Sea-based Missile Defense:
The First Line of Defense for U.S. Homeland

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George S. Patton once averred that when Samson slew a thousand Philistines with the jawbone of an ass the weapon was surely *en vogue* for centuries.

The U.S. Navy's Aegis Weapon System has not been around for centuries, but it has been the vanguard of American sea power for more than three decades and continues to be upgraded to support new platforms, such as sea-based missile defense.

The emerging Aegis Ballistic Missile Defense is the sea-based component of the nation's Ballistic Missile Defense System (BMD). Aegis BMD is designed to shoot down short to medium-range ballistic missiles in their midcourse phase of flight using a modified Standard Missile-3 (SM-3) as the interceptor. The SM-3 uses "hit-to-kill" technology that destroys target warheads by colliding directly into them.

Aegis, Greek for shield, is an integrated radar and missile guidance system. Aegis-equipped ships are able to detect and track ballistic missiles and then share that information with other missile defense sensors and the Ground-based Midcourse Defense (GMD) command center.

The Defense Department's Missile Defense Agency (MDA) and the U.S. Navy, which cooperatively manage the Aegis BMD program, have conducted eight sea-based missile defense tests, seven of which ended in successful intercepts. The most recent test, conducted in the Pacific Ocean in June, is considered a milestone for several reasons. First, the newly modified USS *Shiloh*, participating in its first missile defense trial, successfully intercepted a "separating" target – a target warhead that had completely separated from its booster rocket. This had not been done before.

"We are continuing to see great success with the very challenging technology of hit-to-kill, a technology that is used for all of our missile defense ground and sea-based interceptor missiles," Air Force Lt. Gen. Henry Obering, director of MDA, said following the test.

The June test was also the first time new weapon system software, ballistic missile defense 3.6, had been used in an intercept demonstration. Furthermore, it was the first time an allied military – Japan – took part in a sea-based missile defense test. One of Japan's Aegis-equipped destroyers provided detection and tracking assistance during the exercise.

An Aegis BMD test scheduled for December was not completed because of an "incorrect system setting," which hindered the fire control system aboard the ship from launching the first of two interceptors. Both target missiles splashed into the ocean as planned, MDA officials reported. Aside from the *Shiloh*, U.S. Navy guided missile cruisers USS *Lake Erie* and USS *Port Royal* are equipped with full missile defense capabilities, and several other Navy ships are in the process of being upgraded. An additional ten ships are being upgraded with improved radar for long-range surveillance and tracking of hostile ballistic missiles. MDA officials said a total of 18 ships will be "identically equipped with both capabilities" by 2009.

A ballistic missile has three phases of flight. The boost phase lasts only a few minutes as the missile's booster rockets hurl it from launch pad to outer space. The terminal phase is the portion of the missile's trajectory where it plummets toward Earth without propulsion at about 15,000 miles per hour. The terminal phase normally lasts less than a minute. The aptly named midcourse phase occurs between the boost and terminal phases. This leg of the missile's journey offers the best chance for a successful intercept because it is the longest segment of flight, lasting about 20 minutes as the missile jettisons its rockets and cruises outside of the Earth's atmosphere.

As mentioned, current sea-based missile defense technology focuses on destroying short and medium-range ballistic missiles in their midcourse phase of flight, whereas the ground-based interceptors located at Fort Greely, Alaska, and Vandenberg Air Force Base, California, are designed to defend against long-range or intercontinental ballistic missiles (ICBM) in their midcourse phase. These interceptors can be brought to alert status in an emergency but do not yet offer around the clock protection.

There is currently no system capable of performing a boost phase intercept. However, an Airborne Laser (ABL) and a Kinetic Energy Interceptor (KEI) are under development to meet this challenge. MDA aims to deploy mobile ground-based and sea-based KEI technology. Kinetic energy simply means that the target warhead is destroyed by force of collision, not with an explosive warhead. The challenges associated with shooting down a missile in its boost phase are legion, not least of which is that the interceptor must be hyper fast in order to catch-up to a hostile missile that has had a jump-start. The detection, tracking and launch of the KEI would have to occur within seconds. One huge advantage linked with killing a missile in its boost phase is the interceptor would not have a deal with midcourse decoys. It would also destroy the missile over enemy territory.

The Patriot Advanced Capability-3 (PAC-3) is the only operational terminal phase program, although, the Terminal High Altitude Area Defense System (THAAD) is being developed to perform the task. The Navy is reviewing the possibility of incorporating Patriot missiles into Aegis BMD by placing them aboard ships.

In addition, MDA and the Navy are working toward a sea-based terminal intercept capability. In May the *Lake Erie* successfully intercepted a short-range ballistic missile in its terminal phase of flight using a modified Standard Missile-2 (SM-2) during a test conducted in the Pacific Ocean. It was the first sea-based intercept of a ballistic missile in its terminal phase.

Many critics of missile defense argue this and other BMD tests do not live up to real world rigors because the tests are essentially scripted, with all the participating actors moving on cue. There is undoubtedly some truth to this claim. However, military officials have repeatedly said America's missile defense capability is in its elementary stage and as the system progresses testing will become more demanding.

May's terminal intercept trial was impressive for another reason. The *Lake Erie's* modified Aegis weapon system and SM-2 enabled the ship to guide the missile to achieve either a "direct body to body hit between the interceptor and the threat … or a near-direct hit where the high pressure, heat and fragments are placed on the threat by a blast fragmentation warhead." In the end, the target missile was destroyed with the "combined effects of both mechanisms," military officials said.

"We believe it is an important step towards the desired end-state of a robust sea-based terminal ballistic missile defense capability," said Rear Admiral Barry McCullough, director of Naval Surface Warfare. "And it begins to meet an immediate near-term concern of our combatant commanders."

The warhead used during the terminal intercept trial functions is similar to Israel's Arrow anti-ballistic missile, which was developed jointly by Israel and the United States. The Arrow II has already been deployed by Israel as a defense against short and medium-range ballistic missiles in their terminal phase.

Because GMD is less mature and has been less successful in testing, the U.S. and Japan are working together to upgrade the SM-3 by making it bigger and faster in order to meet long-range missile threats. Plans to test the upgrade are not expected for another seven years.

The Japanese contribute about $1 billion per year to missile defense research and development. Their efforts bore fruit last year when their design for a new advanced nosecone for the SM-3 proved successful. "In previous Aegis BMD flight test missions, the SM-3 missile maneuvered to eject the nosecone before deploying the kinetic warhead to intercept the target. With the modified configuration, the nosecone opens like a clamshell without any missile maneuvers," a March 2006 MDA press release explained.

Due to the fact the U.S. and Japan face many of the same 21st century security challenges, the alliance between the two countries grew stronger under President George W. Bush and former Japanese Prime Minister Junichiro Koizumi. For one, the threat posed by North Korea is worrisome to both nations. North Korean missile tests have proven the Hermit Kingdom has the capability to strike Japan, and probably Alaska and Hawaii with its medium-rage Taepodong-1 missile. The communist country drew a new round of international ire when it test-fired seven ballistic missiles in July and set off a nuclear device in October.

As the U.S. and Japan ramp up their missile defense cooperation, Japan's pacifist constitution, written by Americans following World War II, poses a few wrinkles in regard to mutual defense. It forbids Japan's Self-Defense Forces, one of the most advanced military forces in the world,

from engaging in offensive military action. The constitution stipulates that Japan can only defend itself within its own territory and prohibits defending an ally, such as the U.S.

For example, a North Korean ballistic missile fired at Hawaii is likely to fly directly over Japan, and, unfortunately, Japan would not be constitutionally permitted to shoot it down. Ironically, Japan would also be unable to aid the U.S. Navy if it were attacked in the Pacific. Japan's new prime minister, Shinzo Abe, wants the constitution rewritten. This is unlikely because changing the constitution requires a two-thirds majority in both houses of Japan's parliament, the Diet. Therefore, Abe is likely to push for constitutional reinterpretations that might allow Japan to defend an ally with missile defenses used inside its territory.

As Duncan Currie pointed out recently in the *Weekly Standard*, Japan has made "operational exceptions" to its constitution before, like when it participated in "joint inspections of North Korean ships."

Some people are fearful that Japan's recent assertiveness on the world stage coupled with its active role in missile defense is a sure road to the country's remilitarization. Not all agree. "Even if the Japanese were so inclined, their dependence on American power gives them less flexibility to pursue a truly militaristic agenda," Currie noted.

The alliance with Japan is possibly the most important strategic bi-lateral partnership the United States has today – probably even more important than America's relationship with Britain. North Korea poses the most immediate missile threat to the United States and Japan (Iran has not successfully test-fired a missile capable of hitting the U.S. homeland, yet its missiles do present a serious regional threat – to Israel and American troops in the Middle East), and an emerging China poses the greatest long-term challenge, so it is vital the U.S. and Japan continue to cooperate on sea-based missile defense.

U.S. government officials have said they welcome the rise of a peaceful and prosperous China, but are taking note as it systematically modernizes its military capabilities. According to an executive summary of the Defense Department's "2006 Annual Report on the Military Power of the People's Republic of China," the People's Liberation Army is in the process of a long-term transformation from a mass army designed for long-drawn-out wars of attrition on its territory to a more modern force capable of fighting short, high-intensity conflicts.

"China is beginning to develop the capability to project power. This is worth noting," Peter Rodman, assistant secretary of defense for international security affairs, told reporters when the DoD report was released in May. China has had missiles capable of hitting the United States for many years, but Rodman said they are currently developing and deploying long-range ballistic missiles with improved range, mobility and accuracy. In addition, Chinese short-range missiles opposite Taiwan continue to grow by 100 per year, he said.

For the time being U.S. relations with China appear to be improving. Last fall the American and Chinese navies even participated in their first joint exercises.

Let’s hope the North Koreans can be talked into giving up their nuclear and ballistic missile ambitions, and the United States and China have a long and friendly relationship. But since nothing is guaranteed, sea-based missile defenses are, and will remain, the first and best defense against a ballistic missile attack on the U.S. homeland – an attack more likely to originate from Asia than anyplace else.