The 12M™ Tethered Aerostat System: Rapid Tactical Deployment for Surveillance Missions
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The 12M™ is the latest in a series of compact Tactical Aerostat Systems and has been developed by TCOM to satisfy a requirement to lift small electronic payloads in a battlefield environment. At standard conditions from sea level it can lift 60 lb to 1,000 ft. Previous papers have described earlier designs for the 15M, 17M, 22M and 28M Class systems, which carry larger payloads to higher altitudes.

The 12M™ Tactical Aerostat System was developed as a self-contained, expeditionary, low cost unmanned lighter-than-air system. Two complete systems, including mooring station, ground control equipment and payloads can be transported in a 20-ft ISO sized envelope. In addition, the entire system can be carried with a half-ton pickup truck or relocated using helicopter transport.

The required launch pad area is approximately 80 ft diameter. The system can be set up and made operational in less than two hours using a crew of three persons, and launch or recovery of the aerostat also requires a crew of three. Typical flight duration capability is 5 to 7 days while maintaining adequate free lift, followed by a short moored period for addition of helium to the aerostat.

The aerostat flexible structure is an aerodynamically shaped nonrigid structure that uses helium as the lifting gas. It is designed to operate in 40 knot steady winds and survive 50 knot steady winds while airborne or moored. The 12M™ helium volume is slightly greater than 6,000 cubic feet. The helium-filled empennage uses fins in an inverted "Y" configuration. An internal air filled ballonet compensates for helium expansion/compression during ascent/descent and a blower is used with the air ballonet to automatically maintain hull pressure. The rigging lines spread the load forces from the tether to the flexible structure material. Special enhancements that result in a lightweight system are described in the paper.

The mooring system is a completely new and simple design that uses a safe and proven launch and recovery concept with nose line and port and starboard closehaul line winches. The main tether winch is capable of 80 feet per minute inhaul or outhaul. While moored the aerostat can weathervane on the mooring system. Slip rings are provided to allow power to be continuously fed to the mooring system at the rotating base and through the rotating winch to the aerostat. Also, a fiber optic rotary joint is integrated into the tether winch and rotary base to pass data to/from the payload.

The high strength tether is a single cable that contains conductors for power. Two optical fibers embedded within the tether core are used to communicate aerostat and payload data between the aerostat and the ground processing unit. Surrounding the power conductors and optical fibers are the high modulus strength member layers. The outer layer consists of a polymer outer jacket to protect the core from the environment.

The aerostat is designed for and has successfully handled various payload components at the same time. The aerostat system can be customized with payloads that include video surveillance and SIGINT / COMMS Relay equipment, enabling military forces to obtain actionable data, even in the most remote and challenging terrain. Payloads are attached to the rigging lines using special lightweight mounting racks. Typical power supplied to the payload is 0.5 kW, 28VDC. A ground-based display unit is supplied for monitoring the payload and aerostat parameters. Avionics on the

aerostat include an airborne power and communications unit, an automatic rapid deflation device, weather sensor, and airborne cables.

The new 12M™ Tactical Aerostat System adds a unique capability to the aerostat suite. A complete description and the development of the system is presented along with altitude and payload capability charts. Various payload applications are also presented.