



National Technical Systems has over 40 years of experience in providing energetic materials engineering, research, and test services. Engineers in Littleton, Colorado have demonstrated expertise in energetic material research, breaching studies for both military and civilian organizations, and human injury studies. The Colorado Operations Division, located in Littleton, is able to assist armor manufacturers and developers to accurately assess the performance of current and new armor designs verses Improvised Explosive Devices and Mine Blast threats.

### **Anthropomorphic Test Device (ATD)**

For many years ATD's have been used to simulate the dimensions, weight proportions and articulation of the human body. Most ATD's are instrumented to record the dynamic response to crash – most notably is the ATD's used in the automotive industry to document crash studies. More recently, ATD's have been used in explosive testing to simulate the response of the human body to the peak pressures and impulse resulting from explosions. The ATD's are particularly useful in determining efficiencies of Advanced Chemical Energetics (ACE) – sometimes referred to as thermobaric or enhanced blast weapons. Conventional measurement techniques do not accurately describe the performance of the material in these cases, but using ATD's, peak pressure and impulse effects can be more accurately measured.

The Hybrid III is the latest example of a manufactured ATD to satisfy crash related human injury studies. However, for explosive testing, the Hybrid III is very expensive (\$100K-\$150K) and prone to severe damage during the testing. Thus it is not cost effective to use the Hybrid III for explosive testing involving fragmentation/debris. During the past several years alternative ATD's have been developed which attempt to capture blast effects, mostly "Blast Lung" from blast overpressure, some examples include the Blast Test Device (BTD), the Thoracic Rig, and Jellman. However, none of these systems are designed to operate in a fragmentation environment. NTS is developing a new modular ATD (see next page, Blastman, Figures 1 and 2) that can use parts and systems from the other ATD's named above (and others) to measure "blast Lung" or use its own thorax system to capture "Blast Lung" and simultaneously measure many other lethal insults.

## Blastman I

The current combined and simultaneous measurements of “Blastman” include:

- **External pressure** - Total reflected, static, dynamic
- **Debris/Fragmentation** - Tissue damage
- **Whole body translation** - Acceleration, rotation, displacement, impact
- **External heat flux** - Skin burn/thermal load
- **Dust/Contaminated air** - Explosive driven and chemical/ biological agents

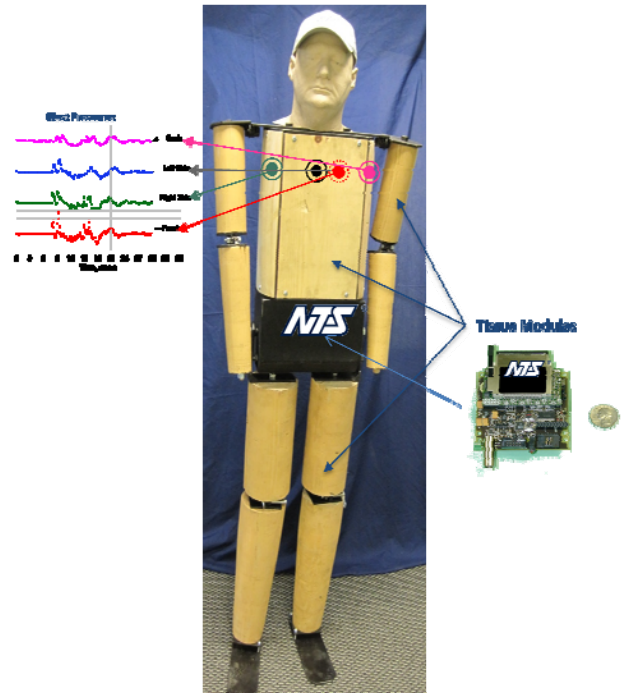


Figure 1. Blastman Prototype Standing

## Blastman II

The next generation “Blastman” (**Blastman II**) will accomplish several enhanced technical objectives:

One, to clad the ATD in a flesh-like outer covering that more closely resembles the human body for enhanced blunt trauma and penetration data – yet, keep it robust and cost effective to maintain. Two, to better understand the brain injuries occurring in theater due to IED events will require research and design of a head surrogate for ATD’s providing enhanced technical information.

This information involves measurements of various insults to the brain. Therefore, in addition to the traditional measurements associated with explosive effects, with the new Blastman II ATD NTS will be able to offer increased resolution with new “flesh” covering and measurements associated with brain and central nervous system damage/problems.

The design objectives for all generations and versions of the Blastman ATD are to keep the ATD (test dummy) inexpensive, robust, modular (user defined biofidelic accuracy), position/place and test (fully self contained and unrestrained) capable of simultaneous multiple insult measurements.



Figure 2. Blastman in Sitting Position