



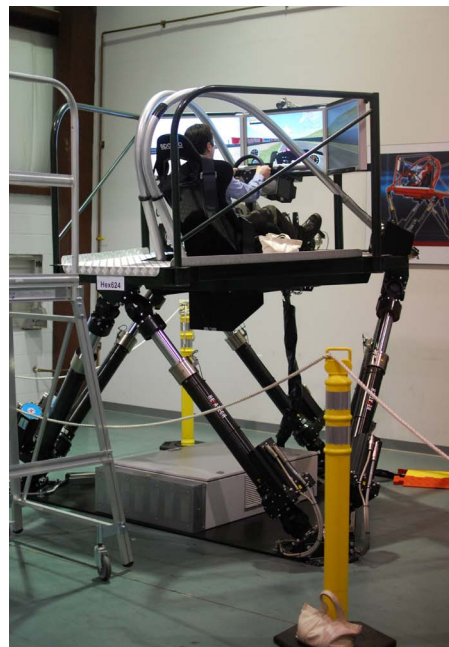
### Overview

Used for training and rapid prototyping, VTTI's Simulator Suite offers many potential benefits to the commercial motor vehicle (CMV) community. Fleets and organizations have the ability to provide high-quality training as well as the ability to prototype and evaluate systems and technologies before moving to full field testing or technology demonstrations. In addition, VTTI's three simulators obtain data using VTTI's proven Data Acquisition System (DAS) for sophisticated driver training feedback.

### Cruden Driving Simulators

VTTI newest additions to its Simulator Suite are two automotive simulators manufactured by Cruden. These simulators feature:

- Full mission driver-and/or hardware-in-the-loop simulation tools
- Ability to network simulators (two drivers in the same environment)
- Three 42" monitors to fully immerse the driver



VTTI's Cruden Simulators (pictured above) and CTAP simulator allow complex and sophisticated scenarios to be quickly generated for testing or training purposes.

- State-of-the-art image generation offering reduced motion blur as well as real-time computer-generated shadowing and environment mapping

*Highway driving is one of the four standard driving worlds used in the CTAP simulator.*

- 6 degrees of freedom (6DOF) motion platform (heave, pitch, roll, surge, sway, and yaw)
- Force feedback steering and seatbelt tensioners
- Fully compatible with Matlab/Simulink
- Ability to integrate simulation models from dSpace, CarSim and VeDYNA
- Ability to manipulate and measure vehicle characteristics:
  - Chassis, wheelbase/tack, tires
  - Suspension settings
  - Drivetrain (engine, gearbox, differentials)
  - Aero loading and aero draft (slip streaming)
  - Steering, brakes
  - Driver aids and safety systems (traction control, stability control, ABS, etc.)

### Commercial Training and Prototyping (CTAP) Simulator

- Commercial vehicle simulator manufactured by FAAC (model TT-2000-V7)

## VTI Simulator Suite (cont.)

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The CTAP simulator is able to replicate a number of vehicle configurations (including conventional and cab-over tractors, as well as single-unit trucks) and driving environments (including different roadway, weather, and traffic scenarios).

- Full mission driver- and/or hardware-in-the-loop simulation tools
- Five 60" forward visual channels providing a 225-degree borderless horizontal field-of-view
- Two 42" rear visual channels
  - Viewed through real flat mirrors
  - Provides real mirror parallax
- 3 degrees of freedom (3DOF) motion seat (heave, pitch, and roll)
- Force feedback steering
- Ability to simulate multiple vehicle types:
  - Conventional and cab-over tractors
  - 5- & 10- yard dump trucks
  - Autoshift, non-synchronized, and fully-synchronized transmissions
    - Eaton Fuller 9- & 13-speed
    - Meritor 10-speed
  - Engine options
    - Cummins 350hp, 435hp, and 500hp
    - 2- & 4-cylinder engine braking
  - Van (28-, 50-, and 53-ft.), flatbed (40- & 48-ft), doubles (28-ft pup) and tanker (40-ft) trailers with variable weight and load distributions
- Interactive and programmable traffic and roadway environments (e.g., snow, rain, construction zones, etc.)
- Ability to trigger vehicle malfunctions (e.g., front tire blowout, air pressure loss, etc.)
- Uses a fully integrated VTTI Data Acquisition System (DAS) with the ability to record:



A view of the interior of the CTAP simulator. All typical controls, gauges, and warnings used in real vehicles are present and operational in the simulator.

- Standard driver performance metrics (steering and pedal inputs, speed, lane position)
- Reconfigurable video views (driver face, over-the-shoulder, forward roadway, side of vehicle, etc.)
- Ability to record data using the same DAS technology in real trucks
- Ability to manipulate and measure vehicle characteristics:
  - Chassis, wheelbase/track, tires
  - Suspension settings
  - Drivetrain (engine, gearbox, differentials)
  - Aero loading and aero draft (slip streaming)
  - Steering, brakes
  - Driver aids and safety systems (i.e., traction control, stability control, ABS, etc.)
- Ability to use custom-generated geospecific worlds
- Ability to custom program additional transmission and engine models
- Ability to add additional vehicle and trailer models



The VTTI CTAP Simulator features rear-mounted monitors that reflect through real flat mirrors. This provides mirror parallax, something that cannot be accomplished with virtual mirrors.



Last modified 1/12/12