Iraq's al-Samoud:

A Missile with Great Possibilities

Feb 21, 2003

Brief Analysis

A dispute is rapidly growing between UN inspectors and Baghdad concerning Iraq's stockpile of al-Samoud missiles. The UN is expected to order the destruction of these missiles today. According to Hans Blix, executive chairman of the UN Monitoring, Verification, and Inspection Commission, the fact that these missiles are capable of attaining a range 22 percent greater than that allowed under UN restrictions is a "prima facie" case for their proscription. Yet, Iraqi deputy prime minister Tariq Aziz has said, "There is no serious violation," and it is unclear whether Baghdad would obey a destruction order. Understanding the significance of the al-Samoud requires a closer look at the missile's developmental history, technical capabilities, and strategic purpose.

Born as Air Defense

The al-Samoud is partly based on the SA-2, a large Soviet air defense missile developed in the 1950s and exported by the thousands. Like most surface-to-air missiles, the SA-2 can play a secondary role as a surface-to-surface missile. Serbia used it in this manner in the Balkans conflict, attacking targets at a range of some 50 kilometers.

The SA-2 has also become the basis for surface-to-surface missiles with much greater range. China used it as the basis for its 150-kilometer-range "8610" missile, which it later exported to Iran. India used a cluster of two SA-2 rocket engines for the propulsion system of its land-based Prithvi missile, which has a range a 250 kilometers (the sea-based version, the Danush, has a range of 350 kilometers). Prior to the Gulf War, Iraq used the SA-2 as the template for the Fahad missile family, with the hope of achieving ranges of 300 to 500 kilometers. Iraq also planned to use the SA-2 as the second stage of the Tammuz II missile; by installing it on top of an al-Husayn missile (a stretched Scud), designers hoped to attain a range of 2,000 kilometers.

After the Gulf War, Iraq tried to adapt the SA-2 as a secret missile (termed the G-1 or J-1), but all flight tests failed. Iraq had far better success transforming the SA-2 into the al-Samoud, whose claimed range fell below the 150-kilometer limit prescribed by the ceasefire terms. In order to make this adaptation, Iraq combined the technology of the SA-2 with that of a proscribed missile, the Scud.

Married to the Scud

In creating the al-Samoud, Iraq took the liquid-fuel SA-2 rocket engine and incorporated it into a missile based heavily on Scud technology. The al-Samoud's thrust vector controls, which aim the rocket in a precise direction, are those of the Scud rather than the SA-2. The design of the al-Samoud's components and geometry are clearly similar to those of the Scud as well; even its guidance system bears more resemblance to the Scud's than to the SA-2's. Moreover, the al-Samoud missile system includes an Iraqi-designed transporter-erector-launcher for quick deployment, similar to the Scud; the SA-2 does not have this feature. Perhaps most important, the manufacturing technology developed for the al-Samoud -- particularly brazing technology, in which missile parts are metallically fused -- solved many of the problems that had hindered Iraq's Scud production prior to the Gulf War. Indeed, Robert Schmucker, a former missile inspector with the UN Special Commission on Iraq (UNSCOM), argued in 1999 that the

al-Samoud "should be considered as a simplified Scud B system on a 25 percent scale."

One of an Impressive Family

The al-Samoud's design has huge growth potential. Under UNSCOM monitoring during the 1990s, the missile had a diameter of 50 centimeters. In spite of explicit UNSCOM prohibitions, however, it acquired a bigger brother (sometimes called the al-Samoud 2) with a diameter of 76 centimeters, close to the Scud's diameter of 88 centimeters. The issue of diameters is not a quibble; for a missile of a given length, the amount of propellant it can hold grows with the square of its diameter. Hence, the al-Samoud 2 could carry 2.3 times as much propellant as the smaller variant, leading Schmucker to estimate that it could fly nearly twice as far. Blix reported that "the two declared variants of the al-Samoud 2 missile" were capable of ranges beyond 150 kilometers, but it is not clear whether the UN's destruction order will apply to the smaller variant.

These performance estimates do not account for the possibility that improvements may have been made to the missile in the years since UNSCOM monitoring. Schmucker's 1999 estimates envisioned "medium term" improvements that could extend the range of the smaller al-Samoud to 230 kilometers with its full 300-kilogram payload. With a payload reduced to 200 kilograms, the range would rise to 300 kilometers. Presumably, the larger missile's range could be increased correspondingly.

Moreover, as with the Tammuz II (an SA-2 on top of an al-Husayn), the al-Samoud could be incorporated into a two-stage missile. Depending on the specifics of the design, a 300-kilogram payload could be delivered to a range in excess of 1,000 kilometers. Such a missile is not publicly reported to exist at present, but many former UNSCOM inspectors fear that it may be the next step.

Iraq has pursued the al-Samoud with great dedication. Even after the UN's "final opportunity" Resolution 1441, Iraq illegally imported SA-2 rocket engines -- 380 in total. Although Iraq is now believed to have manufactured only about fifty al-Samouds, these import numbers suggest the magnitude of Iraq's intentions as well as the enormous gaps in UN export controls.

Strategic Implications

The al-Samoud's 300-kilogram payload, as shown to UN inspectors, is about half high explosive and half protective steel shell. The payload is not likely to be large enough for a nuclear device, but it is great enough for a chemical or biological warhead.

Even if the al-Samoud approached the UN-permitted 150-kilometer range without exceeding it, that capability would allow Iraq to strike targets throughout Kuwait and into Jordan and Turkey, endangering any U.S. forces there. Yet, Iraq would need to move the missiles into the northern or southern no-fly zones to reach Kuwait or Turkey; and U.S. forces have recently attacked Iraqi ballistic missiles in the southern zone.

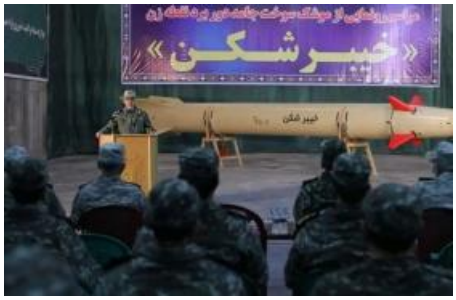
The tested 183-kilometer range would also enhance the missile's survivability. The 22 percent greater range (compared to the UN-permitted range) would allow the al-Samoud to be hidden in a nearly 50 percent greater area and still threaten a given target. With a 300-kilometer range, the missile could be fired from Mosul and strike the important Turkish air base at Diyarbakir. It could also reach from the westernmost corner of Iraq to the Golan Heights. In a dash mode, in which the al-Samoud on a transporter-erector-launcher rushes 100 kilometers or so into sparsely guarded Saudi territory, the 300-kilometer-range missile could strike critical Saudi oil facilities. If a 600-kilometer-range version of the missile were manufactured, it could strike targets at the same strategic depth as did Iraq's al-Husayn missiles during the Gulf War. And a 1,000-kilometer two-stage version could target the eastern two-thirds of Turkey, the Gulf down to the Straits of Hormuz, and -- of course -- all of Israel, with strategic depth to spare for concealment.

The al-Samoud is now believed to be fueled and ready for use. But it has already served other purposes. Its development has provided Iraq with a cover story for building a rocket test stand larger than that used for Scuds. And, by serving as a testbed for the development and improvement of indigenous Scud technology, the al-Samoud -- if not eliminated -- could help restore Iraq's missile capabilities to a level greater than that before the Gulf War.

Richard Speier is a former Pentagon official specializing in missile nonproliferation issues.

Policy #713

RECOMMENDED



BRIEF ANALYSIS

Iran Takes Next Steps on Rocket Technology

Feb 11, 2022

Farzin Nadimi

(/policy-analysis/iran-takes-next-steps-rocket-technology)

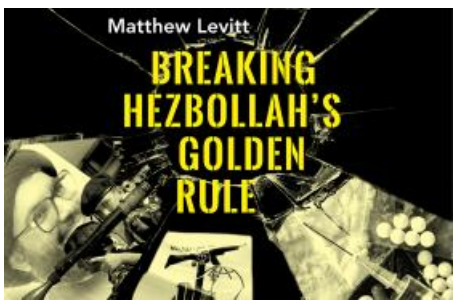
BRIEF ANALYSIS

Saudi Arabia Adjusts Its History, Diminishing the Role of Wahhabism

Feb 11, 2022

Simon Henderson

(/policy-analysis/saudi-arabia-adjusts-its-history-diminishing-role-wahhabism)



ARTICLES & TESTIMONY

Podcast: Breaking Hezbollah's Golden Rule

Feb 9, 2022

◆

Matthew Levitt

(/policy-analysis/podcast-breaking-hezbollahs-golden-rule)

TOPICS

Military & Security (/policy-analysis/military-security)

Proliferation (/policy-analysis/proliferation)

REGIONS & COUNTRIES

Iraq (/policy-analysis/iraq)