



Multi-sensor Sentry

With an integrated mission system, the HC-144A Ocean Sentry gives the Coast Guard a versatile medium-range surveillance aircraft networked to share a common operating picture.

By Frank Colucci

As of August 2011, the U.S. Coast Guard had 12 HC-144A Ocean Sentry medium-range surveillance aircraft and a dozen associated Mission System Pallets (MSPs). Another three aircraft are on order and contract options will allow the service to buy up to five more HC-144As over the next three years. The versatile new Ocean Sentry has already cued Coast Guard cutters and other surface vessels to drug smugglers and dangerously overloaded migrant boats. It has airlifted casualties from the Haitian earthquake and marine animals caught in the

Deepwater Horizon oil spill. "I've had 73 brown pelicans in back at one time," noted Lt. Cmdr. Travis Burns, chief of fixed-wing operations at Coast Guard Air Station (AirSta) Miami. Transitioning from the HU-25 Guardian, also known as the Falcon, to the Ocean Sentry at AirSta Mobile, Ala., Burns was also the pilot for the first HC-144A "save" when his observer spotted a downed U.S. Air Force F-15 pilot in the Gulf of Mexico in 2008. He found the new turboprop a more effective low-speed, low-altitude search platform than the speedy jet it replaces. "It made all the difference in the

world, just that we were doing 120 knots and we had that bubble window to see the guy," said Burns. "In the Falcon, I'm not sure we would have."

The Ocean Sentry also gives Coast Guard crews a state-of-the-art sensor suite with multimode radar, multiband electro-optics, and the Automatic Identification System. Miami Chief Aviation Electronics Technician Anthony Castelli recalls one case flown with Drug Enforcement Administration observers during which an experienced Coast Guard mission system operator (MSO), using the Ocean Sentry's radar, detected a small wooden smuggling boat many miles away. "It came in crystal clear, and it was a good bust. The cutter was there in an hour." The Ocean Sentry also gives multi-mission crews multi-agency communications. "I can remember flying over Sector Key West and not being able to talk to them whatsoever with the Falcon," said Castelli. "With this plane, there are so many radios, if you can't talk to someone, there's something wrong."

Operational test and evaluation from September 2011 through March 2012 will enable crews from AirSta Miami and independent observers from the U.S. Navy and Coast Guard Operational Test and Evaluation Force to assess the integrated Ocean Sentry platform, sensors, and systems in mission vignettes. "They will check all the different mission sets from SAR [search and rescue] and surveillance to targets of opportunity," explained acquisition HC-144A Project Manager Ron McIntire at Coast Guard Headquarters. "It's real-world scenarios."

Significantly, the real-world scenarios will give the U.S. Department of Homeland Security (DHS) a chance to evaluate the Ocean Sentry's radar. The Coast Guard's multisensor surveillance aircraft is meant to support multiagency homeland security missions. Depending on its assigned role and mission, the Ocean Sentry will contribute and consolidate information at successive levels of the Common Operating Picture (COP) shared by DHS decision-makers. The classified COP, which is annotated with target tracks and friendly forces, can be transmitted to the National Maritime Intelligence Center and distributed to Coast Guard cutters and other users. Burns added, "What the operational commander really likes is we'll take capture video images - jpegs - and we can email those to the tactical commander. It helps them make an assessment as well. That's a huge advantage, to see picture as we arrive."

McIntire summarized, "As the medium-range maritime patrol aircraft, the Ocean Sentry delivers maritime domain awareness [MDA] essential to achieving



Opposite: With multiple sensors and secure communications, the Coast Guard HC-144A will be a key contributor to maritime domain awareness. **Top:** The U.S. Coast Guard's first national security cutter, the *Bertholf*, under way with the new medium-range surveillance aircraft. SIPRNet connectivity will enable the Ocean Sentry to pass secure sensor imagery and tactical information to the cutter. **Above:** The Ocean Sentry medium-range surveillance aircraft can drop rescue packs to survivors awaiting rescue at sea.



Above: Lt. Steve Pittman (left) and Lt. Derrick Hendrickson, HC-144A Ocean Sentry pilots from Aviation Training Center Mobile, Ala., fly toward Haiti Jan. 15, 2010. The pilots and their crew conducted damage-assessment flights after a 7.0-magnitude earthquake struck near Port-au-Prince, Haiti, Jan. 12, 2010. **Opposite:** The HC-144A Star Safire III IR/EO package provided imagery of the *Deepwater Horizon* oil spill during cleanup operations. Imagery and annotated displays can be downlinked to shore stations, cutters, and other networked assets.

mission success in congressionally mandated missions." DHS defines MDA as the understanding of anything at sea that could impact the security, safety, economy or environment of the United States. It considers MDA a key piece in an active, layered maritime defense.

Pallet and Payload

The Coast Guard procurement objective is to deliver 36 HC-144As by 2025 to Air Stations Mobile; Miami; Cape Cod, Mass.; Corpus Christi, Texas; Elizabeth City, N.C.; Ventura County, Calif.; Astoria, Ore.; and Borinquen, Puerto Rico. In the post-9/11 Coast Guard recapitalization efforts, the 240-knot HC-144A turboprop replaces the 430-knot Falcon jet in SAR and law enforcement missions. "I think the biggest advantage is the sensor suite that we didn't have in the HU-25," said Burns. "The second thing would be the endurance. The HU-25 had very limited on-scene time."

Ocean Sentry operational test requirements call for 4.7 hours of endurance 300 nautical miles from base and return. The HC-144A platform has the persistence to play multi-sensor observer or multi-asset commander. In one case, an Ocean Sentry with a

quick refueling diversion was able to keep eyes on an overloaded Haitian immigrant boat for 12 hours. "We were able to stay on scene and the whole time, send pictures of the freighter to our tactical commander up in Miami," said Burns.

Equally important, the Ocean Sentry has a powerful processing and communications suite integrated on an 1,800-pound MSP that can be rolled on and off through the aft cabin ramp. "The Mission System Pallet is a game-changer," said McIntire. "Because of that, the Ocean Sentry is a multi-role aircraft." Lockheed Martin Mission Systems and Sensors provide the MSP hardware, software, and systems engineering services. Each pallet includes side-by-side workstations with 19-inch color displays, keyboard and trackball controls, radio control heads, and processing electronics for two enlisted MSOs to collect, manage, and downlink secure data.

The backbone of the Coast Guard system is derived from one aboard the Navy P-3 Orion patrol aircraft. However, rather than dedicate operator stations to specific sensors, the Ocean Sentry architecture enables either operator to access all the information generated by any sensor. While the Falcon had a single sensor systems operator, the Ocean Sentry teams two MSOs on the pallet to share the workload. According to Castelli, "On the case, on the



MSP, there's so much more you can be doing on the flight, monitoring radios, looking at the forward-looking infrared system [FLIR]; it definitely warrants the two people."

Without the MSP, the HC-144A can carry three pallets or 8,000 pound of cargo. Burns noted, "We can put 42 people in this thing. The Falcon was maxed out at 12." The pallet-less Ocean Sentry, nevertheless, retains basic sensor capability. "We train our pilots to be proficient," he said. "They're essentially being an MSO from the flight deck." Upgrade plans include a hand-held navigation display for a cabin observer to downlink information without pilot intervention.

The MSP fuses information from Ocean Sentry's sensors, explained McIntire. "It allows the operators to establish a radar track on a contact and automatically slew the FLIR to get an optical image of the contact." Contact tracks from the radar, Electro-Optical/Infrared (EO/IR) gimbal, and the Automatic Identification System (AIS) are consolidated in one display to give each operator a decluttered view of the situation.

Ocean Sentry pallet operators primarily use the longer-ranged radar and AIS to find targets. The EO/IR gimbal can then reveal vessel names and other data for positive identification. MSP operators can also cue the cockpit crew through their Control Display Unit to modify search patterns. An integrated multi-function display on the flight deck shows the Ocean Sentry pilot and co-pilot select information from the MSP. Burns said, "We can ask them to give us certain information on that screen. It could be the FLIR output, the tactical map, whatever we ask for."

Ocean Sentry displays can be recorded on a hard drive on the MSP or shared with shore-side facilities, the new National Security Cutter, and, eventually, the Offshore Patrol Cutter and other players via the Coast Guard Digital Network Plus (CGDN+) or the Department of Defense (DoD) Secret Internet Protocol Router Network (SIPRNet). "The shore side is the primary one," noted McIntire. "They're going to wind up sending that data to the other cutters." The Ocean Sentry is the first Coast Guard aircraft with Authority to Operate SIPRNet, so it can share classified information in real-time with the DoD and other national security agencies.

The INMARSAT receiver-transmitter and related electronics are packaged on the MSP. The Ocean Sentry itself, meanwhile, has a multiagency communications suite with Cobham/Wulfsberg law enforcement radios and Rockwell Collins ARC-210 military UHF/VHF/HF radios. In the 2008 sea search for Air Force F-15 pilots, an Ocean Sentry from Mobile was led to a debris field by another fighter and served as an on-scene rescue coordinator with Coast Guard and commercial vessels. "We were able to slow down, make a pass through, and our left observer saw a pilot in the water," recalled Burns. "It was a 'Mark One' eyeball catch, but we were able to use the AIS system to locate a nearby small vessel and vector them to pick the surviving pilot out of the water."

Sensor Suite

The Ocean Sentry sensor suite was integrated for the EADS CN235 maritime patrol aircraft but fine-tuned to U.S. Coast Guard requirements. The

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The Ocean Sentry provides more than nine hours endurance for sustained surveillance and command-and-control missions.

Coast Guard, for example, drove development of an Enhanced Small Target Detection (ESTD) mode for the Telephonics APS-143(V)3C Ocean Eye maritime surveillance and imaging radar. In August 2011 alone, HC-144As from Miami interdicted 204 migrants in multiple cases. "In every one of those cases, it was the aircraft radar that found these vessels," noted Burns. The ESTD mode enables the active sensor to find very small contacts in a sea of clutter. "Some of these vessels are nothing more than tractor tires with a tarp on them."

Once a contact is found, the radar can use sea motion to generate an Inverse Synthetic Aperture Radar (ISAR) image of the target for classification. "The ISAR works very well," said Castelli. "It looks like a fuzzy image on the screen, but the right operator can tell that's a cruise ship or a freighter or a suspect vessel." The same radar has alternative search modes, weather displays and other functions. Comparative tests showed the Ocean Sentry radar had the best Probability of Detection performance in the Coast Guard fleet, an important parameter in sizing search patterns.

The HC-144A is the first Coast Guard aircraft with the AIS. The SAAB R4A AIS uses a transmitter and multiple receivers to interrogate shipboard transponders. It can plot the location of ships and, connected with the Ocean Sentry's MSP, can help sort out suspicious contacts from cooperative traffic in busy sea lanes.

The FLIR Systems Star Safire III EO/IR gimbal is widely used on helicopters and fixed-wing aircraft with different sensor payloads, including mid-wave thermal imagers, day and image-intensified television, high-magnification sniper scope, and laser illuminators. The test systems were able to read 6-inch high hull letters from significant distances. Coast Guard operators have already expressed a desire for high-definition FLIR imagery.

On a Mission

Most Ocean Sentry pilots have transitioned to the HC-144 from the HU-25. Burns explained, "We have a couple of C-130 Hercules guys, but the majority have come out of the Falcon community." The 11-week pilot transition course at the Aviation Training Center in Mobile includes 28 to 30 flying hours. "At Mobile, your first time at the controls is in the actual aircraft." The same is true of the MSOs. The Naval Air Systems Command Naval Air Warfare Center Training Systems Division has contracted for an Ocean Sentry operational flight trainer on behalf of the Coast Guard to be based at Mobile. Fidelity of the motion-based flight simulator will be equal or superior to Federal Aviation Administration Level D training devices, with a 290- by 60-degree visual display and realistic command, control, communications, and computer functions.

Coast Guard utilization plans budget each Ocean Sentry for 1,200 flight hours per year – 50 percent more hours than allocated for the HU-25s. Since the Aviation Training Center at Mobile first achieved initial operational capability (IOC) in 2008, each Ocean Sentry has averaged 1,150 hours a year. About 60 percent of the hours flown by AirSta Miami are dedicated to law enforcement missions, specifically migrant interdiction operations. A small amount of time now goes to counternarcotics actions, and the rest to SAR missions and training flights.

Notional delivery schedules will give the Coast Guard its last Ocean Sentry about when the first aircraft is due for midlife upgrade. With flexible avionics architecture and a versatile cabin configuration, the new Ocean Sentry has just begun to fulfill the many missions of the medium-surveillance aircraft.