PRESS BACKGROUNDER

DATE: **January 26, 2016**

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PHOENIX AIR – VERIZON – PULSE AEROSPACE

DEMONSTRATES DELIVERY OF CRITICAL MEDICAL SUPPLIES BY UNMANNED AIRCRAFT

Recently, a team of unmanned aircraft pilots and specialists with Cartersville, Georgia based Phoenix Air UNMANNED, were handed a map with coordinates to a "soldier-down" who was in desperate need of blood and hemorrhage control products. Getting to the injured soldier by medevac helicopter or ground Humvee ambulance was going to take hours – the soldier was seven miles away from medical help and isolated by a harsh countryside. There were few options on the table.

The pilots studied the map looking at terrain, routes to the soldier and routes back out. They looked at the payload – a 10-pound tactical trauma kit consisting of four units of blood, hemorrhage control instruments and combat gauzes, factored in the weather and then began entering data into a laptop computer.

The payload of life sustaining blood was packaged and attached to the bottom of a Pulse Aerospace Vapor 55 unmanned helicopter. The senior pilot pressed a button on his laptop and the autonomous rescue mission was underway – the pilot's job was done; now computers, barometric pressure sensors, satellite-based GPS receivers and highly sophisticated aircraft control systems would take over for the entire 14-mile round-trip mission.

The completely automated Vapor 55 helicopter was quickly airborne, climbing to 500-feet and turning away, flying off toward the injured soldier seven-miles downrange. The delivery point is

the roof of a three-story building located in a non-descript Middle East village crowded with open markets, alley ways, office buildings and walled residences. The injured soldier and his teammates are holed up somewhere inside the three-story building.

Minutes after going airborne, the helicopter arrived above the pre-designated building and hovered down to a point 10 feet above the flat roof. The Vapor 55 released the tactical trauma kit attached under its belly – the units of blood, Z-Medica Combat Gauze, and trauma supplies dropped onto the roof, landing within a pre-programmed three-foot circle locked into the helicopter's flight control system. The Vapor 55 then corkscrewed back up to 500 feet of altitude and turned back toward its starting point seven miles in the distance. Minutes later, the helicopter arrived back at its starting point and landed. All in all, it had flown 14 miles and delivered a 10-pound package with pinpoint accuracy, all programmed in advance and without any human involvement once the pilot pressed a single "start" button on his laptop.

Was this building in a village in Afghanistan, Mali or Libya? No, it is located at the Mississippi National Guard's Camp Shelby near Hattiesburg, Mississippi, where more than 100,000 military personnel are trained every year in realistic settings for deployments around the world.

Mission Concept Originated at Harvard Medical School

Welcome to the new age of delivery of critical medical products or supplies in places where there is not a hospital or pharmacy on every corner – or even within a hundred miles.

The concept was developed throughout 2015 by Lt. Col. David King, MD of U.S. Army Joint Special Operations Command and Director of Trauma Research/Professor of Surgery at Harvard Medical School, and Pulse Aerospace, LLC of Lawrence, Kansas.

Dr. King was watching advances in Unmanned Aerial Systems (UAS) and wanted to conduct a peer review project based around the delivery of medical trauma kits to war fighters via an unmanned aircraft, since speed is the best means to increase survivability of wounded or injured soldiers in the field. Dr. King learned of developmental work underway at Pulse Aerospace, on a specialized unmanned helicopter that seemed to fit his concept. Eventually Dr. King made contact with Aaron Lessig, CEO of Pulse Aerospace, and discussions got underway.

"Research and development work on our high endurance UAS helicopters was difficult because current FAA regulations require that all unmanned aircraft flown in U.S. airspace must remain within view of the pilot at all times," Lessig explained. "Our goal was an autonomous, long-range, multipurpose aircraft capable of performing different missions for commercial and military clients both within and beyond line-of-sight of the pilot."

Pulse Aerospace's twelve-year history of developing advanced flight control systems and unmanned vehicles has resulted in UAS aircraft with military grade capabilities at commercially relevant price points. This experience and R&D has produced the FAA approved Vapor 35 and Vapor 55 with class leading endurance, payload, precision and safety. These systems provide the capacity for commercial operators to carry the heavy, high-end sensors necessary for real work while staying within FAA weight limits.

From Ebola Flights to Unmanned Flights

About the same time Dr. King contacted Pulse Aerospace, another company was looking into the burgeoning new field of unmanned aircraft. Phoenix Air Group, Inc., headquartered in Cartersville, Georgia was just beginning to explore the use of unmanned aircraft to add to their portfolio of highly specialized work for various agencies of the U.S. Government, such as their role as a provider of electronic warfare training services to the U.S. military and NATO, and a leader in international air ambulance services. Phoenix Air would also soon become immersed in some of their most complicated aviation work to date when the Ebola virus crisis erupted in Western Africa.

Several years earlier, Phoenix Air, along with the U.S. Centers for Disease Control and Prevention (CDC) and U.S. Department of Defense, had developed a very sophisticated patient isolation system for installation in several of their customized Gulfstream business jets. The system would allow them to transport highly infectious patients over long distances, while keeping their pilots and medical crews safe from exposure and possible infection. The U.S. Department of State contacted Phoenix Air in July, 2014 inquiring if they could transport Dr. Kent Brantly and medical technician Nancy Writebol (both infected with Ebola and near death) from Monrovia, Liberia back to the United States for advanced treatment. Phoenix Air immediately deployed their specialized aircraft on high-risk mission since their isolation system had never been deployed before. The system performed exactly as designed, and over the next nine months the company performed over 40 Ebola-related flights from Western Africa to Europe and the U.S.

Just prior to the Ebola virus arriving on the world's doorstep, an internal decision was made by Phoenix Air managers not to integrate unmanned aircraft operations into Phoenix Air, but to set up a sister company aptly named Phoenix Air UNMANNED, LLC. Fellow Atlantan and retired U.S. Army helicopter pilot William Lovett came onboard as managing director of the new unmanned program. One of his early tasks was to seek out the best in class of unmanned aircraft manufacturers for Phoenix Air UNMANNED to align with. Pulse Aerospace and Phoenix Air UNMANNED soon developed a close business relationship.

Phoenix Air UNMANNED set out to obtain FAA authorizations to operate UAS aircraft in a variety of fields such as motion picture and television camera platforms, precision geospatial survey, commercial inspections of utility company power lines and pipelines, agriculture inspections, and other developing uses for UAS aircraft. Within a year, Phoenix Air UNMANNED received all of its FAA certifications and the company became operational.

Camp Shelby Evaluation

Aaron Lessig at Pulse Aerospace and Dr. King at Harvard had been working for over a year to find an appropriate U.S. military base with restricted airspace where they might set up the peer review project Dr. King had long sought. They identified Camp Shelby Joint Forces Training Center in Mississippi as ideal, with restricted airspace where a UAS could fly freely over its 134,000 acres (200 square miles) and where Camp Shelby Range Control sets the rules for

overhead flights of unmanned aircraft…it is the perfect place for unmanned and completely autonomous aircraft to fly many miles beyond the UAS pilot's line-of-sight as normally required by the FAA.

Pulse Aerospace managers reached out to their military and industry contacts which included senior leadership at Verizon, and Phoenix Air reached out to several U.S. Government agencies responsible for emergency medical situations around the world. The operational evaluation program was born and military airspace at Camp Shelby was reserved. Z-Medica, an innovative blood clotting technology company, also joined the evaluation. Z-Medica is the creator of QuickClot hemostatic products which are in every combat medic and military corpsman's medical bag.

Deploying unmanned aircraft in emergency situations in addition to the battlefield can occur such as after natural disasters like Hurricane Katrina, or for product deliveries into isolated villages or encampments difficult to reach by road. The program added a new layer – a non-military integrated communications network allowing for ultra-secure application access via a Software Defined Perimeter. Drawing upon Verizon's experience supporting Hurricane Katrina response efforts, Verizon developed a Concept of Operation for delivering real-time communications, collaboration and a Common Operating Picture (COP) environment.

This new approach demonstrated it was possible to unite multiple stakeholders (who had not worked with one another previously) to rapidly create, deploy and execute the underpinnings required to plan, operate and support the UAS mission. Verizon leveraged CorasCloud, a cloud-based rapid application development environment, to build a comprehensive UAV mission management environment in less than 72 hours. Verizon then integrated the App with VCORE Solutions 4DScape visualization environment tied to a Verizon mobile phone and a tablet camera to complete the onsite visual picture.

Bringing it all together, Verizon deployed multiple satellite assets from their Mobile Emergency Response team, establishing a Mobile Command Center, remote Satellite Communications and fly-away packages that facilitated Software Defined Perimeter connectivity with Vidder's Precision Access technology. Verizon's highly sophisticated Mobile Command Center was brought into Camp Shelby and operated alongside the Phoenix Air UNMANNED Ground Control Station. The mobile Verizon system created a secure wireless "bubble" around the immediate area to permit hand-held mobile devices such as personal smart phones and tablets to connect into the Mission Control Center so that everyone involved in the evaluation project could communicate.

"This effectively demonstrated our ability to accomplish what was nearly impossible to achieve ten years ago at this same location (Camp Shelby) during the initial phases of the Katrina Response Effort," said Verizon's Jeff Schweitzer, chief solutions architect. "We can now use commonly available technologies that everybody carries, such as a smartphone, to instantly create actionable intelligence and rich collaboration across nearly any network that's intact after a catastrophe. With key technologies, our expert team and the art of the possible, we made this real in the middle of a muddy field in Camp Shelby, Mississippi."

During the evaluation, four separate missions were flown delivering tactical trauma kits containing critical blood products into an isolated location seven miles downrange from the Ground Control Station, and every mission was deemed a success. The time variance between four identical flight routes of 14 miles was less than 12 seconds, demonstrating the precision and predictability of the unmanned aircraft and flight control systems in real-world conditions.

On hand to observe the project were more than 50 employees from the U.S. Department of Defense, federal law enforcement agencies, cyber security organizations, Harvard Medical School and regional power and utility companies.

“This may be the first time that an FAA-approved commercial off-the-shelf UAS autonomously launched, delivered a truly relevant payload to a specific location, and recovered to its starting point,” stated Phoenix Air’s Will Lovett. “The real take away from this evaluation is the particular aircraft we used today with 10-plus pounds of deliverable payload. The Vapor 55 can be easily scaled to a larger unmanned aircraft carrying much heavier payloads for further distances.”

Echoing that, Pulse Aerospace’s Aaron Lessig told the assembled observers that they are already working on new prototypes capable of transporting over 100 pounds of payload.

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