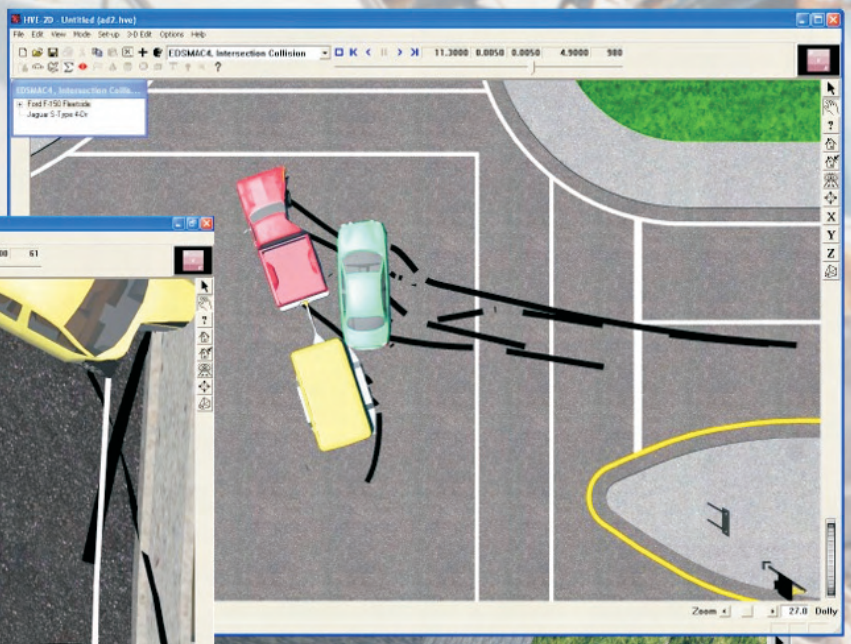
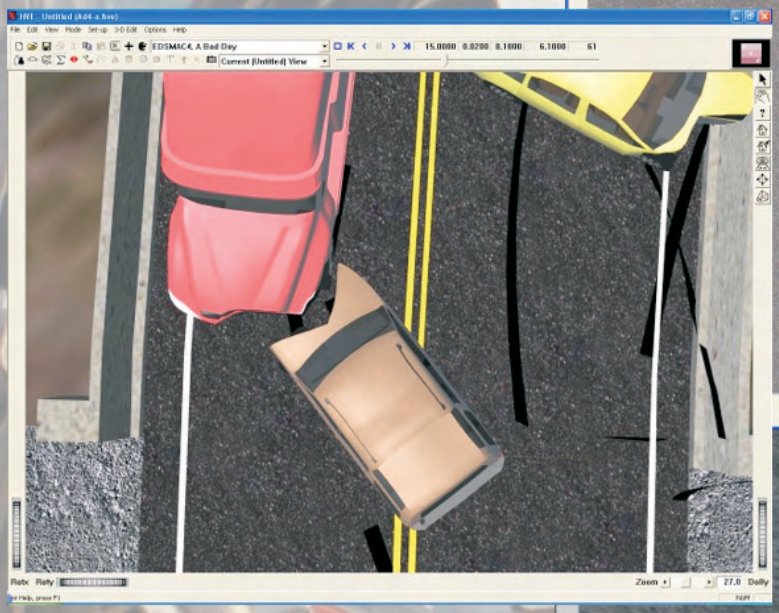
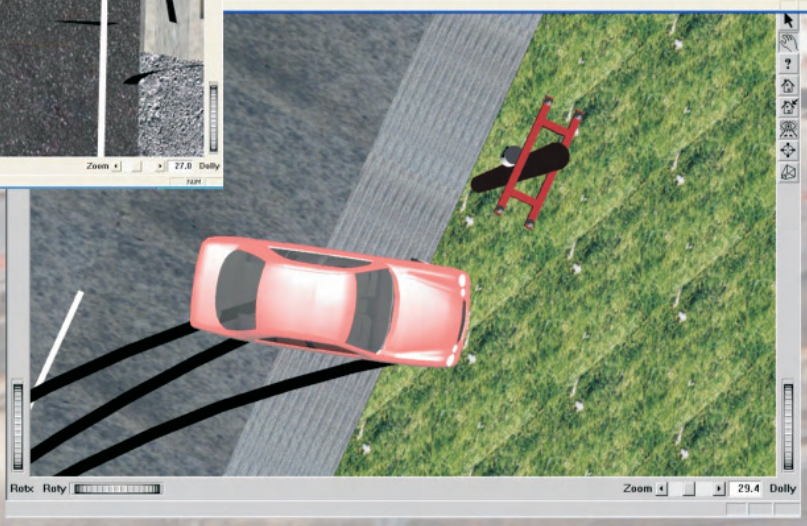
HVE-2D

Human-Vehicle-Environment

Accident Reconstruction Software







HVE COMPATIBLE™

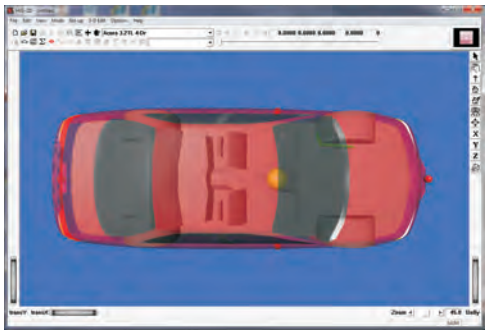
ENGINEERING DYNAMICS CORPORATION

Simulation Software for Vehicle Design and Safety Research

USING *HVE-2D*

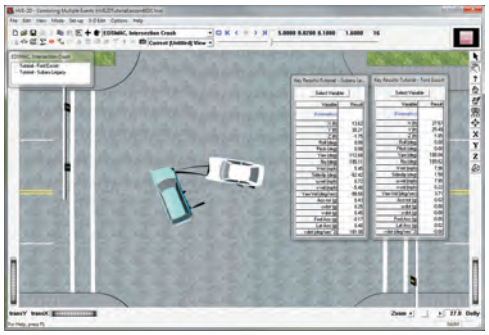
HVE-2D allows you to reconstruct and simulate loss-of-control scenarios and crashes on relatively flat surfaces. Events may involve any number and any type of vehicles, including articulated vehicles. Using *HVE-2D* is very intuitive. First, select the vehicles from the database and then import or create your scaled crash site drawing as the background for your work. Now you are ready to set-up and run reconstruction or simulation calculations and view the results as text and graphic reports. You can even produce simulation movies for real-time playback in your presentations.

HVE-2D has the following components:



Vehicle Editor - Select vehicles from databases according to *Type*, *Make*, *Model*, *Year* and *Body Style*. Vehicle types include *Passenger Car*, *Pickup*, *Sport-Utility*, *Van*, *Truck*, *Trailer*, *Dolly* and *Fixed* and *Moving Barrier*. Once you select a vehicle from the database, all of the data needed for your reconstruction or simulation is complete. If you need to make edits to the data, it's very intuitive. Edit exterior dimensions by clicking on the body. Edit tire parameters by clicking on the tire. You can change the weight, the color, the stiffness coefficients; any data that is important to your analysis.

Environment Editor - Create and edit or import scale drawings or models (DXF or VRML format) to use as the terrain for your reconstruction or simulation. You can edit the gravitational constant. You can create friction zones or edit the friction factor for the entire roadway to simulate dry, wet, icy or other conditions. You can also use aerial photographs and textures, such as asphalt, concrete or grass, to enhance the appearance of the environment.



Event Editor – Setting up your reconstruction or simulation is fast. Simply choose the calculation method (e.g. *EDSMAC4*) for the event and then drag and drop the vehicles directly onto your scaled environment. Assign positions and velocities and use easily accessed dialogs to enter *Driver Controls*, *Damage Profiles*, *Payloads*, *Wheel Data* (*Tire Blow-out*, *Displacement*), *Accelerometers*, and other information. Press the *Play* button on the Event Controller and immediately see the results of your inputs. View *Trajectory Simulations* and *Key Results* of simulations in progress. To fine-tune your analysis or study several scenarios, you can quickly edit positions and other key parameters and re-execute the events.

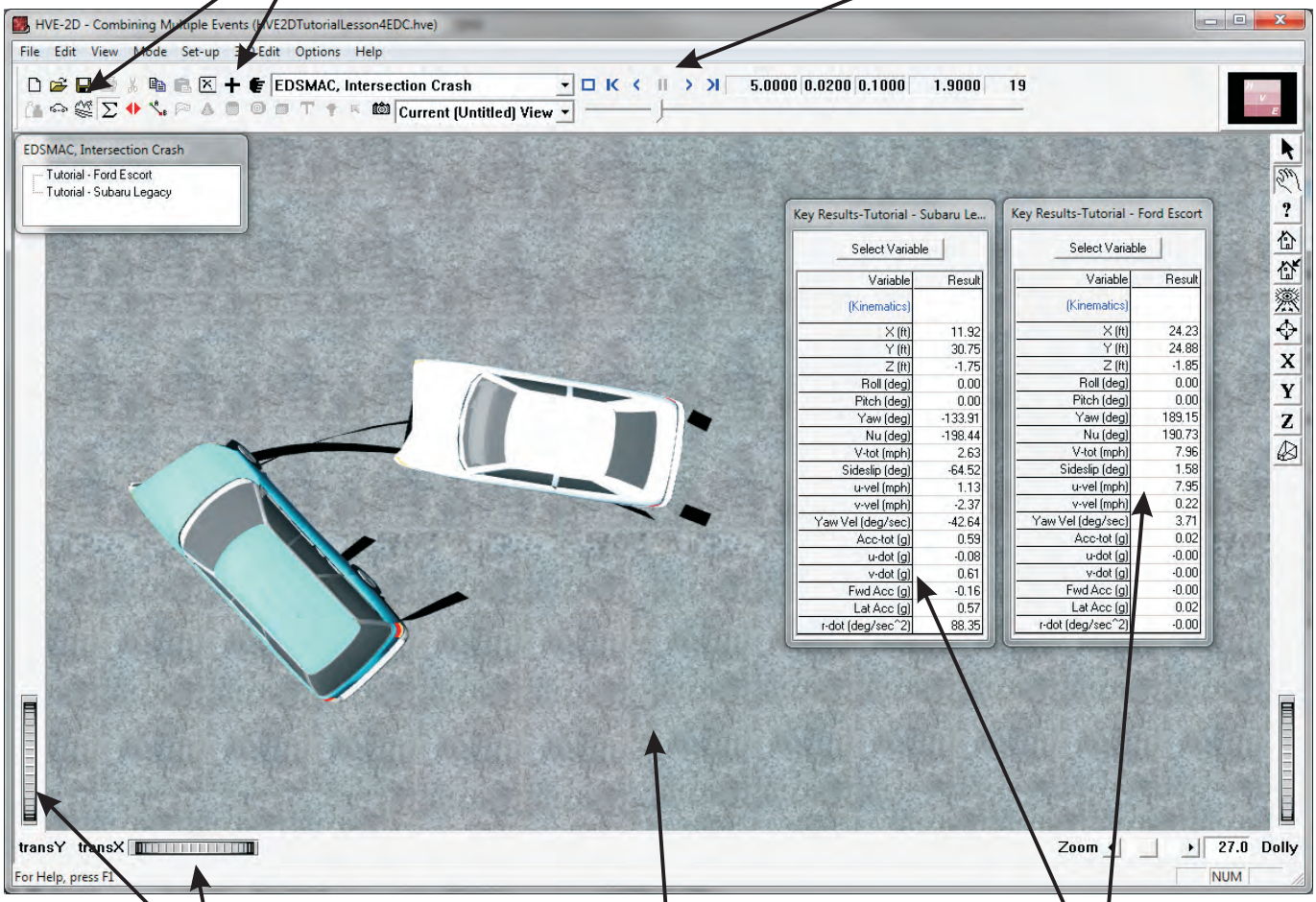
Playback Editor – View and print all program inputs and outputs contained in the *Accident History*, *Audit Trail*, *Damage Data*, *Damage Profile*, *Driver Data*, *Messages*, *Momentum Diagrams* (*Damage*, *Scene*), *Program Data*, *References*, *Site Drawing*, *Variable Output* and *Vehicle Data* reports. View *Trajectory Simulations* and dynamic *Damage Profiles*. Create AVI simulation movies using the Playback Window's video interface.

Program Details

HVE-2D has a single-window design providing easy access to the main menu, toolbar, data entry dialogs, event controllers and other time-saving features, such as the *Distance Tool*. The same window is used when working in the Vehicle, Environment, Event and Playback Editors. An overhead camera view with user-definable scale, pan and zoom control offers excellent visibility when setting-up and executing the event. The camera can even be assigned to follow a vehicle's motion during a simulation.

The Editor buttons on the toolbar allow the user to move quickly between the *Vehicle*, *Environment*, *Event* and *Playback Editors* simply by clicking on the appropriate icon. The user can also quickly create new objects (e.g., vehicles, events) by clicking on *Add New Object*, or view the information dialog for an active object by clicking on *Object Info*. Other routinely used functions are also located on the toolbar.

The Event Controller is used to execute events and display simulation results in the Event Editor. The Event Controller Slider allows the user to review the simulation results time-step by time-step. The numeric fields around the Event Controller provide quick reference to user-selected simulation time controls and also the current frame and simulation time.



Thumbwheels on the viewer allow the user to drag or dolly the camera view. A 3-button mouse may also be used to dynamically manipulate the view.

Single-window design incorporates the viewer and all menu and tool options into an easy-to-use layout. Many of the viewer features can be simply toggled on or off by the user.

Key Results windows can be used to display important calculation results for each vehicle in an event.

Validated Reconstruction and Simulation Models Available for *HVE-2D*

EDCRASH

EDCRASH is a reconstruction analysis of single- or two-vehicle accidents, including collision. *EDCRASH* primary purpose is to determine impact speed and delta-V (a measure of impact severity) based on accident site and vehicle damage measurements. *EDCRASH* is also well-suited for collisions with immovable barriers, such as bridge abutments and large trees.

EDSMAC

EDSMAC is a simulation analysis of single- or two-vehicle accidents involving collision. Accident investigators can use *EDSMAC* to predict and visualize vehicle response before, during and after impact, and also determine impact velocity and delta-V. The procedure involves an initial estimate of the conditions of impact made by the user or supplied by an *EDCRASH* reconstruction; this is followed by a series of user-defined adjustments to the initial conditions until the final results duplicate the physical evidence (rest positions and vehicle damage) found at the accident site.

EDVTS

EDVTS is a simulation analysis of the response of a vehicle-trailer system (either a tractor-trailer or automobile-trailer combination) to driver throttle, braking and steering inputs. *EDVTS* determines how the vehicle and trailer respond to driver inputs by generating the path, velocity, acceleration, tire forces and other vehicle-trailer data as a function of time. Accident investigators can use *EDVTS* to determine how a driver may have lost control of the vehicle-trailer combination.

EDSVS

EDSVS is a simulation analysis of the response of a motor vehicle to driver throttle, braking and steering inputs. *EDSVS* determines how the vehicle responds to driver inputs by generating the path, velocity, acceleration, tire forces and other data as a function of time. The path of the vehicle is also visually displayed on a scaled crash site diagram.

EDSMAC4

EDSMAC4 is a simulation analysis of vehicle collisions. Based on *EDSMAC*, *EDSMAC4* includes numerous extensions developed by EDC. Any number of vehicles, trailers, and/or barriers may be included. Simultaneous collisions between any number of objects are allowed (examples include a multi-vehicle freeway pile-up, pinning a vehicle between a striking vehicle and a tree, etc.). The original SMAC collision model has also been extended significantly, and now includes A and B stiffnesses for each side, as well as direct support for barrier collisions. *EDSMAC4* also provides a robust model for collisions involving articulated vehicles towing any number of trailers, with or without dollys.

EDGEN

EDGEN uses positions and velocities supplied at up to eight user-specified locations (e.g. Initial, Pre-braking, Impact, etc) to determine the time required to travel between each location. Using this time, *EDGEN* calculates the average linear accelerations between each location, and then calculates the current velocity and position at each timestep between the user-entered positions.

Also Available for *HVE-2D*

***EDVDB** Vehicle Database -* *EDVDB* is a comprehensive vehicle database developed by EDC for use with *HVE-2D*. *EDVDB* contains several hundred unique vehicles. Every vehicle in the database is complete with all the data necessary to perform a complex reconstruction or simulation. The use of *EDVDB* will improve results, increase productivity and save time.

EDKEY - The *EDKEY* provides the flexibility to use the software on multiple computers, such as a desktop and a laptop. Simply plug the *EDKEY* into the computer that you wish to run the software on, and the application is unlocked. This flexibility makes is easy to work on computers at your office, your home or while traveling.

3D-VIEWERS - The 3-D viewers in *HVE-2D*+ allow cameras to be positioned anywhere and look everywhere in a 3-D world, just like *HVE*. *HVE-2D*+ users can easily set up ground level views and target-following cameras, such as those used to display a driver's view of an impending crash or show the view of an eyewitness observing a crash.

For more information about *HVE-2D*, reconstruction and simulation models, or other available options, contact EDC Customer Service or visit the *HVE-2D* Product pages on our website at www.edccorp.com.

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