The Missiles of August–Part II

The democratization of cruise missile technology.

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Family resemblance: U.S. **Tomahawk**; Chinese **YJ-62** cruise missile; Pakistan's **Babur** cruise missile

This is the second part of a story that ran on August 16.

For many experts in weapons proliferation, cruise missiles are the most disturbing threat today.

Hezbollah's recent use of an Iranian variant of the Chinese "Silkworm" C-802 radar-guided anti-ship missile against an Israeli warship illustrates the larger trend. In the wake of the Soviet Union's collapse, the first Gulf War demonstrated America's unparalleled global power, which flowed, in part, from possession of a new class of weapons with near-surgical accuracy at great distances. Fifteen years later, another shift in the balance of global military power is occurring as missile technology–particularly, the cruise missile technology that was a hallmark feature of U.S. military supremacy–is being democratized.

Cruise missiles can be as sophisticated as the American AGM-129 Advanced Cruise Missile and its W80 nuclear warhead–which can strike targets 3,000 kilometers away, using guidance systems that hug satellite-mapped terrain–or as simple as small, unmanned air vehicles (UAVs) built from commercially-available kits. The German World War II-era V-1 "buzz bomb" even meets the definition of a cruise missile: an unmanned self-propelled guided aircraft that uses aerodynamic lift to deliver a payload to a target. Still, as Owen Cote, associate director of MIT's Security Studies Program, explains: "Antiship cruise missiles only need a relatively simple inertial navigation system and a radar return from their target, which is within the area the missile is launched at." Consequently, antiship cruise missile systems, being simpler and often shorter range, are generally the first kind of cruise missile acquired by states or organizations, such as Hezbollah.

The Missile Technology Control Regime (MTCR), a voluntary nonproliferation agreement involving 34 countries and supposedly limiting export of unmanned systems that can deliver weapons of mass destruction, defines a antiship cruise missile as having a range of less than 300 kilometers. A cruise missile is a Category II item–meaning, essentially, that it may be exported by any company that manufactures it. (Category I severely limits exports of ballistic missile systems, space-launch vehicles, and land-attack cruise missile systems.) Given that antiship cruise missiles can be converted to land-attack systems, the MTCR is a particularly leaky sieve. But American actions have also inadvertently helped spread the technology. In 1998, when the Clinton administration launched 75 Tomahawk cruise missiles at Osama bin Laden's bases in response to al Qaeda's bombing of U.S. embassies in Kenya and Tanzania, six of the missiles misfired and landed across the border in Pakistan. It has long been suspected that these unexploded missiles were studied by Pakistani and Chinese scientists. Ted Postol, a professor of science, technology, and international security at MIT, confirms this: "A Pakistani colleague of mine told me that a significant number of those missiles that we launched at Afghanistan actually landed in Pakistan and those guys reverse-engineered them."

The propulsion system of the Babur missile that Pakistan tested in 2005 definitely resembles that of the BGM-109 Tomahawk. After an initial launch by a solid-fuel booster, a cruise turbo fan engine cuts in, giving the Babur a speed of 880 kilometers per hour and a range of 500 kilometers. That Chinese assistance was a factor in developing the Babur's GPS- and INS-based guidance system is supported by its resemblance to the Chinese YJ-62 antiship cruise missile and the family resemblance of both missiles to the Tomahawk.

The Babur was, in a sense, Pakistan's predictable response to the test-firing in 2001 of the PJ-10 BrahMos cruise missile by its subcontinental rival, India. Jointly developed by Russia's Mashinostreyenia and India's Brahmos Corporation, the BrahMos's ramjet cruise engine is based on the Russian supersonic antiship Yakhont missile and capable of speeds of 2.5 to 2.8 Mach (three times faster than the Tomahawk). India and Russia ensured that the BrahMos didn't violate the MTCR, however, by keeping its range within the 300-kilometer limit specified for antiship cruise missiles.

Family resemblance: India's **BPJ-10 Brahmos** supersonic cruise missile; Russia's **Yakhont** supersonic cruise missile

How many cruise missile types exist in the world today and how many countries have them? Given that reverse-engineering and modification have produced different variants of the major types, some accounts reckon that as many as 130 types exist, with 75 countries possessing them. Not only has the MTCR's permissive handling of antiship cruise missiles aided this proliferation, but some MTCR nations have turned a blind eye when their own companies have exported cruise missiles in defiance of its rules. For instance, Russian defense minister Sergei Ivanov claims that Ukraine, a MTCR signatory, sold the nuclear-capable X-55 cruise missile to Iran and China in

2001 and 2002. John Pike, director of private military information group Global Security.org, charges that many European companies have regularly contravened the MTCR: “They’re open for business and they want to make money.” As for the most worrisome non-MTCR nations–Iran, North Korea and Pakistan–Pike maintains that their close collaboration on missile technology amounts to “one development program in three different places.”

Cruise missile proliferation may soon become bigger news. Last week, Iran–Hezbollah’s primary missile supplier–blocked U.N. inspectors from viewing the Natanz complex housing Iranian uranium-enrichment efforts and delivered its nonresponse to the incentives offered by the U.S. and Europe in return for Iran halting its nuclear program., Therefore, America and its U.N. Security Council allies threaten that they’ll attempt to pass a U.N. resolution on August 31 that would impose economic sanctions on Iran.

That effort may be of little avail. Firstly, Russia and China, both veto-wielding Security Council members, vigorously oppose sanctions. Secondly, even if America and its European allies finesse Russian and Chinese opposition, it’s not clear that the U.S. can sanction Iran more effectively than it has for the last quarter-century.

So while the Bush administration has proceeded with diplomacy, officials repeat that the military option “remains on the table” if that’s what it takes to deny the Tehran regime the nuclear bomb. Indeed, many in Washington believe that U.S. Air Force is ready with advanced plans to bomb Iranian nuclear sites.

John Pike maintains that not only is the administration preparing for a pre-emptive attack on Iran, but even without such a move the destabilizing forces already unloosed in the Middle East may escalate into a situation in which Iran will try to obstruct the passage of shipping through the Strait of Hormuz–where the Persian Gulf narrows to only 34 miles and through which 90 percent of Persian Gulf oil exports pass. If, according to Pike, Iraq breaks up into three partitioned regions–Kurdistan in the north, an oil-less “Sunnistan” in the middle, and a Shia-dominated region in the south–Saudi Arabia, already the Sunni insurgency’s biggest supporter, will see its fellow Sunnis deprived of the oil wealth that has historically been theirs and will possibly increase its aid to the Sunni insurgency. Iran will respond with increased support for Iraqi Shias. Thence, the struggle could intensify into a conflict resembling the 1980-1988 Iran-Iraq “Tanker War”, when both countries attacked oil tankers and merchant ships–including those of neutral nations–to deprive their opponent of trade. As in the 1980s, U.S. naval forces would be drawn into such a conflict between Iran and Saudi Arabia.

This time, though, the Iranians possess at least 300 Exocet antiship missile systems and an undisclosed number of Russian Moskit supersonic antiship systems–and possibly also the improved Moskit version, the Yakhont.

Recent naval history provides a foretaste of what the relatively primitive Exocet missiles could do. In the Falklands War in 1982 between the U.K. and Argentina, Argentinean jets armed with French-made Exocets hit the H.M.S. *Sheffield*, whose superstructure was constructed of lightweight aluminum. The aluminum melted and the frigate burned to the waterline and sank. Similarly, in 1987, during the Iran-Iraq War, an Iraqi jet launched two Exocet missiles into the U.S.S. *Stark*, another frigate, and its lightweight aluminum superstructure also caught fire.

It is Iran’s Moskits, though, that are the real concern for American ships. These ramjet-equipped missiles, flying two and a half to three times the speed of sound and as low as five feet above the

water, were specifically designed by the Russians to overcome the Aegis defense systems and SM-2 and SM-3 defense missiles protecting American aircraft-carrier groups. The maximum theoretical response time to a Moskit launch is 25 to 30 seconds, leaving little time for jamming and countermeasures–let alone bringing to bear missiles and quick-firing artillery. Unlike past decades, when U.S. warships were constructed with aluminum superstructures (which were 35 to 45 percent lighter than steel and assisted a vessel's speed and maneuverability), current American warships, like the Arleigh Burke-class destroyers that are primary components in a U.S. carrier group, generally have steel superstructures. Nevertheless, al Qaeda's attack on the U.S.S. *Cole* in 2000 provides some insight into what a Moskit can do. The *Cole*, an Arleigh Burke-class destroyer with steel armor, was docked in Aden harbor when a small craft exploded against its port side, putting a 40-by-40-foot (12-by-12 meter) gash in the *Cole*'s flank. That explosion was the result of as much as 600 pounds of explosive. The *Cole*'s vulnerability suggests that any of Iran's Russian-made Moskit missiles, and their 750-pound warheads, are potential ship-killers.

HMS Sheffield hit by **Exocet** missiles, 1982; **USS Stark** hit by **Exocet** missiles, 1987; **USS Stark** closeup, damaged hull plates

The Falklands War has been much pondered by military analysts. John Arquilla, professor at the U.S. Naval Postgraduate School, says: "The Exocet missile definitely proved the vulnerability of the slow-moving big ship." The key to the U.K.'s Falklands victory, Arquilla continues, was that the British calculated how to put their two aircraft carriers beyond the range of Argentinean air attacks while still enabling British aircraft to hit Argentinean forces. That lesson has applications for the challenge that the U.S. Navy may soon face in the Persian Gulf. Yes, the Gulf's north shore belongs to Iran and is potentially a platform for their cruise missiles. True, any ship within the Gulf, including ships docked at the U.S. Fifth Fleet's base in Bahrain, could theoretically be targeted from across the Gulf or from speedboats and helicopters that the Iranians have purportedly adapted as mobile platforms for their missiles. In practice, however, America has and will maintain complete air dominance.

That means that if America stands off its naval assets over the horizon, the Iranians have three options: they can aim their missiles at targets in visible range, employ radar-guided missiles to acquire over-the-horizon targets, or else use sea-based platforms to launch missiles. In all those cases, they will immediately become vulnerable to U.S. retaliation from the air. The Iranians would likely only get one chance at launching their cruise missiles before their platforms were destroyed.

Yet what if the Iranians could launch swarms of hundreds of missiles simultaneously? All bets might be off. In such a scenario, the Iranians could conceivably devastate an American naval force. Do the Iranians possess enough missiles to do that? The truth is that we don't know, as the congressional report released on Thursday, August 24, concluded. In terms the threat level, independent analyst John Pike puts it this way: "Iran is a riddle wrapped in an enigma."

In the longer term, the trend seems clear. Iran developed its first indigenous 32-bit microprocessor last month. Like mounted cavalry faced by the machine gun in 1914 or the battleship confronted by aerial attack in 1941, the U.S. aircraft carrier battle group seems likely to become increasingly a giant, slow-moving target when an enemy can fire swarms of self-guiding cruise missiles from hundreds of miles away. “Sixty-odd years ago, the German admiral Durnitz had in his office a picture of the ocean with a few gulls and a sunlit sea,” John Arquilla says. “Durnitz would point to this picture when his U-boat skippers visited him and say, ‘That is the future of naval warfare–there will be no great vessels, only submarines and aircraft.’ In 21st-century sea warfare, expect the rise of sea power without a navy.”

Regarding the democratization of cruise missile technology generally, Arquilla continues: “When cruise missiles are as widespread as AK-47s, we will truly have the war of all against all.” As for the strategic prospects in such an era, Arquilla says, “I always send people back to Jean Bloch’s *The Future of War* (1898). Bloch was a banker and he looked at society, security, and strategy all together. Before World War I, he understood that technological advances were creating systems of enormous destructive capacity, but the societal systems that were emerging would be capable both of taking great damage and of continuing. Because everybody had these capabilities, you would end up with a long attritional war, which both sides would lose. I think we’re in a similar situation to the one Bloch described, where the barriers to entry have dropped sufficiently so that, as long as anyone has the will to fight, they’ll be able to continue fighting. I think that’s the strategic picture that’s most pertinent to our time.”