"The Avalanche Dummy" - Development and Testing of a System to Measure Loads and Forces Experienced by an Avalanche Victim, Using an Automotive Crash Test Dummy

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Avalanche injury data has generally been derived from medical evaluation of victims, or in the worst case, by autopsy. These post-event examinations evaluate injuries sustained, but cannot directly determine the forces or impact loads experienced by the victim. If an individual is caught in a slide, what forces and accelerations are experienced, and what injuries might result? The MSU Avalanche Dummy project was undertaken to directly investigate the forces imparted to a snow avalanche victim. During initial testing, a full-sized, instrumented crash dummy was entrained in avalanches at the Bridger Bowl Ski area. A portable battery-powered digital data acquisition system was developed and utilized to record multi-axis force data from load cells in the upper and lower leg, and knee. It also recorded head impacts sensed by accelerometers in the bio-fidelic ~200-pound dummy. Test sequences were recorded with both video and still images from setup through explosive-induced avalanche to recovery. This yielded a good visual record of entire test events, for research use and possibly for public avalanche awareness education purposes. Equipment, setup, test protocol and logistics, data correlation, test results, and future test scenarios are discussed.