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Feature Article

Mobile Range Instrumentation System To Be Tested on Carrier

by Sandra I. Erwin

A sophisticated air combat maneuvering instrumentation system is expected to arrive on the Navy's USS Kitty Hawk aircraft carrier next summer, despite recent difficulties in the program, including delays and cost overruns.



The prototype system is part of a Navy-Air Force program called the Joint Tactical Combat Training System (JTCTS). The Navy originally sought this technology for tactical combat training, to replace older Top Gun-type ranges. The goal was to develop a range system that could be used at sea, where both the aircraft and the ships would be instrumented. A Navy-only program was cancelled in 1992. In 1995, the Defense Department mandated that the program become a joint effort with the Air Force, which was seeking a similar capability for its combat ranges.

Air combat maneuvering instrumentation consists of sensor-equipped pods, carried under the wings of aircraft used in training. They contain electronics that record and calculate simulated firings of weapons and "kill" messages. The information, which relies on Global Positioning Satellite (GPS) data, is viewed in real time via a computer data link to ground-based monitors.

"The Navy and the Air Force have unique tactical training requirements," said William V. McCanless, program manager for JTCTS at the Naval Air Systems Command. The Navy's existing tactical aircrew combat training system (TACTS) and the Air Force's air combat training systems (ACTS) have been in use for many years. "To take advantage of recent technologies and replace our legacy training systems, a determination was made [by the Pentagon] to create a joint acquisition with the Navy as the lead service," McCanless told National Defense.

A contract for the JTCTS was awarded in 1995, to the Raytheon Company Naval and Maritime Systems, in Portsmouth, R.I. It was a five-year contract with production options, said Joseph Ricci Jr., the company's technical

director for training systems.

JTCTS can be described as a range-less instrumented training network of ships and aircraft that rely on GPS satellites and simulation technology to create a “synthetic environment overlaid on real world participants,” said Ricci in an interview. Simulated weapon and radar threats also are part of JTCTS. The air maneuvers can be monitored in real time on ground- or ship-based stations or can be recorded for future after-action review.

The instrumentation would monitor aircraft position and record combat actions. The instrumentation also would simulate threats and stimulate aircraft sensors with threat data. A JTCTS game area would cover a 400-nautical mile radius from the monitoring site, or 150 nautical miles, line of sight, for range-less operations. One hundred instrumented aircraft would “play” in an exercise with about 600 simulated entities.

The technology, said Ricci, provides a “deployable training system, interfacing with, but not dependent upon dockside facilities, shore-based training sites, or fixed ranges.”

Raytheon is expected to deliver a mobile JTCTS to the USS Kitty Hawk, in July 2001, said McCanless. “Initial delivery of the system will include instrumentation for 12 aircraft (F-14s and F-18s), a central core, and a display and debriefing system.”

The next phase, said Ricci, will be “to take the hardware and integrate it into fixed ranges,” at Oceana, Va., Cherry Point, N.C., Fallon, Nev., and others. “The last phase will be a full battle-group training capability for use on aircraft and ships.”

The system is designed for real-time monitoring, similar to what is done at current ranges, Ricci said. It also can operate in a range-less mode, such as when an aircraft takes off from a carrier and flies beyond the line of sight, so it can't be monitored. The simulated weapon engagements “will run inside the instrumentation and keep track of what is going on,” he explained. If a radar signal hits the aircraft, the effect is simulated to the radar-warning receiver. “The pilot will know he is being tracked by enemy radar, and will anticipate a weapon being fired. If the simulated weapon hits him, he will know. When he returns to the carrier, all the recorded mission data will be downloaded so there can be a debrief.”

The instrumentation pod that goes on an aircraft looks like a missile. “It has the same weight and balance of a missile so it does not disrupt the aerodynamics aspects of the aircraft,” said Ricci. The electronics are packed in small boxes. “The goal for both services would be to have the system inside the aircraft entirely. The Navy already has moved in that direction with the F/A-18. The electronics go inside the instrumentation package, instead of an outside tube.”

The system for the Kitty Hawk has instrumentation for 12 aircraft, "but you could have as many as 100 aircraft," he said. Out of the 12, four will have pod-based systems and the other eight will have internal electronics packages.

Risk in the Program

The JTCTS program has been criticized for being overly complex and too expensive. Development costs since 1995 have topped \$100 million, Ricci said. A senior Navy officer who asked to not be named said JTCTS has "some risk in it right now [but] we think it's the right thing to do."

Cost overruns were experienced in 1999, said McCanless. As a result, the contract with Raytheon was re-negotiated from a "cost-plus" to a "fixed price" arrangement. The schedule, therefore, slipped by one year, McCanless said. "Primary causes of the JTCTS schedule delay were assessed as software development issues, inadequate management and key personnel turnover."

Ricci conceded that staffing problems were a factor in the delays. "The amount of software that had to be developed was more than we had anticipated. We needed more people," he said. "Getting qualified software developers for real-time development was a strain."

The company also made "some management changes," Ricci said. "We have a different management team, more experienced in integration and testing."

To address the Navy's complaints about cost overruns, he said, "Raytheon took the position that it would take this [as a] fixed price [project] to mitigate this concern."

If the deployment on the Kitty Hawk is successful, Raytheon expects to receive a production contract for JTCTS next year. That agreement also may be on a fixed-price basis, said Ricci. "When the production contract is issued, we will provide production unit costs, depending on the production run. We don't know their production strategy yet. ... There will be a production decision for the Air Force and for the Navy. We don't know the number of systems."

In the future, Ricci said, JTCTS will be compatible with Army ground range instrumentation. "Ultimately JTCTS will be used as the air portion of a joint war game."

The next-generation Joint Strike Fighter, he said, has a requirement to be JTCTS compatible. "All new aircraft will have to meet that requirement, so you don't have different developments and support systems."

One of the JTCTS subcontractors, Cubic Defense Systems, in San Diego, has been one of the dominant players in the range instrumentation industry. The company ended up on the JTCTS team after acquiring Applied Data Technology Inc., which had been a subcontractor to Raytheon since the beginning of the program

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Cubic has been in the air combat maneuvering instrumentation business since the early 1970s. The company was awarded a \$3 million contract earlier this year by the U.S. Air Force to expand air combat training capabilities at the Air National Guard's Combat Readiness Training Center at Alpena, Mich. The first range-less air training technology was deployed at the Kadena Instrumented Training System (KITS) in 1997, at Kadena Air Force Base in Okinawa, Japan.

"At this time, Raytheon does not plan to use any of the KITS technology in the JTCTS program," said Ricci. "We will look at what they have done for KITS," such as the magnetic devices used to record the training missions.

Rick Dickson, Cubic's director of air range systems, said the company will focus on the displays. He noted that JTCTS has "very demanding requirements" because it is a joint program. "It's more stringent than just a single-service system."

Cubic's range-less systems cost anywhere from \$5 million to \$10 million, depending on the requirements, said Dickson.

Until JTCTS is completed, the Air Force is using the USAFE (Air Force Europe) range-less interim training system, or URITS. Cubic competed for that award, but lost to Metric Systems Corp., in Fort Walton Beach, Fla. URITS supports F-15, F-16 and A-10 fighter squadrons in Europe and the Middle East.

Paul W. McGillick, electronic warfare marketing manager for Metric Systems, said he hoped the Navy would become interested in the URITS equipment, since JTCTS is behind schedule. "We are trying very hard to incorporate the Navy into our customer base," he told National Defense.

McCanless said the Navy will wait for JTCTS and had no plans to buy training pods from other vendors.

Metric has built and delivered 88 training pods to USAFE. The systems are leased over a five-year term, at the end of which they can be bought or returned to the contractor. "We have to meet an uptime availability of 85 percent to get paid," said McGillick. "These systems have flown 13,000 sorties and we have exceeded 99 percent availability." The cost of leasing a URITS pod is between \$170,000 and \$200,000.