

RACK AND LOAD

WITH HELP FROM AIR FORCE SBIR CONTRACTS, A PENNSYLVANIA
COMPANY CREATES SMARTER RACKS FOR GUIDED BOMBS



Photo by Airman 1st Class Michael Murphy

We've all seen the old movies and newsreels. Fleets of massive bombers lumbering over a target while flak bursts around them. Then the bombs fall, dropping like logs, while everybody in the plane hopes they'll land in the right place.

Aerial bombing has been around for a long time, and for much of that history, it's been an imprecise method. The results have depended, in large part, on rapid trigonometry performed on-the-fly by Warfighters in incredibly dangerous and stressful conditions. Sometimes, it took scores or hundreds of bombs to hit and destroy a crucial target. Collateral damage was high.

Things began to change with the development of smart bombs, weapons that could direct themselves with increasing precision. That meant fewer bombs were needed to take out a specific target, and collateral damage was minimized.

By 1989, the U.S. Air Force and Navy knew how to attach two 1,000 pound

smart bombs to F-16 and F-18 attack fighters. The planes had the power to carry more bombs, but nobody had figured out a way to connect the complicated electronic and communications systems in the planes to the wiring required for carrying more than two bombs.

The smart bombs needed a smart rack. That's where an SBIR call from the Air Force came in.

A Pennsylvania-based company, M Technologies, believed they could provide a solution. After applying, the Air Force awarded M Technologies a contract for a Phase I feasibility study. Then came a larger, Phase II award to build a prototype, which also proved successful.

The new technology helped cut risks to American and allied Warfighters, furthered the interests of national security, and reduced collateral damage in multiple war zones.

M Technologies was, at the time, run by Bill Meiklejohn. "In the past, if you wanted to hit four targets, you had to take two aircraft," he said. "Now you can take one."

And much of the guesswork in bombing has been eliminated.

Guided bomb units steer themselves to a target by tracking a laser designator or locking in to the target's GPS coordinates, which have been determined beforehand. Gravity pulls the bombs to the ground (they aren't propelled, like missiles) but the fall is controlled by self-adjusting fins that correct the weapon's course according to orders from the onboard computer and electronic sensor systems. Before they are released, those devices need to be informed by the plane that is carrying them, which means the target's coordinates must be transferred to the racks and through them to the bombs.



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The rack developed by M Technologies through the SBIR program accomplishes this with no modification to aircraft wiring or hardware. The system works by attaching the smart racks to pylons beneath an airplane's wings.

In the past, each pylon could carry one bomb. But the new rack system enabled each pylon to hold two 1,000-pound bombs and "talk to them" efficiently through a data bus, which Meiklejohn compared to a "big internet cable," but with more capacity. It can detach the hooks that hold the bombs and ignite a small pyrotechnic explosion that punches pistons, which rapidly propel the bombs away from the airplane. That's necessary because the high speed of modern jets creates "all kinds of aerodynamic chaos" under the wings. That turbulence can create a real risk of the plane colliding with its own armament if the bombs aren't ejected fast enough to break through the choppy air.

Adding two tons of bombs slows the planes, but those bombs can be ejected miles away from target. And after the bombs are released, the bombs continue to communicate with GPS satellites to make what adjustments they need for their flight path.

"It's fire-and-forget capability," Meiklejohn said. Both the Air Force and the U.S. Navy wanted the platforms, but each branch used somewhat different configurations on their planes and on the pylons. "So we added all the electronics" to make it work for both F-16s and F-18s, Meiklejohn said. F-16s use a platform called BRU-57 while F-18s use a BRU-55.

Meiklejohn holds the patent on the bomb racks, though it is administered by DoD.

The devices are still manufactured and sold today by Harris Corporation, and are in use around the world.



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Modernization Priority: General Warfighting Requirements (GWR)

SBIR contract: F08630-98-C-0007 • Agency: Air Force • Topic: AF97-199, SWARMER - Optimal Carriage of Multiple Small Smart Weapons SBIR contract: F33615-99-C-3003 • Agency: Air Force • Topic: AF98-178, Active Separation Control for Improved Weapon Separation Characteristics