

# Low Cost, High-G, Micro Electro-Mechanical Systems (MEMS), Inertial Measurement Unit (IMU) Coordinated Development and Manufacturing Effort for Common Guidance

Micro Electro-Mechanical Systems technology to provide inherent cost savings and size reduction, and for application to navigation and control systems for small missiles and munitions.

## OBJECTIVE / SOLUTION

The goal of this program is the design, development, and implementation of automated manufacturing technologies for low-cost, high accuracy, high-g, survivable MEMS IMUs and Common Global Positioning System (GPS)/IMU guidance components. ManTech funding will establish automated manufacturing technologies that will allow production of IMUs that will meet 90% of DoD munitions, missiles, and potentially soldier and unmanned aerial vehicle needs.

## ACHIEVEMENTS

Prototypes have survived Air Gun Test to 20,000Gs set back and Ballistic Rail Gun Test to 13,200Gs set back. Prototypes have survived Gun Launch Testing at Yuma Proving Grounds to 20,000Gs set back. Phase 1 is complete. Phase 2, IMU testing has been completed and performance goals met. Phase 3 performance and packaging is still in development (2 in<sup>3</sup> volume).

## BENEFITS

The Army is pursuing technologies to meet transformation goals of a lighter, faster, more lethal, and greatly reduced logistical footprint. Munitions and missiles are major contributors to the logistics footprint and are essential to increase lethality in the field. MEMS technology provides inherent cost saving, size reduction, reduced power consumption, and enhanced commonality. Using MEMS technology, gyroscopes, accelerometers, and control electronics can readily be integrated to form tightly packaged, low-cost, high performance IMUs. Projected benefits to MEMS-based IMUs versus conventional IMUs are:

- 66% weight reduction
- 90% volume reduction
- 80% power requirement reduction
- 75% cost reduction.

## STATUS

- Phase 2, IMU packaging, received delivery of first six (6) units in January 2005
- Final six (6) units to new performance specifications delivered June 2005.
- Phase 3, IMU is scheduled for completion in August 2007, and planned production beginning in FY08.

## WEAPON SYSTEMS / SECONDARY ITEMS IMPACTED

- Missile and munition programs potentially impacted at end of Phase 2 include the ERM, Excalibur, AGS-155, XM395 Precision Guided Mortar Munition (PGMM), MRM, Compact Kinetic Energy Missile (CKEM), and Long Range Land Attack Projectile (LRLAP).
- Programs potentially impacted at end of Phase 3 include SDB, Joint Standoff Weapon (JSOW), Joint Common Missile, Guided Multiple Launch Rocket System (GMLRS), JDAM, Patriot PAC-3, Theater High Altitude Area Defense (THAAD) System, Soldier Navigation, and Wind Corrected Munition Dispenser (WCMD).

## POTENTIAL COST AVOIDANCE

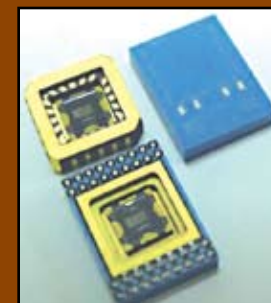
- Projected manufacturing cost avoidance of \$880,000,000 from FY06 through FY12.



Theater High Altitude Area Defense (THAAD) System



Phase 3 Inertial Measurement Unit (IMU)



Common Ground Control Station (CGCS) Sensor Package