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Draganfly

X4-ES sUAS First Look:

Agency Tests Draganfly for Varied Public Safety Missions

By **Alan Frazier**, Deputy Sheriff, Grand Forks (ND) County Sheriff's Office, Assistant Professor, University of North Dakota's John D. Odegard School of Aerospace Sciences

Photos courtesy of Mesa County (CO) Sheriff's Office, Shawna Widdel, UND Aerospace and Bob Cary, UND Aerospace

No, "Draganfly" is not a misspelling. The small unmanned aircraft system (sUAS) is named for Zenon Dragan, founder and owner of Draganfly Innovations based in Saskatoon, Canada.

Founded in 1998 as a hobby remote-controlled helicopter company, Draganfly has grown to be one of the leading manufacturers of sUAS for public safety agencies. The company has manufactured more than 8,000 small helicopters. Currently, 15 public safety agencies in five countries deploy Draganfly sUAS. A Draganfly X4-ES sUAS operated by Royal Canadian Mounted Police is credited with the first "save" by an sUAS, when the Mounties used a FLIR TAU-640 infrared camera payload on the aircraft to locate an injured and disoriented man who had walked away from a roll-over traffic collision in below freezing temperatures near St. Denis, Saskatchewan.

The Grand Forks County Sheriff's Department (GFSD), collaborating with the University of North Dakota's (UND) Law Enforcement Unmanned Aircraft Systems Research Project, began utilizing a Draganfly X6 sUAS in February 2010. In May 2013, GFSD took delivery of a Draganfly X4-ES sUAS. Also in May 2013, the UND was designated as a factory-training center for Draganfly sUAS flight training.

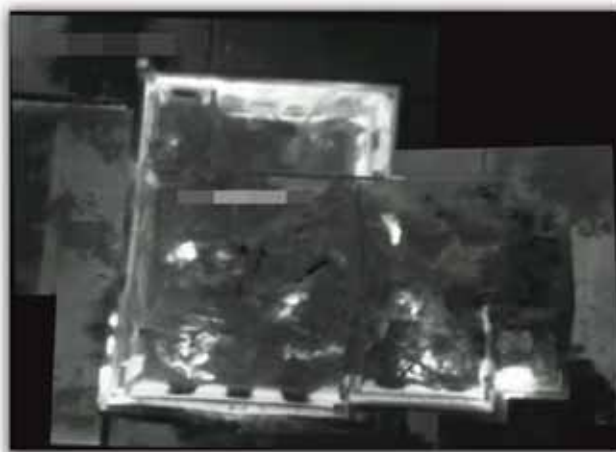
UND pilots have logged more than 70 hours of flight time with the X6 and X4-ES. During that time, the Draganfly airframes have proven to be stable and easy to fly.

Exploring the X4-ES

The X4-ES is a 5.7-pound quad-rotor sUAS with four brushless electric motors powered by a lithium-polymer battery that allows average flight times of 20 minutes. Its 11 separate sensors contribute to its stability and controllability. The X4-ES is a "pilot's

aircraft" in that it requires direct pilot control for some operations (principally landing), yet it has the ability to remain stationary through the use of a hold function enabled by its GPS reception capability.

The X4-ES is controlled via Draganfly's proprietary multi-function ergonomic hand controller/ground control station. The hand controller places both flight and payload controls in logical and easy to manipulate locations. Control use is intuitive and straightforward. A left mounted joystick controls throttle and yaw while a right mounted joystick controls pitch and roll. Top mounted buttons control motor engagement and disengagement, as well as the camera shutter. Two rear-mounted buttons control camera zoom. The center area of the hand controller is occupied by a large LCD screen, which provides aircraft telemetry information and a live video from the aircraft's camera. The screen is bright and viewable during





The Draganfly X4-ES in Brief

List Price:	\$25,000
Price as tested:	\$25,000 (including Sony DSC-RX100 digital camera)
Range:	1 km
Endurance:	20 minutes
Length:	36.25 inches
Weight:	5.7 pounds (with Sony Camera Payload)
Payload:	Sony RX-100, Sony NEX5R Low Light, FLIR TAU 640 thermal imaging

sunny conditions. The entire system is transported in a 19 x 24 x 10-inch polycarbonate case that complies with airline checked baggage requirements.

The X4-ES has been flown in over 25-knot winds by factory personnel. GFSD-UND pilots have flown the sUAS successfully in 15-knot winds. GFSD-UND flight policies and procedures dictate the use of a pilot and separate sensor system operator. To accomplish this, sensor system operators utilize the handheld ground control station while the pilot flies the aircraft with a less sophisticated hand held controller that does not offer a live video feed. GFSD-UND personnel have not found this to impede operations but provided an added safety bonus as the pilot is not distracted by the video. The sensor system operator, who also serves as a visual



observer, operates the camera. Crew resource management is critical, as the pilot and sensor system operator must communicate succinctly and clearly to accomplish.

The X4-ES uses a gimbaled, gyro-stabilized payload mount capable of carrying a variety of payloads, including a combination still/video camera, a low-light camera or an infrared camera. High definition video and still photos are captured on an SD card within the camera. Standard definition photos are stored in the memory of a global cache service, which creates folders for each flight and stores associated data and standard definition photos. This has proven to be the best sorting and data storage protocol GFSD-UND personnel have experienced with the four different sUAS they fly. The system saves many man-hours when it is time to remove and either delete or store data files.

Comparisons With the X6

Both the Draganfly X6 and X4-ES have been utilized dozens of times by public safety agencies in missions as varied as searching for victims to identifying hot spots at structure fire scenes. In September 2011, the Mesa County (CO) Sheriff's Office used an X6 with a FLIR Tau 640 infrared camera to identify hot spots and locate the point-of-origin of an arson fire that destroyed a historic hall in Grand Junction, CO. Two years later, in September 2013, Mesa County used the X6 to locate the body of a victim who fell 450 feet to her death from a scenic overview point. Images taken from the aircraft allowed the recovery team to formulate a safe plan for recovery of the body. In June 2013, GFSD utilized an X6 to aid in a search for a drowning victim in a large flooded area that was largely inaccessible to ground teams due to mud and debris. Although the victim was not located at the time, the aircraft saved many man-hours searching a difficult and dangerous area.


In comparing the X6 and X4-ES, UND-GFSD pilots prefer the X4-ES's handling and performance in high winds, as well as its increased battery capacity (an additional 8-10 minutes of flight time). While flight time is directly proportional to wind velocity (higher winds require more electricity to produce more thrust), UND-GFSD pilots have routinely achieved flight times of 18-24 minutes with the larger battery. Another significant improvement in X4-ES is the ability to program the lost link protocol to return the aircraft to "home" (the takeoff location). Previous Draganfly aircraft initiated a landing at the lost link location, which could be problematic if the aircraft was over difficult to access terrain or water.

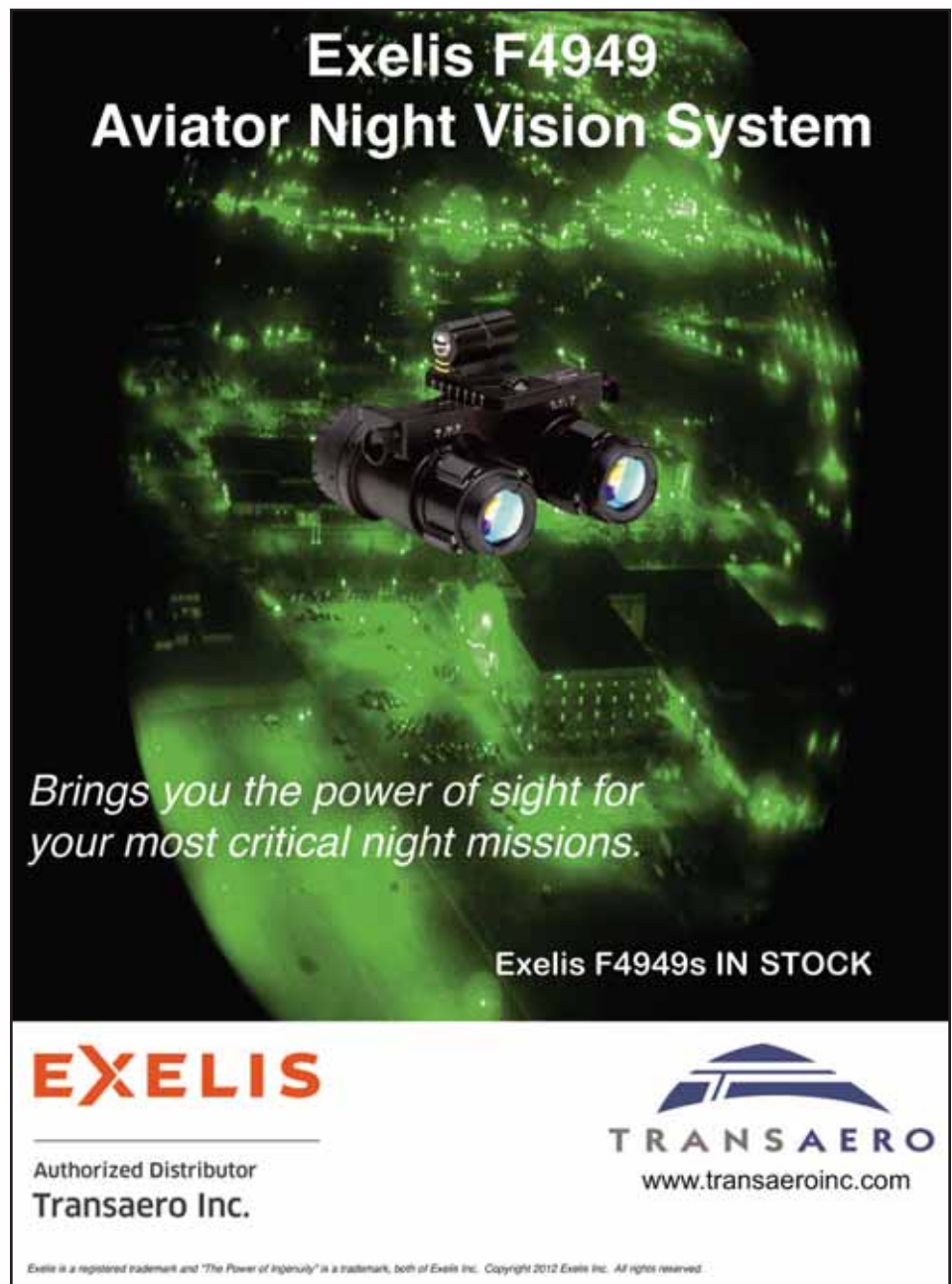
The X6 and X4-ES payloads offer both strengths and weaknesses. The available off-

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the-shelf cameras are well designed, robust and affordable, and all of them offer good resolution photos and video. The cameras

are complimented by Draganfly's gyro-stabilized mount, which keeps them level regardless of aircraft attitude. However, only one payload can be carried at a time. If an operator wishes to switch from a visual to infrared camera, the aircraft must land first. Although a payload swap can be done within minutes, the lack of ability to instantly switch from visual to infrared imagery is a limitation.

Training to fly the Draganfly airframes consisted of traditional ground and flight instruction conducted by Draganfly Factory Personnel. The two-day course was comprehensive and focused on hands-on activities. Draganfly is a relatively small company currently employing 17 personnel. This size yields high levels of customer service, and UND-GFSD personnel have indicated factory support has been outstanding. 




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