Presented at 17th International Symposium on the Military Aspects of Blast and Shock,
June 2002, Las Vegas, Nevada

To Film Or Not To Film: Effects Of Anti-Shatter Film On Blunt Trauma Lethality From Tempered Glass

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ABSTRACT

A very common approach to retrofitting existing conventional buildings for blast effects is to apply anti-shatter film to all exterior windows. The easiest way of applying film is through "daylight" application, where the film terminates near the edge of the pane of glass and is not attached to the window frame. For annealed glass, this serves to hold fragments together and greatly reduce the risks due to sharp, high-velocity shards of glass. For tempered glass, however, the penetration hazard is already mitigated by the small cubic fragments into which the glass is broken; daylight application of film thus may actually increase lethality by holding the glass sheet together, producing a more massive object that impacts the human and causing more severe blunt trauma.

A recently conducted series of experiments exposed anthropomorphic test dummies to impact from glass sheets, both filmed and unfilmed, at a range of blast environments. The dummies were instrumented to measure head accelerations, from which an estimate of lethality could be obtained. The results show that, at very high levels of impulse, the addition of film to a tempered glass window does not change the outcome: both cases produce a fatality. However, at lower loadings, the results suggest that adding film will increase the lethality by one AIS level. That effect may be even greater at intermediate load levels where test data is currently unavailable.