Aurora's Centaur performing an Arctic science mission lead by Harvard University and NOAA. Photo courtesy Aurora Flight Sciences.

FILLING A NICHE WITH A SWITCH

The aerospace and defense industry sees growth potential for air, ground and maritime vehicles that operate in both manned and unmanned modes.

By Marc Selinger

While unmanned aerial vehicles have become the main alternative to — or even replacement for — manned aircraft, some aerospace and defense firms are betting that optionally manned systems will play a growing role in the coming years.

Optionally piloted aircraft (OPAs) are being eyed for a number of roles, including speeding the testing and certification of new unmanned aircraft. Having a pilot in the cockpit provides close-up observation of the aircraft and allows a pilot to take over if a problem arises in the unmanned mode.

With an OPA, "more testing can be conducted safely until we can demonstrate the maturity of the whole design," says Dino Cerchie, a program manager at Boeing, which has developed an optionally manned version of its Little Bird helicopter.

Optional manning also allows aircraft to be ferried in manned mode through national and international airspace, where unmanned aircraft systems are greatly restricted, and then undergo long repetitive missions in unmanned mode in areas where they are permitted to fly. Optionally manning may even be useful for the six UAS test sites that the Federal Aviation Administration, at press time, was planning to pick by the end of calendar 2013.

"You could conduct operations in one test area autonomously, use your optional pilot to transit to a second area, conduct operations and go to a third area, and so forth, all with one aircraft," says Bob Davis, CEO of Proxy Technologies, which makes flight control systems for OPAs. "It would reduce expense quite a bit not having to maintain aircraft at every test site."

OPAs Take Flight

Several optionally piloted aircraft are already in use. Armasuisse, the Swiss defense agency, is flying Centaur, developed by Aurora Flight Sciences, to test collision-avoidance sensors for unmanned aircraft. Centaur gives the Swiss "full remote control from a ground control station with the option of an onboard safety pilot," Armasuisse spokesman François Furer explains.

Because airspace restrictions prohibit Centaur from flying from the continental United States to Alaska in unmanned mode, it will fly there with a pilot, then be converted to unmanned. This will avoid the time-consuming task of taking the aircraft apart, shipping it to the Arctic and then reassembling it.

"The whole idea of this airplane is it can self-deploy without going into boxes or other airplanes,"

Boeing's Unmanned Little Bird has performed shipboard autonomous takeoffs and landings off the coast of Florida. Photo courtesy the Boeing Co.

"We think that exactly what the Swiss are doing should be of interest to all of these people who are bidding on these FAA test sites," says John Langford, Aurora's chairman and CEO.

Centaur is already being used for environmental data collection in the United States. In August 2013 in Alaska, Centaur flew more than 60 hours in manned mode for a Harvard University-National Oceanic and Atmospheric Administration Arctic research project. It is slated to return to the Arctic in 2014 to fly in its unmanned mode, which will allow for longer missions.

Langford says. "Going into the unmanned mode … is about a four-hour switchover, and then the airplane can be flown remotely just like any other UAV."

In unmanned mode, Lockheed Martin's optionally manned K-MAX helicopter has transported more than 3.5 million pounds of cargo in war zones for the U.S. Marine Corps. Its manned mode allows the Marines to reposition the aircraft "without having to go through an extensive UAS checkout," says Jon McMillen, K-MAX business development lead. In addition, during maintenance flights, a pilot may notice problems that

Armasuisse is flying Aurora's Centaur to test UAS sensors. Photo courtesy Aurora Flight Sciences.

the helicopter's data collection systems can miss.

"Whenever a pilot goes on, they are able to feel subtle vibrations that they haven't felt before," McMillen says. "They are able to hear things, smell things."

Two Northrop Grumman Firebirds are under contract with an undisclosed customer to undergo flight testing at a company facility in Mojave, Calif. Interest in Firebird is growing, because the system can be used for a variety of missions, including communications relay and multiple forms of intelligence gathering, according to the company.

"If you need to react quickly to an event, a pilot may be the best option," says George Vardoulakis, Northrop Grumman vice president for medium-range tactical systems. "Should the aircraft be conducting surveillance activities over a long period, the unmanned option would be the best fit. The versatility of the system really allows for cost savings to our customer during operations, because they don't have to purchase different aircraft to meet specific mission needs."

Proxy Technologies has tested its technology on SkyRaider and Velocity propeller-driven planes. In January 2012 in Wilmington, Del., a SkyRaider OPA was controlled from a Boeing manned reconnaissance aircraft.

Davis believes the U.S. Department of Defense will operate in foreign countries where it is permitted to fly unmanned aircraft in sparsely populated areas but must use piloted aircraft over cities. An OPA would allow the DOD to operate throughout such countries with one aircraft type, he says.

Besides its work with Proxy, Boeing has its own OPA projects. In mid-2012, for instance, Boeing's Unmanned Little Bird, with "safety pilots" aboard, performed autonomous takeoffs and landings in shipboard tests off the Florida coast.

Not Just Aircraft

Optionally manned systems are not limited to the air. Oshkosh Defense has demonstrated that its TerraMax kit can turn manned U.S. military trucks into optionally manned platforms. This technology can allow one person to control a convoy of these trucks, reducing the number of people in harm's way while transporting supplies or clearing roadside bombs. But all of the trucks can still be driven the traditional way if necessary.

"It really makes sense to be optionally manned, because there will probably always be a time where you need someone to get in and drive," such as in hard-to-navigate areas, says John Beck, Oshkosh's chief unmanned systems engineer. "Also, there is certainly an advantage to these vehicles not looking different from normal manned vehicles. It makes it much more difficult for an enemy" to determine which trucks have people in them.

Proxy is talking with car manufacturers about applying its technology to "driverless cars," which might start hitting roads in 2020. Automating cars could reduce accidents caused by human error, allow senior citizens who can't drive to have access to the motorways, and enable vehicles to share information to deconflict their routes and ease traffic congestion, according to Davis.

"We believe the regulatory agencies in most countries will initially require the driver in the seat, kind of as the safety driver, for a period of time where he or she could take control," Davis says. When "everybody gets more comfortable with the technology, a driver would not be required in the driver's seat."

Thales UK and Autonomous Surface Vehicles Ltd. are developing Halcyon, an optionally manned boat, to destroy mines. Thales displayed Halcyon at the Defence & Security Equipment International (DSEI) 2013 conference in London in September.

"We're looking at what we can do with an unmanned surface vehicle with other unmanned sensors and platforms on board it," says Stuart Robinson, marketing manager for Thales Underwater Systems. "The idea is that we keep the man out of the minefields by putting an unmanned platform into the threat area and then deploy other unmanned systems from this platform."

Thales UK and Autonomous Surface Vehicles Ltd. are looking to remove humans from harm in mindfields with the Halcyon optionally piloted boat. AUVSI photo.

Since Halcyon is optionally manned, "it provides flexibility and additional options for how the vessel is used," Thales spokesman John Warehand adds. "It can be used unmanned for a wide range of capabilities — for example, mine warfare, hydrographic or antisubmarine warfare — but if the situation demands it, the commander can choose to quickly use it in a manned configuration." ■