite drone videos of the missiles’ impact,\(^19\) the accuracy and battlefield effectiveness of the Zulfiqar remains open to debate.\(^20\) Iranian outlets allege that the Zulfiqar has a range of 700–750 km, and can carry up to a 500 kg warhead.\(^21\)

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**Qiam-1**
- **Reported launch date:** June 2017 (part of Operation Laylat al-Qadr)
- **Type:** Liquid-fueled SRBM
- **Number:** At least 1
- **Source and comments:** As noted above, both Persian and English language Iranian sources attest that the Qiam-1 was part of the batch of missiles fired at Islamic State positions in Syria. Independent experts assess that the Qiam-1 can travel between 600-800 km and can carry up to a 750 kg warhead. Iranian outlets report similar statistics.

**Unknown Ballistic Missile**
- **Reported launch date:** July 2017
- **Type:** MRBM (likely liquid-fueled)
- **Number:** No more than 1
- **Source and comments:** In a July 28 joint statement condemning a July 27 satellite-launch vehicle (SLV) launch by Iran, the U.S., France, Germany, and the UK drew attention to a previously unmentioned July 4 MRBM test by Tehran. No other U.S. government source has mentioned this launch, and the Iranian media was silent on the matter. Major Western press outlets which reported the SLV launch on July 27/28 omitted any reference to the alleged MRBM launch, with only one major Middle Eastern outlet reporting the State Department allegation in English.

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Simorgh

- **Reported launch date:** July 2017
- **Type:** Two-stage, liquid-fueled**^{30}\)** space/satellite-launch vehicle (SLV)
- **Number:** 1

**Source and comments:** While both Western**^{31}\)** and Iranian news outlets**^{32}\)** reported the launch of the Simorgh, unnamed U.S. officials from U.S. Strategic Command later told a Fox News journalist that no satellite had been put into outer space and that the entire endeavor was a “catastrophic failure.” Yet at least one American analyst who has traditionally been skeptical of Iran’s missile capabilities cited it as “the first successful launch of the Simorgh.” However, it remains unknown if the Simorgh was carrying a satellite. Nonetheless, Iranian outlets claim that the Simorgh can put a 250 kg satellite into 500 km orbit.**^{35}\)**

Analysis of the Most Recent Missiles Launched

Since being put “on notice” by the Trump administration in February 2017,**^{36}\)** Iran has reportedly only once conducted an MRBM test.**^{37}\)** This matters because the bulk of Iran’s missile tests in the previous reporting period (July 2015 – February 2017) were MRBMs, which are generally considered more threatening than SRBMs because all of Iran’s MRBMs are nuclear-capable. It is highly likely that the administration’s threat intimidated Tehran, altering its flight-testing calculus. In fact, a hardline Iranian outlet quoted an Islamic Revolutionary Guard Corps (IRGC) official who complained that an SLV test was delayed due to fears over the potential American response.**^{38}\)**

Out of all the ballistic missiles Iran launched in 2017, only four can be considered nuclear-capable. In 2016, Iran fired 10 missiles that can be considered nuclear-capable.**^{39}\)**

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39. Both tallies reflect the assessment that the Simorgh SLV is considered nuclear-capable (should it undergo significant modifications), while the Zulfiqar SRBM is assumed unlikely to be nuclear-capable.
The first is the Khorramshahr, an MRBM fired in late January 2017 which was included in the original FDD assessment from February. The Khorramshahr is believed to be an Iranian copy of the North Korean BM-25 Musudan. The Musudan is a liquid-propelled intermediate-range ballistic missile (IRBM) reportedly derived from a Soviet submarine-launched ballistic missile (SLBM). Open source reporting and analysis suggests that Pyongyang may have provided Tehran with the Musudan.

The second is the Qiam-1 SRBM, at least one of which Iran reportedly fired at Islamic State positions in eastern Syria during an operation in June 2017. The Qiam-1 is Iran's first finless ballistic missile, and is an upgraded Shahab-2/Scud-C liquid-propelled missile with a triconic warhead.

The third is an unknown ballistic missile, which a State Department press release mentioned in passing in response to Iran's July 27 SLV test. Although the press release did not mention the exact type of MRBM, all of Iran's MRBMs meet the requisite Missile Technology Control Regime (MTCR) threshold for being a nuclear-capable missile. It is unclear why Western or Iranian media chose to omit the reported launch from their coverage.


44. For more on the Qiam-1 when it was unveiled, see: Joshua Pollack, “Iran’s New Missile,” Arms Control Wonk, August 23, 2010. (http://www.armsccontrolwonk.com/archive/503101/iran-new-missile/)


46. This is inclusive of the Shahab-3, Ghadr, Emad, and Sejji MRBMs, as well as all their variants.

And the fourth is the Simorgh.\(^{48}\) Technically, this SLV requires significant design modifications to serve as a battlefield-ready ICBM\(^ {49} \) or even an IRBM.\(^ {50} \) But it is included as a nuclear-capable system because, as cited by Germany, France, the UK, and the U.S in an official complaint, it is “inherently capable of delivering a 500 kg payload to a range of at least 300 km if configured as a ballistic missile.”\(^ {51} \)

Though the stated range for the Zulfiqar is 700 km\(^ {52} \) and Iranian outlets allege that the missile can carry a 500 kg warhead,\(^ {53} \) it is highly likely that this munition, despite meeting the MTCR threshold, may not be nuclear-capable. The Zulfiqar is Iran’s latest single-stage, solid-fueled SRBM.\(^ {54} \) It upgrades the Fateh-313 SRBM, which itself is an upgrade to the Fateh-110 SRBM, which in turn is based on the Zelzal rocket.\(^ {55} \) Absent a significant miniaturization capability, in order for Iranian missile engineers to grow the range of the Fateh platform,\(^ {56} \) they would need to decrease the payload for the missile.\(^ {57} \) Moreover, the true payload cap for the Zulfiqar – whether armed with a unity or cluster munition warhead – remains unknown.\(^ {58} \)


\(^ {55} \) Anthony H. Cordesman, Iran’s Rocket and Missile Forces and Strategic Options, (Washington, DC: Center for Strategic and International Studies, 2014), page 70. (https://books.google.com/books?id=nBeMBgAAQAJ&pg=PA70&dq=Zulfiqar+rocket+Fateh+Missile+Iran&source=bl&ots=v2d8sicsfV&sig=zRScNMaKqcboBOOcU58Z-EebS&hl=en&sa=X&ved=0ahUKEwi4sdfqmOTXAhUIRN8KHbpMAv4ChDoAQhMMAY#v=onepage&q=Zulfiqar%20rocket%20Iran&f=false)


\(^ {58} \) As a predicate, see how Iran converted the Shahab-3 into the Ghadr-1: Michael Elleman, Iran’s Ballistic Missile Capabilities: A Net Assessment, (London: International Institute for Strategic Studies, 2010), pages 23-26; also see how Saddam Hussein extended the range of his Scud missiles: Joseph Cirincione, “Why the Patriot Missile Might Fail America’s Military,” The National Interest, December 7, 2017. (http://nationalinterest.org/feature/why-the-patriot-missile-might-fail-americas-military-23530?page_show=true)


Rather than focus on the number of military drills or exercises – each of which may be composed of multiple missile launches – FDD logged the type and number of SSMs with a ballistic trajectory that were reportedly fired and mentioned in the Persian- and English-language press. This permits a more complete understanding of the systems in Iran's arsenal.

FDD's metrics include SLV tests because Iran's space program, according to a 2017 U.S. Air and Space Intelligence Center report, "could shorten a pathway to an [Intercontinental Ballistic Missile] ICBM." That same report further specifies that Iran's SLVs "could serve as a test bed for developing ICBM technologies."

FDD's tally of post-deal launches also includes both tests and combat launches, since tests and combat launches provide indications of Iran's overall capability. Similarly, missile tests were included regardless of their success or failure. As a general rule, flight-testing provides states with critical data that can be used to refine their capabilities, even if a test fails.

Lastly, FDD's metrics also includes ballistic missiles that meet and do not meet MTCR's threshold. While this may pose challenges for determining a technical violation of UNSCR 2231's Annex, with the right modifications, missiles that fall short of the MTCR's range threshold could still potentially serve as a delivery vehicle for a tactical nuclear weapon in the future.

What the FDD metrics exclude, however, are cruise missiles, despite their ability to carry an unconventional warhead, and non-SSMs that have at least a quasi-ballistic trajectory, such as anti-ship ballistic missiles (ASBMs). Cruise missiles are excluded due to the explicit emphasis on ballistic missiles in UNSCR 2231, and ASBMs are excluded given that they are intended to strike maritime targets, something we judge would be unlikely for Tehran to do with weapons of mass destruction (WMD). An example of an Iranian cruise missile omitted from this report is the Soumar, a copy of the Russian Kh-55 land-attack cruise missile (LACM) that Iran reportedly tested.


63. For more on these violations, see: Valerie Lincy and Behnam Ben Taleblu, “Iran’s Compliance with UNSCR 2231: Alleged Violations Must Be Addressed,” Foundation for Defense of Democracies and Iran Watch, August 2017. (http://www.defenddemocracy.org/content/uploads/documents/MEMO_WPONAC.pdf)

in January 2017. An example of an Iranian ASBM not included in this assessment is the Hormuz-2, two of which were fired during a military drill in March 2017.

**Challenges to Accurately Reporting Iranian Missile Launches**

On September 23, Iranian media outlets carried video of the flight test of a ballistic missile identified as a Khorramshahr, alleging that the launch took place the same day. Almost immediately, reputable Western press outlets re-reported the Iranian media's claims about the launch, yet soon a prominent American defense journalist, citing unnamed U.S. government officials, corrected their reporting. There had been no Iranian ballistic missile launched in September. American journalists had fallen for an Iranian bluff. As it turned out, the video was from a failed January 2017 test.

There are two main challenges to using open-source assessments of the number of post-JCPOA missile launches. The first challenge is navigating, aggregating, and analyzing multiple conflicting sources of information, often in different languages. Long-standing Iranian deception efforts in official and semi-official media outlets hype their ballistic missile capabilities. The second is the lack of unclassified U.S. government information about Iranian missile tests and their success rate. It remains unclear if the U.S. desire to withhold this information is due to concerns over sources and methods, political considerations, or both. And in cases where the U.S. government provides information, as in the case of the alleged July 4 MRBM launch, there is scant media reporting to back it up.

**Recommendations and Improving U.S. Reporting Requirements**

Under both the Obama and Trump administrations, the media has had to rely on unnamed U.S. government officials to selectively confirm Iranian missile launches. In fact, the amount of information made public from

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72. Admittedly, the Trump administration has put greater emphasis on this issue: The White House, Office of the Press Secretary, “Remarks by President Trump on Iran Strategy,” October 13, 2017. (https://www.whitehouse.gov/briefings-statements/remarks-president-trump-iran-strategy/)

the U.S. government regarding North Korean launches\textsuperscript{74} is far greater than the information available on Iran’s launches.\textsuperscript{75} Therefore:

Congress should require that the White House release a tally of all post-JCPOA Iranian ballistic missile launches. This tally should be broken down by missile type, what international conventions it violates, if the test was successful, and if it can be considered nuclear-capable. This data should also inform the capabilities the U.S. maintains or is developing for both itself and its international partners to offset the Iranian missile threat.

The National Defense Authorization Act of 2017 contains a request for quarterly reports from the DNI to Congress on “any confirmed ballistic missile launch by Iran.”\textsuperscript{76} More recent congressional initiatives seek to amend that bill to continue the quarterly reporting requirement on Iranian missile launches “through December 31, 2022.”\textsuperscript{77} These reports presumably provide an important baseline in the debate on Iran’s ballistic missiles and should be made public.

While questions of how Washington can combat the threat posed by Iran’s missiles is outside the scope of this memo, the House of Representatives has passed legislation that can provide more data about the entirety of Iran’s missile program.\textsuperscript{78} Should this legislation become law, this information should be used to inform the public debate about Iran’s ballistic missile intentions and capabilities. More transparency on the threats Iran’s ballistic missiles pose will be needed as Tehran’s arsenal grows. As members of the administration appear before Congress for hearings in 2018, this information must become public record to inform policy. And while experts debate the quality and quantity of Iran’s post-deal launches, there should be no debate that the actual number should have been zero.


\textsuperscript{77} The House of Representatives recently passed H.R. 1698, the Iran Ballistic Missiles and International Sanctions Enforcement Act, which contains reporting requirements on Iranian attempts to acquire or export components and whole missile systems as defined by the Annex of UNSCR 2231. See: Iran Ballistic Missile Reporting Act of 2017, H.R. 3078, 115\textsuperscript{th} Congress (2017). (https://www.congress.gov/bill/115th-congress/house-bill/3078)

### Annex 1

**FDD’s Comprehensive Table of Post-JCPOA Launches**

<table>
<thead>
<tr>
<th>Date</th>
<th>Type of Launch</th>
<th>Number of Missiles</th>
<th>Name of Missile</th>
<th>Type of Missile</th>
<th>Propellant</th>
<th>Nuclear-Capable?</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 2015</td>
<td>Test</td>
<td>1</td>
<td>Fateh-313&lt;sup&gt;1&lt;/sup&gt;</td>
<td>SRBM</td>
<td>Solid</td>
<td>No</td>
</tr>
<tr>
<td>October 2015</td>
<td>Test</td>
<td>1</td>
<td>Emad&lt;sup&gt;2&lt;/sup&gt;</td>
<td>MRBM</td>
<td>Liquid</td>
<td>Yes</td>
</tr>
<tr>
<td>November 2015</td>
<td>Test</td>
<td>1</td>
<td>Ghadr-110 (aka Ghadr-1, Ghadr-101)&lt;sup&gt;3&lt;/sup&gt;</td>
<td>MRBM</td>
<td>Liquid</td>
<td>Yes</td>
</tr>
<tr>
<td>March 2016</td>
<td>Test/Drill</td>
<td>1</td>
<td>Ghadr-F&lt;sup&gt;4&lt;/sup&gt;</td>
<td>MRBM</td>
<td>Liquid</td>
<td>Yes</td>
</tr>
<tr>
<td>March 2016</td>
<td>Test/Drill</td>
<td>2</td>
<td>Ghadr-H&lt;sup&gt;5&lt;/sup&gt;</td>
<td>MRBM</td>
<td>Liquid</td>
<td>Yes</td>
</tr>
<tr>
<td>March 2016</td>
<td>Test/Drill</td>
<td>1</td>
<td>Qiam-1&lt;sup&gt;6&lt;/sup&gt;</td>
<td>SRBM</td>
<td>Liquid</td>
<td>Yes</td>
</tr>
<tr>
<td>March 2016</td>
<td>Test/Drill</td>
<td>1</td>
<td>Shahab-3&lt;sup&gt;7&lt;/sup&gt;</td>
<td>MRBM</td>
<td>Liquid</td>
<td>Yes</td>
</tr>
<tr>
<td>April 2016</td>
<td>Test</td>
<td>1</td>
<td>Simorgh&lt;sup&gt;8&lt;/sup&gt;</td>
<td>SLV</td>
<td>Liquid</td>
<td>Requires modification, but yes</td>
</tr>
<tr>
<td>April 2016</td>
<td>Test</td>
<td>1</td>
<td>Unknown&lt;sup&gt;9&lt;/sup&gt;</td>
<td>Likely MRBM</td>
<td>Likely liquid</td>
<td>Unknown, but assumed likely</td>
</tr>
<tr>
<td>July 2016</td>
<td>Test</td>
<td>1</td>
<td>BM-25 Musudan&lt;sup&gt;10&lt;/sup&gt; (possibly the Khorrasshahr)</td>
<td>IBRM (possibly MRBM)</td>
<td>Liquid</td>
<td>Yes</td>
</tr>
<tr>
<td>September 2016</td>
<td>Test</td>
<td>1</td>
<td>Zulfiqar&lt;sup&gt;11&lt;/sup&gt;</td>
<td>SRBM</td>
<td>Solid</td>
<td>Alleged, but assumed unlikely</td>
</tr>
<tr>
<td>November/December 2016</td>
<td>Test</td>
<td>1</td>
<td>Qiam-1&lt;sup&gt;12&lt;/sup&gt;</td>
<td>SRBM</td>
<td>Liquid</td>
<td>Yes</td>
</tr>
<tr>
<td>December 2016</td>
<td>Test</td>
<td>1</td>
<td>Shahab-3&lt;sup&gt;13&lt;/sup&gt;</td>
<td>MRBM</td>
<td>Liquid</td>
<td>Yes</td>
</tr>
<tr>
<td>January 2017</td>
<td>Test</td>
<td>1</td>
<td>Khorrasshahr&lt;sup&gt;14&lt;/sup&gt;</td>
<td>MRBM</td>
<td>Liquid</td>
<td>Yes</td>
</tr>
<tr>
<td>June 2017</td>
<td>Operation</td>
<td>≤5</td>
<td>Zulfiqar&lt;sup&gt;15&lt;/sup&gt;</td>
<td>SRBM</td>
<td>Solid</td>
<td>Alleged, but assumed unlikely</td>
</tr>
<tr>
<td>June 2017</td>
<td>Operation</td>
<td>≥1</td>
<td>Qiam-1&lt;sup&gt;16&lt;/sup&gt;</td>
<td>SRBM</td>
<td>Liquid</td>
<td>Yes</td>
</tr>
<tr>
<td>July 2017</td>
<td>Test</td>
<td>≤1</td>
<td>Unknown&lt;sup&gt;17&lt;/sup&gt;</td>
<td>MRBM</td>
<td>Likely liquid</td>
<td>Unknown, but assumed likely</td>
</tr>
<tr>
<td>July 2017</td>
<td>Test</td>
<td>1</td>
<td>Simorgh&lt;sup&gt;18&lt;/sup&gt;</td>
<td>SLV</td>
<td>Liquid</td>
<td>Requires modification, but yes</td>
</tr>
</tbody>
</table>

Total: 23 launches

Additional information detailing these missiles’ manufacturer, range, payload, translation of their name, as well as other related data and sourcing is available upon request.


7. Ibid.


16. Ibid.
