



Expanded Emissions
Testing Capabilities



Roadside Safety
Hardware Testing



Fall 2009 Industry
Events List



TRC

TRACKS *newsletter*

Future Space Travelers

Helmeted, strapped in, padded, and climate-controlled. While this may sound like a race car driver, we are actually describing those men and women who ride rockets into space; the astronauts of the National Aeronautical and Space Administration (NASA). As earth's inhabitants, immeasurable efforts have been expended by millions of people to help protect us from harm while when engage in sports, drive a car, wash skyscraper windows, take a bath, and even operate a reclining chair. We take such safety and even gravity for granted. Now imagine being among the relative few working for NASA, and having in your very hands, the responsibility to ensure the health and safety of the lives of the space travelers.

The Transportation Research Center Inc.(TRC Inc.) Impact Laboratory, in conjunction with The Ohio State Uni-

versity's Injury Biomechanics Research Laboratory (IBRL), is playing a key role in the development of the next generation space suit. The space suit testing being conducted here is part of the NASA Constellation Program which plans to send human explorers back to the Moon and then to Mars and other space destinations. Space suit configurations are currently being assessed to understand and address potential crew injury concerns during various mission phases of the new crew exploration vehicle, Orion.

TRC Inc. was chosen for this testing because we have one of three of the world's largest impact simulators. Our Simulator features a 24-inch diameter HYGE Shock



Tester which simulates the deceleration conditions of an impact, but in reverse. Prior to an actual crash, a vehicle and its occupants (dummies) are moving at a constant velocity. At impact, they are decelerated very rapidly. With the HYGE system, the test vehicle and dummies are initially at zero velocity. The programmed, rapid acceleration of the HYGE thrust column accelerates the sled with attached test article(s) and produces an impulse similar to that generated during the rapid deceleration of a moving automobile or aircraft during a crash impact. Depending upon the orientation of the test article(s), crash load simulations of up to 750,000 pounds of thrust can be applied to any

continued next page

Future space continued...

axis. Payloads of 10,000 pounds can be accelerated to 71 mph and attain a peak acceleration of 44 G's. Peak accelerations of 100 G's and velocities of 100 mph can be attained with lighter payloads. More detailed information about our impact simulator can be found on our website at: http://www.trcpg.com/impact_hygesled.asp. The HYGE simulator can also accommodate testing for:

- Anthropomorphic test device development
- Aircraft seat certification and fuselage tests
- Accident reconstruction
- Airbag development
- Seat systems
- Cargo restraint systems
- Child safety seats
- Interior impact protection systems
- Occupant restraint systems
- Athletic safety equipment
- Windshield retention systems

Capable of carrying crew and cargo to the space station, Orion will be shaped like cone-shaped space capsules of the past, but it will take advantage of 21st century technology in computers, electronics, life support, propulsion devices and heat protection systems. It will be able to rendezvous with a lunar landing module and an Earth departure stage in low-Earth orbit to carry crews to the moon and, one day, to Mars-bound vehicles assembled in low-Earth orbit. Orion will be the Earth entry vehicle for lunar and Mars returns. TRC Inc. and IBRL will help NASA study and understand the potential injury risks associated with different landing scenarios. The NASA Project Leader summed it up as "This is truly a critical effort that is at the top of the space suit element list of priorities." And now you may imagine how proud is the staff of TRC Inc. to know that we are helping NASA to do just that.

You can read more about the space-suits by visiting our website at: <http://www.trcpg.com/whatsnewdetail.asp?id=45>.

INDUSTRY EVENTS FALL 2009



SAE On-Board Diagnostics Symposium
September 22-24
Indianapolis, Indiana
Booth Number: 5

Association for the Advancement of Automotive Medicine
October 4-7
Baltimore, Maryland
Attendee

SAE Commercial Vehicle Engineering Congress & Exhibition
October 6-7
Rosemont, Illinois
Booth Number: 400

Automotive Testing Expo North America
October 27-29
Novi, Michigan
Booth Number 12005

SAE Powertrains, Fuels, & Lubricants Meeting
November 2-4
San Antonio, Texas
Booth Number: 3

53rd Stapp Conference
November 2-4
Savannah, Georgia
Attendee

Feature Facility Dynamic Handling Course

The Center's 1.6-mile asphalt Dynamic Handling Course (DHC) was built with vehicle development in mind with both long- and short- course sections which can be combined or run independently. The DHC's exacting slow, medium, and high-speed corners through slight elevation changes and turns of varying camber offers motorcycles and passenger vehicles the opportunity to run a number of course configurations in either direction for a wide range of testing including:

- Suspension performance
- Tire performance
- Brake system performance
- Drivetrain and suspension component deflection
- Strain and stress of suspension and wheel components
- Handling and stability of towed vehicle combinations
- Steering systems

The course is also used in many of the Center's advanced driver training programs, and can be reserved for media events. For more information visit our website at: <http://www.trcpg.com/facility/dynhandling.asp>.



Roadside Safety Hardware Testing

Post test image courtesy of Off the Wall Products, LLC.

While TRC Inc. does not normally offer engineering consulting services, when requested by our customers, we can team with a select few engineering organizations that provide unique expertise. We are honored to team with Battelle, of Columbus, Ohio for testing of many aspects of transportation products, and also for highway and security perimeter barriers that require advanced engineering support.

Battelle, an international science and technology enterprise that explores emerging areas of science, develops and commercializes technology, and manages laboratories for customers, was named one of five Centers of Excellence (COE) in Finite Element Crash Analysis by the U.S. Department of Transportation, Federal Highway Administration (FHWA). The purpose and main objective of the COE is to provide technology resources to state and local transportation agencies and vendors and manufactures of roadside safety hardware to help solve problems and issues concerned with roadside (highway) safety.

The Federal Highway Administration's (FHWA) policies require that all roadside appurtenances such as traffic barriers, barrier terminals, crash cushions, guardrails, signposts, bridge railings, portable concrete barriers, truck-mounted attenuators, and work zone

hardware used on the National Highway Systems meet safety performance criteria. FHWA developed National Cooperative Highway Research Program (NCHRP) Report 350, a comprehensive procedure for crash testing of both permanent and temporary highway safety features and for evaluating criteria used to assess the test results. A revised draft procedure, known as the American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH), is currently under review.

Until recently, all hardware used on the nation's highway to mitigate the level of severity associated with an errant vehicle leaving the roadway, was approved for use by full scale crash testing. TRC Inc. performs such crash testing in accordance to the original NCHRP Report 350: Recommended Procedures for the Safety Performance Evaluation of Highway Features, and the draft AASHTO/

MASH procedures which defines impact performance criteria for roadside barrier systems. These documents define six different test levels of increasing impact severity that incorporate varying impact speeds and vehicle types. The crash performance is judged on structural adequacy, occupant risk and vehicle trajectory. The rewrite of NCHRP 350 updates the impact condition criteria, the evaluation criteria and the test vehicles. The crash test vehicles used in NCHRP 350 are no longer being produced and heavier vehicles will be used.

As one of only three of the five COE's provide testing capability along with design analysis and evaluation, Battelle has named TRC Inc. as their preferred testing laboratory for this activity. TRC Inc. has experience in conducting numerous full-scale crash barrier tests encompasses the standards of AASHTO-MASH highway testing requirements, as well as to the similar Department of State (DOS), and American Society of Testing Methods (ASTM). These tests are sometimes time-consuming and difficult to effectively critique a candidate hardware design by testing alone; however, Battelle's COE provides analysis and evaluation of candidate safety products using finite element analyses (FEA) to converge to (near) hardware final design prior to full scale testing. The intent is to then perform only the minimum full-scale tests for product qualification. In this way, the time and costs for design, test and qualifications are significantly reduced, which also translates to "shorter product path to the market place".

The team of Battelle and TRC Inc. offers manufacturers and government agencies a unique set of engineering capabilities and expertise to assist them in the design, development and testing of new highway hardware.

Expanded Emissions Testing Capabilities



During the summer of 2009, TRC Inc. brought additional exhaust emissions sample and analysis systems on-line at the Emissions Laboratory. The new systems provide additional capabilities and capacity to serve our emissions and fuel economy customer's certification and research requirements. TRC Inc's Emissions laboratory operates on the same 24/7 schedule as the test track and the rest of the facilities, minimizing downtime and delays between mileage accumulation and emissions test points during durability or extended research

programs. We can test both gasoline, diesel, and alternative fueled vehicles, and provide on-site bulk fuel storage, custom blending, and ethanol content analysis for all fuels.

TRC Inc's emissions sample collection system is capable of collecting four individual dilute emissions samples in addition to one stream of raw tailpipe emissions. Dilute analysis is available on a phase-average or continuous-modal basis. All US EPA, European Union, and Japanese Automobile Standards emissions test cycles are performed by TRC Inc., in addition to custom cycles designed to meet or match customer requirements for speed, distance, load, or grade conditions.

Pollutants collected and analyzed on-site at TRC Inc. include hydrocarbons, carbon monoxide, carbon dioxide, oxides of nitrogen and methane. Exhaust

ethanol analysis is performed using a photoacoustic analyzer, and DNPH cartridges are employed to collect formaldehyde and acetaldehyde samples for on-site analysis and NMOG calculation. Every emissions or fuel economy report is customizable to meet each individual customer's requirements. TRC Inc. can provide reports, as well as data transfer services directly into customer databases as required.

TRC Inc's dynamometer load simulation includes both all-wheel drive and two-wheel drive simulation in a temperature controlled test environment. Test temperatures are controllable from 15° to 110° F with an inertia simulation range of up to 12,000 lbs. Variable grade simulation is available for each test cycle performed by TRC Inc. For more information about our emissions capabilities please visit our website at: <http://www.trcpg.com/serviceemissions.asp>.

Trade Name & other (a publication of) Transportation Research Center Incorporated. For more information, contact: Terrell Hill (ext. 354, Keillor Simon (ext. 309), or Jeff Prague (ext. 342) Marketing, Transportation Research Center Inc., East Liberty, Ohio 43319-0357; phone (937) 666-2011; fax (937) 666-5066; www.trcpg.com

Transportation Research Center Inc.
10820 State Route 347
P.O. Box B-67
East Liberty, OH 43319

