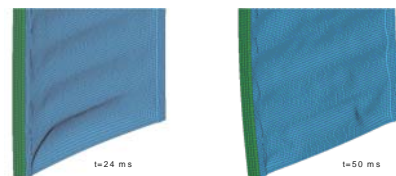
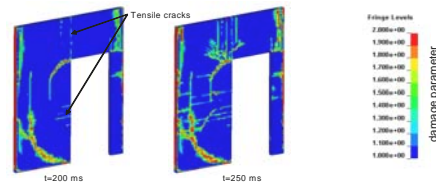
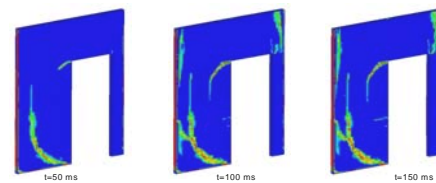
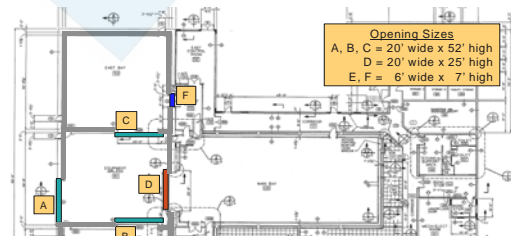


Explosive Hazards and Risks

ACTA provides a full range of services to evaluate the hazards and risks posed by intentional or accidental explosions that include the impact to structures and their occupants and potential mitigation measures. We perform blast, fire, fragmentation and toxic analyses using methods ranging from simplified to detailed blast source and structural nonlinear finite element analyses. We also perform facility-wide analyses to determine the overall annual risk considering the probability of multiple explosion sources affecting multiple buildings and their occupants. ACTA performed blast hazard, risk and mitigation analyses and developed blast safety criteria for Air Force missile ranges, NASA, the Army, MDA, DDESB, FAA, DTRA, oil refineries and the California Department of Education. Some of our projects are highlighted below.

ACTA performed a truck bomb explosion analysis for the Air Force using the HAZX software. The truck inspection area is located adjacent to on- and off-base housing as well as to a day care center and other facilities critical to base operations. To perform the analyses, aerial photos and civil engineering base maps were registered and the locations, occupancy and structural and window attributes of hundreds of facilities, were entered into the HAZX database.

These analyses require an accurate description of the spacecraft and processing bays, structural details of blast walls, gas pressure venting mechanisms and the location of related and unrelated personnel. Blast (shock and gas) and fragment load time-histories are developed using programs such as DebrisHAZ and BlastX. Detailed blast wall and blast door stress patterns are then computed to determine if they can survive the explosion as shown in the figures below.



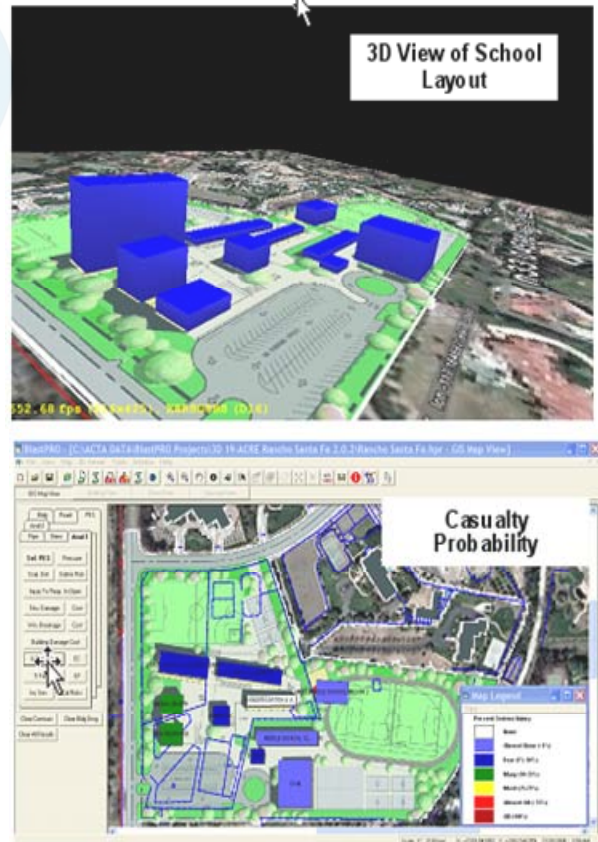
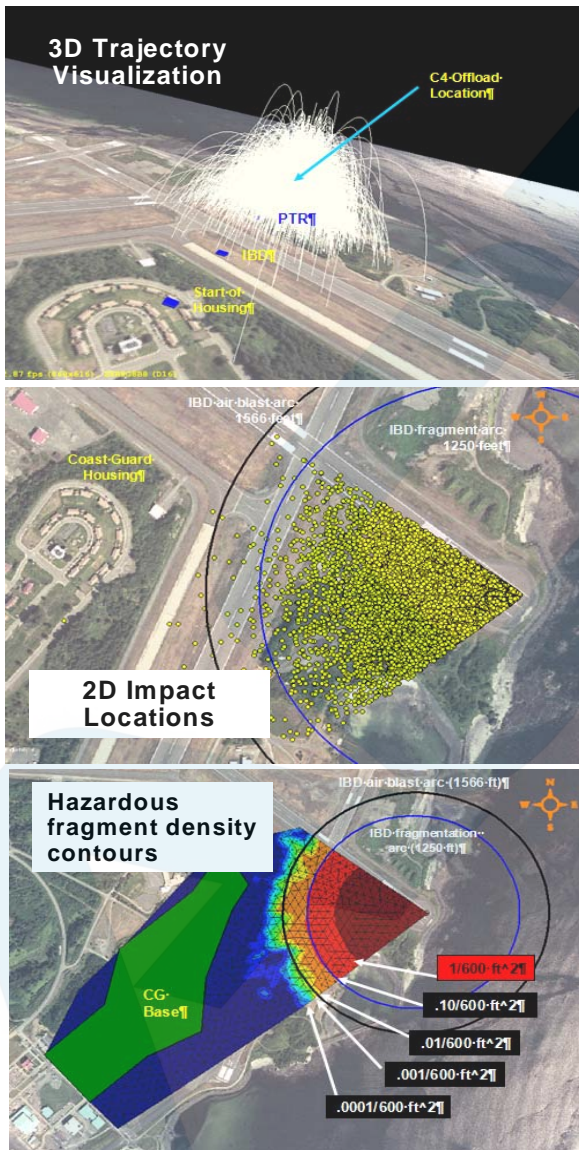
The above figure shows HAZX's visualization of window breakage due to a large truck bomb detonation. HAZX also computes and displays the probability of structural damage and serious injuries and fatalities. HAZX results were used by the base commander to evacuate occupants in base houses closest to the inspection area.

We performed several detailed internal explosion analyses resulting from hazardous propellant processing operations that typically occur during the preparation of a spacecraft for launch.

Our HAZX code offers a unique capability to perform complex fragment throw analyses. Given information that defines the characteristics of fragment groups, including uncertainties in their characteristics, full 3D physics-based simulations of fragment throw resulting from a blast can be performed. HAZX allows a user to define 3D representations of terrain/barriers and extrude 3D building objects and vehicles that could be impacted by fragments. The figures below show HAZX's simulation of Trident Stage 1 and 2 motors exploding during a C-17 offloading operation.

HAZX's fragment module allows a user to visualize fragment throw simulations in 3D and provides added information such as fragment ground impact locations, hazardous fragment density contours and the expected number of impacts to a building's walls, roof and windows and their effects on building occupants.

HAZX includes a module to perform hazard and risk analyses due to a gas pipeline explosion. As stated, a user can enter 3D representations of buildings and define wall, roof, and window and occupancy data. The pipeline can be drawn using the HAZX linear pipeline modeling tool. HAZX then performs a blast analysis assuming an explosion occurs at the worst location relative to buildings, or a risk assessment assuming an explosion is equally likely to occur at any point along user defined pipeline segment(s). We use HAZX to perform gas pipeline explosion analyses for the California Department of Education (CDE). The figures below show an example of a HAZX CDE risk analysis that was required for a school expansion project. We are on the approved list of CDE contractors to perform explosion risk analyses.



ACTA also developed the BlastCAT code that allows air blast analyses to be performed on detailed representations of buildings. BlastCAT meets the General Services Administration (GSA) requirements for assessing window performance subjected to blast loading. As shown in the figures below, BlastCAT allows a user to construct a detailed model of a building including structural elements and different types and sizes of windows. The user can then position explosion sources at any external location relative to the building. BlastCAT computes the reflected overpressure and impulse on each structural and window element and determines its damage state.

BlastCAT allows a user to visualize the blast loading on a building by providing color contours as shown in the prior figures. The effects of blast loading on windows are displayed by color coding each window according to GSA performance guidelines.

Services

ACTA performs explosion hazard and risk assessments and provides explosion assessment tools to a wide range of clients including the Air Force, Army, Navy, NASA, DDESB, petrochemical facilities and California schools.

Products

We license our explosion effects software, HAZX and BlastCAT, to a number of U.S. government and commercial clients and provide training in their use..

ACTA Inc
 2790 Skypark Drive
 Torrance, CA 90505
www.actainc.com

Jon Chrostowski
 Tel: (310) 530-1008
chrostowski@actainc.com

