

Proxy Finds Niche with Low-Cost, Smart Swarming Capability

By Matt Mientka

In a world dominated by others, smaller designers now and then find a niche that fosters true innovation in the continuous evolution of intelligent aircraft.

Executives and designers at Proxy Aviation Systems of Germantown, Md., believe their approach to the market represents the eponymous concept of *Blue Ocean Strategy* (2005), which holds that true innovators create opportunities—or blue oceans—within a “red sea” rife with the blood of competition.

With a staff of fewer than two dozen, the aircraft manufacturer eschews the model of expensive unmanned aerial vehicles for a system linking numerous lower-cost airframes in an intelligent swarm. Last month, Proxy invited *Unmanned Systems* to its hangar for a look at the system, comprised primarily of the SkyRaider heavy-lift, optionally piloted aircraft and the SkyForce Distributed Management System. The system employs a network-centric approach to cooperative flight, by which a constellation of several unmanned aircraft work autonomously to complete preplanned missions, each governed by a “virtual pilot.”

Though missions might be preplanned, complex algorithms permit true autonomy as the missions are carried out, says Patrick Money-maker, president and CEO of Proxy. “With the SkyRaider, the autonomy resides in the aircraft itself in the virtual pilot ... so you can have the ground station go down and the mission continues,” he says. “The software is the elegant piece of it.”

The system might represent one of today’s smartest birds in the sky, as a system that does not learn but “understands” its sensors and mission within a rules-based hierarchical system.

“The autonomy really comes from the ability to perform all of the command and navigation piloting functions autonomously,” says

Money-maker. The aircraft don’t “hit the ground or each other and [they] stay away from designated no-fly zones or potential threat envelopes or, if a sensor alerts on a target, then the whole constellation will then pull in to support ... and validate the information on that particular set of coordinates.”

In essence, the system uses enough preplanned intelligence to adapt to changing situations, such as mechanical problems or other sensory information. If oil pressure runs low, an aircraft knows what to do. If a sensor reveals new information, an aircraft knows what to do. If one of the vehicles in the constellation detects a “point of interest,” the others know what to do: swarm to the area to work the problem as a team.

In fact, every “aircraft in the constellation has an image and memory of the virtual pilot and each aircraft in the constellation has an image and memory of the complete status mission and vitals of not only the host aircraft but [those of] the other aircrafts—in real-time,” Money-maker says.

SkyRaider

As a platform for the airborne system, the SkyRaider offers an alternative to more expensive heavy-lift unmanned aircraft on the market, one that also allows the unmanned vehicle systems industry a way around restrictions imposed by the U.S. Federal Aviation Administration on the National Airspace System—given that developers may at least test unmanned technology via an optionally piloted aircraft, with the human “riding shotgun.”

Composed primarily of fiberglass with a wingspan of 20 feet, the 2,000-pound airframe lifts 2,200 pounds with a 40 cubic-foot “quick-change” payload bay, taking off and landing autonomously.



Proxy Aviation’s optionally manned SkyRaider

The company says the aircraft offers a robust platform for low- to medium-altitude, long-endurance missions of persistent nature, such as intelligence, surveillance, reconnaissance, communications relay, or even firing weapons. In addition, the aircraft provides the capability to drop and release externally stored payload. Though other engines might improve capabilities, the current iteration of the SkyRaider flies with a 260-horsepower engine with an endurance of 20 hours that allows, with a turbocharged option, a flight ceiling of 20,000 feet.

When networked with the Universal Distributed Management System, in addition to the virtual pilot, the aircraft not only takes off and lands autonomously but may participate in cooperative flight with as many as a dozen aircraft. The software system may also control other unmanned aircraft from off-the-shelf ground-control stations, airborne consoles or forward-deployed laptop-size workstations.

The primary mission-management hardware for the system resides within the Multi-Unmanned System Control Station, a van-size vehicle that allows a technician to coordinate the missions involving not only multiple unmanned aircraft but ground system nodes, including remote and mobile user terminals and other mission-management stations. Within the control station, three technicians may work to manage the system while controlling and monitoring aircraft and relaying important information to other system nodes.

With the right sensors, the system might be employed to find hidden mines or improvised explosive devices, helping military forces clear roads just an hour or so ahead of scheduled convoy travel, for example. Among many advantages, the system offers the military and

homeland security buyer an efficiency of cost, Moneymaker says.

“With our software, we can field a system with a fraction of the staffing footprint and personnel, which are costly, as well as fundamental hardware costs that are a fraction of the cost of the Predator [made by General Atomics Aeronautical Systems of San Diego] to field,” says Moneymaker, adding that the SkyRaider matches its rival in loitering but with greater speed and lift capability. “We have a sprint that can allow a response quicker than a Predator” and, as a composite aircraft, “we’re more flexible.”

Proxy successfully demonstrated the aircraft’s autonomous takeoff and landing for the U.S. military in July 2007 at Creech Air Force Base in Nevada, the first phase of the system’s development. This year, the company plans to use \$4.4 million in funding from the Pentagon to demonstrate in the second phase of testing the cooperative flight of the system required of the next-generation of UAVs field by the U.S. Air Force. In June, Proxy plans to demonstrate the ability for one technician to control, or supervise, multiple, mixed unmanned vehicles, including Tier II and III vehicles. Aside from demonstrations for the U.S. military, Proxy has participated in several exercises with a large systems integrator, hoping to field a system using the platform and mission-management software.

Moneymaker says Proxy hopes to soon field a system for the U.S. military and to sell products to others in the unmanned systems industry interested in testing their sensors. “To underscore, the definition of a blue ocean opportunity is one that materializes ... in a sea of competition—there is no competition here,” Moneymaker says.

Matt Mientka is associate editor of Unmanned Systems.

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