



## APPLICATION SPOTLIGHT

# WB MicroTAU

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In 2003, NASA utilized Invocon's Wide-Band Micro-Miniature Tri-Axial Accelerometer Unit, (WB MicroTAU) to monitor a series of foam impact tests at Southwest Research Institute (SwRI) in San Antonio, Texas. The tests simulated the damage caused by external tank foam debris observed striking Space Shuttle Orbiter Columbia 81 seconds after its launch on January 16, 2003.

The tests involved striking various orbital thermal protection materials with insulating foam at speeds and angles of incidence similar to the observed impact on Columbia. The compressed gas gun fired projectiles at 500 mph into a main landing gear door, the bottom of an Orbiter wing section, a wing carrier panel, and a wing leading edge Reinforced Carbon-Carbon (RCC) panel that was removed from the Space Shuttle Orbiter Discovery. This final test punched a hole 16 inches in diameter which would have allowed 3,000 degree Fahrenheit plasma to blowtorch the aluminum structure of the wing as Columbia returned to Earth.



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During this testing, 14 WB MicroTAU units were located in and around the target articles with accelerometers mounted on the surface of the target. The system recorded the impact signature at 20,000 samples per second. NASA included Invocon's units in testing to verify that the WB MicroTAU could perform ascent and on-orbit monitoring for impacts and penetrations. As expected, the test proved that WB MicroTAU hardware matched the performance of large, traditional, wired instrumentation systems and could be capable of wireless ascent and on-orbit monitoring, processing, and event detection.

The Wide-Band Micro-Miniature Tri-Axial Accelerometer Unit (WB MicroTAU) system is a wireless, high-speed data acquisition network for dynamic acceleration sensing and recording applications. WB MicroTAU is a small, battery-powered, autonomous, wireless device designed for trigger initiated acquisition and recording of high-speed data from external accelerometers and low-speed data from an external temperature transducer. Each unit can be programmed for a scheduled or triggered acquisition event. Data download and event setup commands are issued either wirelessly or through a standard USB connection from a Graphical User Interface running on a PC.

Invocon designed the WB MicroTAU to monitor the dynamic behavior between the SSME (Space Shuttle Main Engine) feedlines and the SSME low-pressure turbo-pump that produced the cracks that temporarily grounded the Shuttle fleet in the summer of 2002. The WB MicroTAU is intended to take tri-axial accelerometer data on and around the SSME LH<sub>2</sub> and LO<sub>2</sub> feedlines and their supporting brackets.