

Air Force
SBIR

Transition Impact

Vibration Isolation System Enables Airborne Laser (ABL)



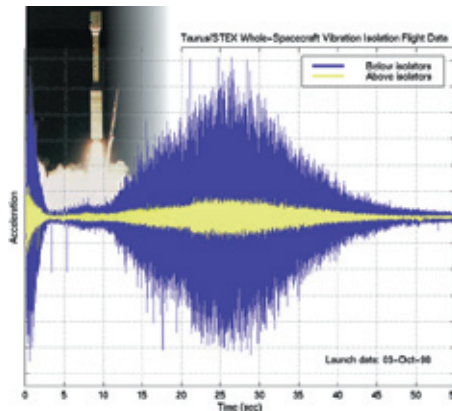
- **SBIR-sponsored small business provided the enabling technology to solve this mission critical problem**
- **The Airborne Laser is vital for tomorrow's Air Force**
- **Without a system for controlling dynamic vibration and precise registration of multiple optical benches the ABL will not perform as required**

Air Force Requirements

The Airborne Laser (ABL) is expected to be the Air Force's first operational fielded directed energy weapon system. The ABL will provide theater missile defense to protect U.S. troops anywhere in the world. One of the most critical issues with ABL development has been the simultaneous stabilization, alignment and vibration isolation of the laser segment resonator optics during flight. The requirements for rejecting unwanted vibration coupled with the competing requirements for extremely precise registration of multiple optical benches in the ABL aircraft is unprecedented. Without precise vibration control the ABL will not operate as advertised.

SBIR Technology

The isolation system is a critical and enabling ABL component, in that it is absolutely necessary to stabilize and align the resonator optics of the ABL laser segment, the primary component of the system. These challenges of precise vibration control were overcome through the SBIR-sponsored development of an innovative system of frictionless, ultra-soft air springs combined with high-performance magnetic actuators. The result was precise, dynamic, six degree of freedom alignment control for the ABL resonator optics with dramatic reductions in transmitted vibration across a broad spectrum from 1Hz and above. In other words, extremely precise position control coupled with an ultra-soft ride for ABL optics, an unprecedented achievement in meeting such competing requirements. The isolation



system that was developed solves the critical issue of providing multiple, extremely stable platforms for sensitive laser optics during all possible flight conditions while operating in the presence of large laser-induced vibration, acoustic, and shock disturbances.

Air Force Transition Payoff

Under an SBIR Phase II, an Airborne Suspension/Vibration Isolation System was designed, built and tested. The isolation system essentially flies a stable optical bench within the aircraft, allowing the transition of high-power laser technology from the laboratory

to an operational weapon system that can operate in the "real-world" environment. Without this system the ABL might not be possible. One of the most complex isolation systems ever built, it successfully demonstrated the advanced technology required to meet the stringent ABL requirement. The Optical Bench Isolation System (OBIS) flight system simultaneously meets the unprecedented requirements for rejecting the large unwanted vibrations affecting the system coupled with the competing

requirements for extremely precise registration of multiple optical benches spaced more than 50 feet apart in the ABL aircraft. This successful SBIR Phase II project has transitioned to a \$6M follow-on contract to build a ground demonstrator and the OBIS. The OBIS system will be a critical enabling component in future operational ABL and other directed energy systems.

SBIR Topic:

AF97-074

Title:

Airborne Suspension/Vibration Isolation System

Contract #:

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SBIR Partner:

CSA Engineering, Mountain View, CA

Technical Project Management:

AFRL/Space Vehicles Directorate

SPO Transition Office:

SMS/DET-12, Space & Missile Center, Space Test Program

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