Devastating cruise missile attacks on US cities? The danger, for years a back-burner issue, now gets high-level attention.

CruiseControl

Two of the most powerful lessons learned from the Sept. 11 terrorist attacks are that enemies don’t always attack in predictable ways, and sometimes, the Defense Department is looking for the wrong thing. The ballistic missile threat is well-publicized and has long been a factor in Pentagon planning, but US vulnerability to cruise missiles has only recently come to the forefront.

Cruise missiles are considered ideal platforms for delivering Weapons of Mass Destruction. The concern is that enemies could, with little difficulty, cobble missiles together from parts readily available in the commercial aviation market.

These missiles could be hidden aboard container ships lying just offshore, then uncovered and launched without warning. In a worst-case scenario, they would carry biological or chemical warheads and would surprise US defenses.

The threat has caught the eye of Defense Secretary Donald H. Rumsfeld. According to press reports, Rumsfeld sent a classified memo to the White House in July, calling attention to the growing cruise missile threat. Two months later, he went public with a related warning by noting that ballistic missiles can be moved within range of key US targets by concealing them aboard inconspicuous commercial ships.

At “any given time, there’s any number [of nondescript vessels] off our coast, coming, going,” Rumsfeld explained at a Sept. 16 Pentagon press briefing. Enemies on ships equipped with a hidden Scud-type launcher could “simply erect it, fire off a ballistic missile, put it down, cover it up,” he asserted. The modus operandi for a cruise missile would be similar.

According to a report issued in July by the Congressional Research Service, “Cruise missiles have many attributes that could make them attractive to terrorists, who may use them in ways that we currently can’t foresee.”

Cruise missiles are problematic because they are inexpensive, accurate, easy to conceal, and hard to detect and defeat. Intelligence and military experts believe the threat of a cruise missile attack on the United States will continue to grow over the next decade, as the technology needed for these weapons proliferates and potential enemies become more appreciative of their capabilities.

Especially troubling is the prospect of a large-scale cruise missile attack that could overwhelm air defenses focused on finding and tracking larger, high-flying aircraft. Limited cruise missile defenses are in place, but many missiles might get through in a mass attack. Fortunately, intelligence assessments predict such an attack is unlikely in the next few years.

There is some evidence that enemies are pursuing advanced engine and guidance technologies. These components could be used to develop longer-range, accurate cruise missiles.

Cruise Missile Club

The CIA’s latest unclassified threat assessment noted that 24 nations will “probably” possess land attack cruise

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missiles by 2015. These will be acquired “via indigenous development, acquisition, or modification of such other systems as anti-ship cruise missiles or unmanned aerial vehicles,” according to the CIA’s national intelligence estimate. While these land attack cruise missiles will have limited range, the CIA pointed out, they will still possess “sufficient range to be forward deployed on air- or sea-launch platforms.”

“From a technical standpoint, cruise missiles are a better alternative” for “launching from forward areas” and may therefore be seen as “advantageous” for an attack on the United States, the CIA assessment concluded.

“The most plausible alternative for a forward-based launch would be a covertly equipped commercial vessel,” it added.

Sept. 11 brought to light “lots of ways to deliver lethal damage to the United States,” Rumsfeld observed. One method—the potential use of a remotely piloted helicopter—was detailed in a manual found in an al Qaeda safe house in Afghanistan in the early days of Operation Enduring Freedom.

The low cost of acquiring cruise missiles is also a concern. An enemy with $50 million to spend could buy one or two advanced tactical fighters, or 15 theater ballistic missiles with three launchers, or “100 off-the-shelf, ready-to-fire cruise missiles, each potentially carrying a [Weapon of Mass Destruction] warhead,” said a DOD report.

Terrorists have shown favoritism toward low-cost, high-impact attacks, a point not lost on CIA Director George J. Tenet. In testimony before the Senate last spring, Tenet noted that the US increasingly faces enemies intent on causing “pain and suffering” rather than defeating the US militarily.

According to DOD, land attack cruise missiles can be delivered by land, sea, or air and are more accurate and mobile than tactical ballistic missiles—but with the same Weapons of Mass Destruction payloads available.

Despite the looming problem that land attack cruise missiles pose, Sen. Daniel K. Akaka (D–Hawaii), who chairs the governmental affairs subcommittee concerned with weapons proliferation, said June 11 that defense against cruise missiles is “often an afterthought.”

Watch and Learn

Ironically, it may have been the Pentagon’s use of cruise missiles that legitimized them to adversaries. Traditionally, ballistic missile programs were pursued throughout the Third World partly as a sign of prestige. Ballistic missiles were seen as symbols of national power, despite the limited effectiveness of the most common, Scud–type systems.

But analysts note that heavy and devastating use of Tomahawk land attack cruise missiles and conventional air launched cruise missiles, beginning in the Persian Gulf War, has not gone unnoticed. Although the United States and its allies still possess the best technology and best missiles, advancing technology is steadily lowering the threshold needed to build effective cruise missiles.

Estimates vary depending on how cruise missiles are defined and measured, but according to DOD, there are currently 19 nations manufacturing cruise missiles and 12 exporting them. Further, the Congressional Research Service said 22 nations are “threshold manufacturers” that could begin programs in short order.

Many of the closest US allies are among the current cruise missile manufacturers, but the list also includes China, India, Iran, Iraq, North Korea, and Russia.

In his testimony, Tenet noted that “Russian entities continue to provide ... technology and expertise applicable to [chemical, biological, and nuclear] ballistic and cruise missile projects. Russia appears to be the first choice of proliferant states seeking the most advanced technology and training.”

The CRS list of threshold manufacturers is a fairly benign group of advanced industrial nations, but the large number of nations that could make the weapons, if they so desired, illustrates that the technology needed to begin a program is within reach of much of the world.

Two developments in recent years have made the cruise missile a more viable weapon, experts say. In the past, guidance and propulsion limitations hindered the ability of most nations to pursue effective land attack cruise missiles, according to Steven J. Zaloga, senior missile analyst with the Teal Group defense consulting firm. But now, these “two big stumbling blocks” are being overcome.

First, the Global Positioning System has revolutionized flight control systems and is useful for both cruise missile guidance and commercial autopilot systems.

“The advent of [GPS] has probably done more to draw attention to cruise missile proliferation than any other event,” noted Christopher Bolcom, CRS national defense analyst, at the June Senate hearing on the cruise missile threat. “Today’s standard GPS
signals offer global accuracy of better than 10 meters [33 feet]."

Second, highly efficient turbofan engines designed for business-jet use are becoming widely available. These engines also make effective cruise missile propulsion systems. Customers buying business-jet engines and commercial GPS guidance systems on the open market likely won’t attract much attention.

Bolkcom described the problem as technology that hides in plain sight because of the market for these dual-use capabilities.

Once missiles get into circulation, analysts caution, there may be very little warning of an impending attack. Even if the intelligence community feels the threat is still some years off, there are concerns the US may be surprised by a cruise missile attack. A September Pentagon briefing by a senior defense official noted that there have been repeated and significant intelligence lapses in recent years.

In addition to the Sept. 11 attacks, the US was surprised by how advanced the Iraqi nuclear program was after the Gulf War, by the state of the North Korean missile program when a Taepo Dong missile overflew Japan in 1998, and by how advanced al Qaeda’s WMD work was when discovered in Afghanistan.

Bolkcom testified that, in 1998, many were caught off guard when the French sold “an accurate, long-range, potentially stealthy” variant of their Apache cruise missile, called Black Shahine, to the United Arab Emirates. Experts call the Apache missile the cruise missile weapon of choice.

There was concern in 1998 that the UAE sale would spur similar sales of advanced Chinese and Russian cruise missiles, but so far this has not occurred.

**Limited Countermeasures**

The Defense Department has limited cruise missile defenses in place today, with better capabilities on the way. Sensor and air superiority aircraft, terminal defenses, and command-and-control systems offer some protection, though largely as a by-product.

The Air Force’s most prominent cruise missile defenses reside in Alaska, where 18 F-15Cs at Elmendorf Air Force Base are equipped with advanced radars capable of tracking and targeting multiple incoming cruise missiles.

These Eagles were upgraded by Boeing in 2000 with Active Electronically Scanned Array radars. The upgraded AESA radars, called the APG-63(V)2, allow the F-15 to take full advantage of its air-to-air missiles and can simultaneously guide Advanced Medium-Range Air-to-Air Missiles to multiple targets.

The Elmendorf F-15s are the first aircraft in the world to employ AESA technology for combat. This capability will be the foundation for future Air Force fighter upgrades.

The radar upgrade also included improved Identification, Friend or Foe capabilities, viewed as critical for cruise missile defense. There is little time to determine whether a radar blip is a cruise missile or a Cessna—and less room for error when deciding whether to engage the target.

Both the F/A-22 and F-35 Joint Strike Fighter will employ advanced AESA radars, and cruise missile identification and tracking is also one of the missions envisioned for the Air Force’s upcoming multisensor command and control aircraft.

Sensors, speed, and weapons make the F/A-22 “the one fighter in the joint air component optimized for cruise missile defense,” according to Rebecca Grant, president of IRIS Independent Research in Washington, D.C.

The US ability to detect cruise missiles has benefitted from overall air defense improvements in the wake of 9/11. For example, analysts say the improvements North American Aerospace Defense Command made to its radar coverage of the United States by integrating radars and linking to civil systems also enhanced the ability to detect and track cruise missiles.

Additionally, DOD will be improving cruise missile detection capabilities through better sensors aboard Air Force E-3 AWACS and Navy E-2C Hawkeye surveillance aircraft and a new Army-led program called the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System, according to the CRS report.

Systems integration is seen as an important stepping stone, stated the report. “Integrating air and missile defense systems may have the greatest payoff in designing and fielding an effective cruise missile defense.”

The USAF Link-16 data link system for fighter aircraft will also be helpful, because Link-16 will improve tactical communications and give pilots better information on possible targets.

The Army favors a system of tethered aerostats for the JLENS program. They would provide low-cost, over-the-horizon cruise missile detection. Incoming missiles could be detected at longer ranges by using aerostats to elevate sensors to altitudes up to 15,000 feet.

JLENS would work in conjunction with fixed-wing aircraft and ground-
based systems. The Army expects a full capability design by 2005.

The JLENS program will fill a void in missile detection. According to DOD, current systems that could offer a cruise missile defense capability are not optimized to handle that threat.

The JLENS program office noted that the Air Force, “while unquestionably the best air force in the world against fixed-wing aerial threats, possesses limited capability against low-flying land attack cruise missiles.” That leaves the Army’s Patriot air defense missile system as the primary terminal defense system. However, when set up for ballistic missile defense, the Patriot system “cannot provide adequate protection against low-flying threats,” according to the JLENS program office. Land-based Patriot sensors in their ballistic missile role have “limited ability to see and engage a target approaching at an elevation of 100 meters [330 feet].” With JLENS sensor data, the Patriot could increase its “effective battlespace by over 700 percent.”

Vulnerability to cruise missiles has long been recognized, but the problem may have been written off as “too hard,” one official said. The “cost–exchange ratio was not in our favor,” he said, and to this day, if you look for a budget line item for cruise missile defense “you won’t find one.” So far, it is only sophisticated systems such as the F/A-22 and Patriot that have been proposed to counter cheap cruise missiles.

Whether a Patriot missile costs $5 million “or the desired $2 million per copy, the figure compares unfavorably with either a $200,000-per-copy cruise missile or large saturation attacks of $50,000-per-copy modified airplanes,” Dennis M. Gormley, senior fellow with the International Institute for Strategic Studies, told Akaka’s Senate panel in June.

Negotiating Limits

For that reason, some believe arms control measures offer the least expensive way to protect the United States from advanced missiles—by keeping quality missiles out of enemy hands. This will be difficult, given the commercial availability of key components.

One such measure, the Missile Technology Control Regime, an informal export control agreement among 33 nations, attempts to halt the spread of advanced missile-related equipment. According to the Arms Control Association, MTCR is designed “to stem the spread of ballistic and cruise missiles capable of delivering a 500-kilogram [1,100-pound] payload 300 kilometers [186 miles] or more” by setting export guidelines and naming restricted items.

One of the problems with MTCR, however, is the ability to “trade off” capabilities. Missiles that are technically OK for export can sometimes be modified—with a boosted range or payload to create a more useful weapon.

Nonetheless, MTCR has slowed proliferation of advanced ballistic missiles, Gormley testified, with “the major consequence ... that the ballistic missile technology that has spread thus far is largely derived from 50-year-old Scud technology, a derivative itself of the World War II German V-2 missile program.”

Gormley argued that cruise missile technology will inevitably continue to spread, but if MTCR can be used to control land attack cruise missile technology, US defenses “can conceivably keep pace with evolutionary improvements.”

Vann Van Diepen, a State Department nonproliferation official testifying at the same hearing, agreed it is important to slow the spread of technology. Although there have been well-publicized developments, such as Iraq’s conversion of Czech L-29 trainer aircraft into unmanned aerial vehicles “for probable CBW [Chemical and Biological Weapon] use,” export controls have helped deny access to the best technology, he testified. Enemy acquisition of cruise missiles is therefore “slower, more costly, and less effective and reliable.”

Van Diepen said the US is attempting to stay ahead of the problem by pushing for the necessary export controls and—when necessary—using interdiction, sanctions, or the threat of military action to interrupt transfers. “Good intelligence is central to nonproliferation,” he said, and these tactics have made cruise missiles “a less attractive option for our adversaries to pursue.”

Tightening the export controls is problematic. Aerospace exports are a major source of US industrial strength, and controls on GPS systems, efficient jet engines, and flight control systems would likely harm legitimate users more than adversaries. Akaka, who hosted the June hearing, noted that “similarities make it difficult to inhibit cruise missile proliferation without impacting the aircraft industry.”

The unanswered question is whether commercial technology has already let the cruise missile cat out of the bag. Some analysts believe the threat has now reached a critical point.