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Wylie's larger Unmanned Aerial System craft, weighing in at about 10 pounds, makes it the best choice for windy conditions.

WYLIE'S UNMANNED AERIAL SYSTEM: VALUABLE PUBLIC SAFETY TOOL

By **Judy Truesdell**, Communications Specialist, City of Wylie
Photo By **Craig Kelly** Flyover Photos By **Wylie Fire Rescue**

It's the Thursday before Halloween, and more than 6,000 Wylie citizens and visitors move up and down Ballard Avenue, in the heart of historic downtown Wylie, for the annual trick-or-treat event, Boo on Ballard. Perched atop one of the venerable buildings are Wylie Fire Rescue (WFR) Firefighter Kate Hull and Fire Inspector/Investigator Joe Wetzel, with eyes in the sky, helping to ensure the downtown event is a safe and crime-free time with friends, fun, and family.

Providing a bird's-eye view of the crowd is one of Wylie's two Unmanned Aerial System (UAS) aircrafts, sending photographs and thermal-imaging video back to the operators and to Captain Katy Willoughby at the mobile command post.

The Process

Wylie has one UAS and one sUAS (Small Unmanned Aerial System) in its arsenal, and the uses for the crafts are becoming more evident by the day. Planning for the program began in January of 2016 when Hull found the notes of a former WFR member. "I was instantly intrigued and knew this was something I wanted to do," she said. Hull met with other interested department members, and, after much research, they presented their proposal to the city council, focusing on how other fire departments were using UAS technology for many and varied calls and rescue situations. They also noted that, in addition to fire, other agencies such as police, public works, fire marshal investigation, and economic development would benefit as well. Council agreed it would be an asset to WFR and the City.

Completing the paperwork to obtain the Jurisdictional Certificate of Authorization through the Federal Aviation Administration was the most time-consuming part of the process, but Wetzel undertook that challenge. The first UAS was purchased in June 2017, and the second in August 2017. Wylie's UAS team consists of Willoughby, who leads the program, Wetzel, Hull, and four additional firefighters (Firefighters Brandon Storm and Travis Martinez and new pilots Firefighters Jared Buckmeier and Patrick Hewitt), all of whom have undergone the 60-hour training to fly and monitor the UAS crafts. When a situation arises for which UAS technology is deployed, the on-duty pilot responds with the aircraft, and the call goes out to all off-duty pilots, so they can respond to the scene. The equipment is currently headquartered at Wylie's Fire Station Two (of three).

The Equipment

The larger UAS, the M210, is the craft best suited for flying in adverse weather conditions; carrying its camera equipment and two batteries, it weighs 10 to 15 pounds and is more stable in wind. The M210 can actually be operated by two people – one flying the aircraft and a second operating the camera from a separate remote location. This craft is specifically designed for public safety, due to its ability to support multiple attachments such as a thermal imaging camera or one with a zoom lens. It has self-heating batteries for use in cold weather. The smaller sUAS, the Mavic, weighs approximately five pounds and requires only a single battery. It is best suited for situations requiring maximum maneuverability. Depending on the speed of the flight, number of attachments, wind velocity and other weather conditions, both crafts have a flight time of approximately 30 minutes on one set of batteries, and both crafts will automatically return to home base if battery power runs low. Originally, there was a 20-second delay for images to reach the operator's screen. Now, with improved software, the delay is only one or two seconds.

Multi-Departmental Use

In the fire service, thermal technology can be used to detect hotspots – areas inside walls or under debris that still have heat or still-active fire, despite the appearance that the fire has been extinguished. "A thermal imaging camera (TIC) allows firefighters to identify these hotspots during a fire to guide us through the thick black smoke," Willoughby said. "It also helps us ensure the fire is completely extinguished prior to leaving the incident." When firefighters arrive, the TIC can help locate the fire if no smoke or flames are visible. This was the case in downtown Wylie the very day of Boo on Ballard in 2018. A fire broke out in a restaurant that shared common walls with two other businesses. Although the damage to the restaurant was massive, the UAS assisted firefighters in seeing flames and hotspots, thereby containing it to the original building – always important, but especially when 6,000 visitors were expected downtown that night.

Although firefighting is its primary focus, the UAS program is yet another example of the cooperation between Wylie's agencies. Police and fire alike use the technology to ensure citizen safety. The smaller craft, for example, was recently used in a SWAT operation in which a suspect was inside a house. The sUAS provided operators eyes on the structure from a safe distance, enabling them to see through the windows and also determine whether a gate was locked.



Wylie also assists other cities and organizations. Grapevine Fire reached out for assistance regarding a possible fatality fire in a home that was too structurally unsafe for firefighters to enter. The owner's truck in the driveway made them fear that he was inside. Wylie also assisted the Texas Forest Service and multiple fire departments battle a large grass fire in Farmersville, flying where vehicles couldn't go and transmitting images; helped locate a car stranded in dense tree growth during a flood in Harris County during Hurricane Harvey; and assisted the Texas Fire Marshall's Office with assessing a multi-million-dollar-loss structure fire in Richardson, among many other instances.

The program has value as a promotional tool. Special licensing is required for applications other than safety and training, such as marketing or commercial uses. (Even flying the crafts for event-planning purposes is considered commercial.) One Wylie pilot holds that special Remote Airman license, and the other five expect to complete their training in March. Non-emergency uses for the crafts include video of the area, for example, of the location of Collin College's new Wylie campus. The footage was used not only for meetings with the college, but also for retail companies and restaurants considering Wylie for new locations.

The Price Tag

Costs associated with the program can vary. Multi-rotor systems can run up to \$75,000 or more, depending on the type of aircraft and the technology it carries, such as thermal cameras, zoom cameras, orthomosaic photography (pictures that group overlapping images to create highly detailed, up-to-date maps in true scale), and 3D mapping equipment. When the M210 was purchased, it had just become available and was around \$10,000. The Mavic cost about \$1,500. Additional costs include \$5 per hour to recharge batteries, plus staffing.

Looking Ahead

Wylie team members hope to purchase a spotlight and laser that can be used to help crews on the ground find subjects during rescue operations, as well as providing overall scene safety. Also on the wish list is an inflatable life jacket/raft system that can be carried out to a victim during a flood and dropped to them, inflating upon contact with the water. New technology will enable WFR members to obtain gas readings at HazMat incidents. Team members are currently working with Wylie's GIS coordinator to create 3D maps and images of structures for pre-planning, fire investigations, and accident scenes.

The technology is fast moving and progressive, requiring Wylie's pilots to stay at the forefront of recent innovations. "With each new advancement, we are given newer tools to do our job better and save lives," said Willoughby. "From new antennas that reach farther, to new cameras that are sharper, to tech that allows us to see in low-light search and rescue, or cameras that let us see the hotspots in any fire, new technology is available almost daily. Each tool makes it easier for us to make our citizens safer."

For more information about the Unmanned Aerial System, contact Willoughby, Wetzel or Hull at katy.willoughby@WylieTexas.gov, joseph.wetzel@WylieTexas.gov, or kate.hull@WylieTexas.gov.

Public Information Officer Craig Kelly, Capt. Katy Willoughby, Fire Inspector/Investigator Joe Wetzel, and Firefighter Kate Hull contributed to this story. ★

