UMTRI HEAVY-VEHICLE
INERTIAL MEASUREMENT FACILITIES

UMTRI operates a compliment of facilities for measuring the mass and inertial properties of large commercial vehicles.

The pitch-plane measurement facility is a fixed-place device for determining the position of a vehicle's center of gravity in the pitch plane—that is, the fore/aft position and height above the ground—and its moment of inertia in pitch. The device is configured as a compound pendulum. Large, triangular-shaped side structures include knife-blade bearings which define the pivot axis of the pendulum. Adjustable cross rails allow two- or three-axle trucks weighing up to 50,000 pounds to be positioned appropriately on the facility.

Roll moment of inertia of commercial trucks is determined using a similar compound pendulum which is built up around the vehicle.

Yaw moment of inertia of large vehicles is measured using a multi-filar pendulum hung from the ceiling of the work shop. Specially built “jack poles” help support the ceiling right at the pendulum support points so that very heavy vehicles can be measured.

A variety of smaller multi-filar pendulums are used to measure moments of inertia, in all planes, of components removed from test vehicles, particularly unsprung mass assemblies and tire/wheel/hub assemblies. The inertial properties of the vehicle’s sprung mass is typically calculated based on the measurements of properties of the entire vehicle and the unsprung masses.