



JSOW Unitary Scores in Third Free-Flight Test

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—CAPT Robert O. Wirt, Jr., JSOW Program Manager PEO(W)

Second floor, middle window, please. The targeting seemed almost that simple as an AGM-154C Joint Standoff Weapon (JSOW) demonstrated an accuracy seldom seen in an autonomous standoff weapon: flying 12 nautical miles before striking a Land Range target with near-surgical precision.

Three for Three

In its third successful free-flight demonstration, the Navy/Raytheon-developed JSOW Unitary variant (the JSOW-C) attacked a specially constructed vertical target at Cole Flat. The event marked the conclusion of the contractor's seeker-development and targeting-algorithm test series.

"JSOW Unitary continues to meet or exceed performance expectations," said CAPT Robert O. Wirt, Jr., JSOW Program Manager in the Program Executive Office for Strike Weapons and Unmanned Aviation (PEO(W)). "This is yet another example of the platinum standard exercised across NAVAIR. The capability demonstrated with this test will further enable absolute combat power for the warfighter."

A Family of Standoff Weapons

JSOW is a family of low-cost glide weapons that use a common delivery vehicle for three different payloads. All three variants incorporate global positioning system/inertial navigation system (GPS/INS). JSOW-C adds target image matching for higher accuracy: launch-and-leave operation can be performed at ranges over 40 nautical miles.

More than 100 weapons have been employed since 1999 as JSOW has proved its combat effectiveness in Operation Southern Watch, Operation Allied Force, and Operation Enduring Freedom.

JSOW-A, currently in production, delivers BLU-97 Combined Effects Bomblets for area targets. JSOW-B, which uses BLU-108 Sensor Fused Weapon bomblets against enemy armor, is in low-rate production.

Both JSOW-A and -B are produced for the U.S. Navy and Air Force for use on the F/A-18, F-16, F-15, B-1, B-2, and B-52 aircraft.

JSOW-C, the newest variant, is designed for precision strike and will enter production for the Navy in 2003. It incorporates a Raytheon-developed uncooled, long-wave imaging infrared (IIR) seeker with autonomous-target-acquisition (ATA) algorithms.

JSOW-C will be the first U.S. weapon to incorporate the Broach penetration multiple warhead, developed by BAE Systems RO Defence in the United Kingdom.

Tricky Turns

Vertical targets (the face of a hydroelectric dam, the entrance to a fortified bunker) present a more difficult challenge than horizontal targets (bridges, runways).

To attack vertical targets, JSOW cruises at its search altitude until it acquires the target. Then it pitches down and dives. At the last moment, the weapon must climb, lifting its nose and approaching the target nearly horizontally.



Incoming—JSOW-C a fraction of a second before impact on the vertical target.

The JSOW-C in this test completed the maneuvers flawlessly, striking well within its specified parameters of accuracy and impact angle.

Pilots' Perspective

CDR Andrew "Harley" Hartigan, a member of VX-31 (formerly Naval Weapons Test Squadron China Lake), was the shooter. In his tour as JSOW Project Pilot, he has launched all three JSOW-Cs. "

Hartigan's F/A-18C took off from Armitage Field with the test item on station 3 under the port wing. He was followed by LT Michael "Mick" Williams, also from VX-31, flying chase in an F/A-18F. Darin Russell, a naval reservist and photographer, was in the rear seat of Williams' Super Hornet.

At Mach 0.75, 14,000 feet above the Land Range, Hartigan released the weapon. The JSOW separated cleanly and began its long glide to the target. Williams maneuvered his aircraft close enough to make sure that the weapon's launch lugs were down and the wings were properly extended.

With the chase aircraft flying off its port wing, the JSOW-C navigated autonomously through the range-on-bearing point before commencing target search. Engineers in the Range Control Center monitored the on-board systems through a telemetry link. After acquiring the target with its IR seeker, the weapon executed the terminal maneuvering sequence and flew to impact.

"We were directly over the target when the weapon hit," Williams recalled. "It was a great shot."

Hartigan sees the latest test as a particularly significant development. "It's absolutely incredible to be able to put a weapon through a window from that standoff range," he said. "That's an unsupported weapon—no lasing, no man-in-the-loop, just the JSOW on its own. We've reached a whole new level in strike warfare."

Collective Effort

Specialists from several NAVAIR Weapons Division organizations joined the Navy/Raytheon JSOW-C team in contributing to the success of the test.



Incoming—a JSOW-C through-the-seeker IR view of the vertical target just before impact.

Test Manager Rob Kruse of the Pacific Ranges and Facilities Department, coordinated range scheduling, control, safety, communications, and instrumentation coverage.

Axel Alvarez of the Advanced Weapons Laboratory is the Flight Test Engineer for JSOW. He prepared the pilots' flight cards, briefed and debriefed test participants on their assignments, and conducted the test.

Jim LeBlanc and Kevin Campbell of the Airbreathing Propulsion and Controls Branch and Charlie Roberts of Raytheon inspected the JSOW-C when it arrived on station to ensure that all components functioned properly. After installing a flight termination system in the Telemetry Instrumentation Kit (TIK). LeBlanc, Campbell, Gary Ford, Dave Bell, and Steve Kamo performed mass properties testing on the weapon.

Immediately before the test, Clark Bartlett and Erin Duchow from the

Advanced Weapons Laboratory and Roberts performed ground checks at the Gun Butts—the weapons loading area at Armitage Field.

NAWS China Lake Weapons Department handled the weapon-assembly process, and EOD Detachment China Lake participated in post-test recovery tasks.

More Tests to Come

The test series just concluded was designed to thoroughly assess the performance of the JSOW-C seeker and associated targeting software. But much testing remains to be done, according to Kathy Sievert, JSOW Systems Engineer.

"There are still environmental, E-cubed (electromagnetic environmental effects), insensitive munitions, arena tests of the warhead, and sled testing," Sievert explained. "Then early next year we start free-flight testing with the Broach warhead against hardened targets here on the Land Range."

When JSOW-C goes to the Fleet, it will be a formidable addition to the strike warfare arsenal. Wade Smith, Raytheon JSOW Program Director, summarized the weapon's benefit. "The JSOW-C with the Broach warhead, IIR seeker, and ATA technology will provide the warfighter with an unbeatable launch-and-leave, highly survivable weapon with true standoff precision strike capability."



On Its Way—the JSOW-C drops away from the F/A-18 launch aircraft over the Land Range.