



## Unique Urethane Material Helps Micro Air Vehicle Project Take Off

Bill Romey

Paramount Industries, Inc. of Langhorne, PA received a contract to manufacture Honeywell International's (Morristown, NJ) newly-developed ducted-fan Micro Air Vehicle (MAV) (Figure 1) for tactical military reconnaissance and surveillance. Each MAV is small enough to be carried in a soldier's backpack, and provides situational awareness day or night by forward and downward looking electro-optical and infrared imaging sensors. This unit, which is powered by a gasoline engine, is capable of a helicopter-like "hover and stare," vertical climb rate of 25 feet/second and can fly horizontally, achieving up to 50 knot airspeed. MAV can fly at altitudes between sea level and 10,000 feet, functioning in urban environments and rugged mountain terrain. It weighs 18.5 pounds fully fueled and stands 13 inches tall.

Production orders in excess of 100 UAS (un-manned air systems), each containing 76 complex plastic parts, were delivered in the first quarter of 2007. Additional systems will be delivered in the last quarter of this year.

The prototypes for the MAVs consisted of 76 polymer production parts, 68 of which are cast urethane. In early 2005 after extensive research, Paramount selected **PTM&W Industries, Inc.** (Santa Fe Springs, CA) to supply their urethane material for the phase one prototypes because of its unique strength-to-weight ratio and its higher operating temperature ceiling. Silicone rubber tooling was a rapid solution and cost-effective during the prototype development process.

"MAV prototypes were wind-tunnel tested and had to fly," said Jim Williams, president of Paramount Industries. "The problem was finding a urethane system that would emulate the mechanical properties specified by the program aerodynamicist and design engineers. When we started, we knew that MAV was destined to be converted to thermoplastic injection-molded materials. Finding a match for prototyping was challenging. Little did we realize at that time that cast-urethane parts would transition from prototype into actual production flight hardware. We needed a war-fighter mission solution leaving little doubt to its reliability."

According to Gary Schulberger, Paramount's production manager, urethane systems from several manufacturers were tested, but none provided the necessary combination of stiffness, dimensional stability, impact strength and strength-to-weight ratios needed for this demanding application.

The problem was solved when they made test parts with PTM&W Industries' PT8902 urethane casting system. PT8902 provides a unique combination of high hardness (D-85), stiffness (386-ksi flexural modulus), elongation (21 percent) and toughness (2.1 ft-lbs./inch Izod impact strength). Heat curing PT8902 was necessary to optimize the mechanical properties.

The stator (Figure 2), used to direct airflow from the propulsion fan, was a special challenge because of extremely tight tolerances, including the diameter dimension and concentricity of the outer rim, thin wall cross-sections and its complex air-foil geometry. "Casting this part due to the complex geometry is no trivial task but the results have been outstanding both visually and dimensionally," Williams said. He added, "Our client was extremely pleased with the results, which in turn led to ongoing production contracts."

*Bill Romey is the national sales manager for PTM&W. For more information on PTM&W Industries, call (800) 421-1518 or visit [www.ptm-w.com](http://www.ptm-w.com).*

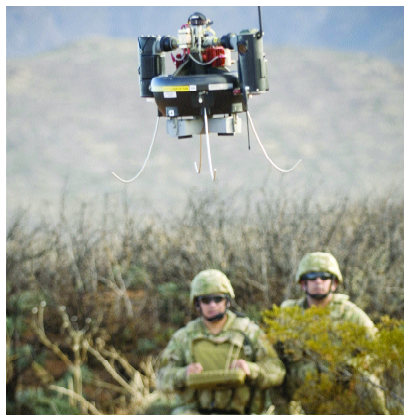


Figure 1: Micro Air Vehicle.



Figure 2: MAV Stator.

Images courtesy of Honeywell International Corp.