

Air Force SBIR Transition **Impact**

Low Shock Separation System Dramatically Reduces Satellite Failures



- **The shock of separation of satellites from the launch system (i.e. rocket) cause many failures requiring development of a satellite low shock separation system**
- **System is now base-lined on over a dozen satellite programs**
- **The Lightband system is 25% lighter, 50% smaller, 40% cheaper, and generates <5% of the shock of existing conventional pyrotechnic separation systems**
- **SBIR innovation viewed as an enabling technology: development of a satellite low shock separation system**

Air Force Requirements

During the past decade, billions of dollars have been lost due to satellite malfunctions resulting in total or partial mission failure. These malfunctions are often directly attributable to vibration loads during launch and satellite separation from the rocket. Low shock separation systems are an enabling technology for small (<100kg) DoD satellites and for the launching of fragile spacecraft components, such as advanced optical systems. Small satellites are particularly susceptible to shock-related failure because of the close proximity of sensors and instruments to the shock source, necessitating a low shock separation system. The Air Force required a low-risk small satellite launch system that was completely compatible with existing systems.

SBIR Technology

Using technology explored under the SBIR program, AFRL's Space Vehicles Directorate (VS) successfully developed and transitioned the country's next generation small spacecraft separation system called the "Lightband" from concept to application. Operating under limited SBIR funding a VS team developed, designed, tested, and successfully flew the world's first reusable, non-discrete point, low-shock, non-pyrotechnic, separation system. This "Lightband" system successfully separated the NASA's Starshine-3 primary satellite from Lockheed Martin's Athena I launch vehicle on the first orbital launch out of Kodiak, AK.

Air Force Transition Payoff

Due to the program's success this separation system is baselined into AFRL's University NanoSat Program, TechSat21, XSS-11, SMC's STPSat and MLV-05 (first EELV Secondary Payload Adapter [ESPA] flight), Navy's NPSat, and the Universities "CubeSat". The "Lightband" represents a major advancement in small satellite separation system technology. The "Lightband" is 25% lighter, 50% smaller, 40% cheaper, and generates <5% the shock of existing conventional pyrotechnic separation systems. For the Starshine-3 spacecraft, the low-shock separation system reduced the shock-induced loading from 8,000 g's (typical pyrotechnic separation system) to <300 g's. The "Lightband" provides a capability that reduces on-orbit failures, reduces the cost of design and redesign, and reduces launch costs. It is estimated that this technology could save spacecraft programs several million dollars in life-cycle-costs per spacecraft.

SBIR Topic:

AF 00-032

Title:

Lightband Advanced Development

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SBIR Partner:

Planetary Systems Corporation,
Silver Springs, MD

Technical Project Management:

AFRL/Space Vehicles
Directorate

Transition Office:

Space and Missile Center,
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SBIR

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