Innovative Technology

**Topic Number** | A09-013
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**Topic Title** | Airworthy Cable Angle Measurement System For Slung Load Operations

Helicopters often participate in heavy-lift vertical resupply operations. Both manned and unmanned helicopters would potentially benefit from load stabilization through accurate cable angle feedback. Advanced Optical Systems (AOS) has developed a Cable Angle Measurement System, which measures a helicopter’s load position and motion at the end of an external sling. The system uses a camera, a Light Emitting Diode target and custom electronics to provide an accurate, low-cost solution. The system offers better than 0.1 degree accuracy across a 150 degree field of view and with 0.1 degree/second angle rate accuracy. The cable angle measurement system provides cable angle and angle rate data at 50 Hz with very low and deterministic latency. AOS’s technology enables direct slung load stabilization by providing feedback to the pilot, flight computer, or automatic load stabilization system. The technology helps to expedite the process of helicopters either picking up or dropping off a load. This is especially useful for unmanned cargo helicopters.

Military and Commercial Significance

AOS received a Phase II Small Business Innovation Research (SBIR) award of roughly $500,000 from the DoD focused on demonstrating the stabilization capability of the technology.

The stabilization effort was an extension of an earlier Army SBIR effort. In addition to SBIR funding, the company has received over $1.5 million in funding from two Army programs. These include a Joint Capability Technology Demonstration funded with roughly $1.2 million and an effort through the Aviation Flight Test Directorate worth approximately $350,000.

In a related technology development effort, AOS has received SBIR funding to address lifting remote minehunting vehicles as part of the Navy’s Littoral Combat Ship mission.

Potentially, the technology could be used in civilian applications such as: passive displays to monitor difficult loads for impending load instability in forward flight; flight director guidance for load stabilization by the pilot in the case of difficult loads; and precision load control in hover in such operations as rooftop equipment installation and air rescue with a Helibasket.