When you complete your simulation in HVE, you are ready to produce video. This makes HVE a very cost-effective presentation tool for every simulation. Non-Integrated solutions often involve miscommunication, software compatibility problems and numerous iterations between the engineer and animator (such as keeping the tires in contact with a 3-D surface during the entire sequence).
**Using HVE, you can . . .**

- Simulate vehicle rollovers including exterior damage.
- Simulate the response of multiple occupants during a rollover collision including contact between the occupants.
- Simulate a crash sequence, change the initial conditions to study avoidability and route both results directly to video showing multiple views including the driver of each vehicle.
- Use virtual thermocouples to monitor brake lining temperatures on a downhill grade.
- Use virtual accelerometers to monitor the velocity and acceleration at any location in the vehicle.
- Simulate the transient response of a vehicle before, during and after a tire blowout.
- Study the effect of occupant positioning on restraint system effectiveness.
- Create a complex 3-D terrain mesh and drive a vehicle on it.
- Use the HVE Path Follower to simulate the driver steering inputs required to negotiate a complex curve.

**HVE: It’s about power . . .**

The above crash sequence was simulated using EDSMAC4. With no additional work, the cause of the crash was obvious by replaying the simulation with HVE's virtual camera attached to the witnesses and driver of each vehicle. HVE's 3-D viewers allow you to zoom, dolly, pan and even spin the entire world.

**HVE's Human and Vehicle Editors** allow you to select from a large assortment of fully defined 3-D human, vehicle and tire data sets in a standard hierarchical database. All properties may be edited using dialogs and viewers. Custom databases, such as EDVDB-3D, are also available containing data sets for specific vehicles (e.g. 2010 Ford Focus 4-Dr sedan) and tires (e.g. Michelin P245/55R16 MXMV4). Databases are user-extendable.

The above sequence used SIMON and DyMESH to simulate loss-of-control and ensuing rollover of a passenger car. The steering inputs required to cause the vehicle to follow the observed tire marks revealed the cause of the crash was due to driver inattention, followed by overcorrection.

The above GATB human simulation involved four occupants in a passenger car. Not only did the occupants strike the vehicle interior, they also struck each other. The collision pulse for this occupant simulation was selected from the EDSMAC4 simulation of the two-car crash.
Quickly Set-Up and Execute Simulations Using HVE’s Editors.

**HUMAN EDITOR**
Select humans (consisting of 14 joints and 15 inertial mass segments with up to 3 ellipsoids per segment) from databases according to sex, age, weight percentile and height percentile. Editable parameters include:
- Inertias
  - Segment Weight, Rotational Inertias (Roll, Pitch, Yaw)
- Contact Ellipsoids
  - Name, Center Coordinates, Semi-Axis Length,
  - Principal Axes, Material Properties
- Injury Tolerance
- Joints
  - Coordinates, Type, Stop Angles, Stop Elasticities,
  - Stop Energy Dissipation, Elastic Constants (Linear, Quadratic, Cubic), Damping Constant, Full Damping Angular Velocity, Joint Injury Tolerance

**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 Barriers. Editable parameter groups include:
- Sprung Mass
  - Inertias, CG Location, Color, Contact Surfaces,
  - Belt Restraints, Airbag Restraints, Inter-vehicle Connections, Aerodynamic Drag, Body Torsional Stiffness
- Unsprung Mass
  - Location, Brake Assembly, Suspension Parameters,
  - Wheel Image
- Tires
  - Number, Spacing, Type, Manufacturer, Model,
  - Size, Performance Parameters (Physical, Load- and Speed-Dependent Fx vs Slip, Fy vs Slip Angle, Fy vs Camber, Slip-Rolloff)
- Exterior
  - Dimensions, Structural Stiffness, 3-D Geometry File
- Systems
  - Brake (ABS System Data, Master Cylinder or Compressor Parameters), Steering (Gear, Column & Linkage Parameters)
- Drivetrain
  - Engine, Transmission (Manual or Auto), Differential

**ENVIRONMENT EDITOR**
Create and edit or import 3-D Environments. Editable parameter groups and file formats include:
- Physical Properties
  - Location (Name, Latitude, Longitude, GMT),
  - Date, Time of Day, Atmospheric Conditions
  - (Wind Speed, Wind Direction, Barometric Pressure, Temperature), Local Gravitational Constant
- Material Properties
  - Surface Constants (Stiffness, Damping, Friction),
  - Unloading Slope, Bekker Soil Exponent, Soil Modulus (Frictional/Cohesive), Moisture Content, Clay Content
- Sky Attributes
  - Ambient Light Intensity, Sky Color, Fog
  - (Type, Maximum Visibility Distance, Color)
- Supported File Formats
  - 3D Geometry – HVE, DXF, VRML, Inventor
  - 2D Images – RGB, BMP, TIF, GIF, JPG

**EVENT EDITOR**
Executes HVE-compatible programs. Observe trajectory simulations and key results of simulations in progress.
- Event Set-Up
  - Initial Position & Velocity, Driver Controls (Throttle, Brakes, Steering, Gear Selection, Path Follower),
  - Wheel Data (Tire Blow-Out, Damage, Brake, Tire-Terrain Model), Accelerometers, Damage Profiles, Payload, Collision Pulse, Contacts, Restraints, Vehicle Mesh (Tessellation Options, Inter-vehicle Friction)
- Time-Dependent Output Variables
  - Kinematics, Kinetics, Accelerometers, 3-D Damage Profiles, Tires, Wheels, Connections, Drivetrain, Driver Inputs, Occupant Contacts, Belts, Airbags

**PLAYBACK EDITOR**
View/print all program inputs and outputs, combine and edit multiple trajectory simulations and record simulation movies (AVI format).
- Outputs
  - Accident History, Audit Trail, Human Data, Injury Data, Vehicle Data, Damage Data, Environment Data, Event Data, Program Data, Driver Inputs, 3-D Damage Profiles, Messages, Momentum Diagrams, 3-D Site Drawing, 3-D Trajectory Simulations, Variable Output

**RECOMMENDED SYSTEM REQUIREMENTS**
- Intel Multi-core Processor (Core i7 preferred)
- Windows 7
- 4 GB RAM (minimum)
- 512 MB graphics memory (NVIDIA preferred)

Please visit our website at www.edccorp.com to download HVE-compatible program datasheets, tutorials, examples, simulation movies, technical papers, newsletters and other related information. You may also contact EDC Sales by phone, fax or email for additional information and assistance.