

# Intelligent Transportation System: Highway to the Future

Efforts currently underway for the Intelligent Transportation System (ITS) are dedicated to making America's highways safer and more efficient in the next century. As ITS technology evolves, complex issues must be resolved to allow the new technology to be integrated into daily operations on our highways. The evolution of ITS must bring together a number of current and emerging technologies into a coherent system. Separately, integration of any one of these technologies into a vehicle is relatively simple. The combination of all technologies and the proper communication among the systems is obviously more complex and critical.

The Nevada Automotive Test Center is a leader in technical innovation, operational validation, technology insertion and real-world problem solving. NATC continues a 40-year tradition of engineering excellence through programs ranging from optimization of current production vehicles to design, development and implementation of fully autonomous on- and off-road vehicles.

## Autonomous (Driverless) Vehicles

NATC designed and operates driverless vehicles at the WesTrack facility in support of accelerated pavement performance tests for the Federal Highway Administration. The WesTrack program objective is to operate heavy vehicles for 1.7 million total vehicle miles over a two-year period. To accomplish the



required pavement loading, four triple-trailer vehicle combinations have been automated for near-continuous operation.

Within a one-year period, NATC engineers and technicians designed, fabricated and certified the system for the autonomous operation of these 152,000-pound combination vehicles at representative highway speeds. A bumper mounted antenna on the front of the vehicle receives signals from a dual-wire set embedded in the asphalt. These signals provide continuous lateral and longitudinal control of the vehicle.

The WesTrack vehicles incorporate brake-by-wire Anti-lock Brake Systems on all wheels (including the triple trailers), Adaptive Cruise Control, autonomous control of lateral and longitudinal position, collision avoidance utilizing GPS and digital speedometer signals, advanced vehicle diagnostics, moving inspections (data transmission), weigh-in-motion (real-time axle loads) and vehicle area networks. The four trucks have operated in the driverless mode for a total of

500,000 miles during the first 12 months of facility operation.

One advanced feature of the WesTrack system is the on-board logging and diagnosis of all vehicle health parameters ranging from engine oil temperature to individual tire pressures. Data is checked every half second as an integral part of the on-board automation. This 160-channel logging and diagnosis package is directly applicable to ITS technologies and can be used to optimize fleet vehicle maintainability and reliability.

## Wireless Remote Control

Many new and innovative systems are untested. It is not feasible or prudent to introduce these systems to a public road environment without prior validation. NATC has facilities to allow safe evaluation of these systems. NATC has pioneered unique systems for wireless vehicle remote control, primarily in support of accident reconstruction, military weapons evaluations, and innovative vehicle systems test. Wireless vehicle operation permits all vehicle functions to be controlled from a remote site, reducing risk to personnel and allowing concentration on the system under test rather than on the methods for safeguarding human life. NATC has used this capability in testing and evaluation situations such as:

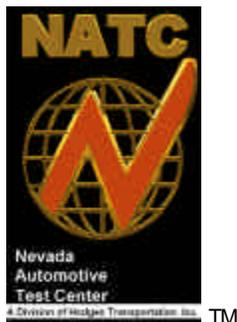
- Accident Reconstruction
- Driverless Vehicle Development
- Collision Avoidance
- Stability and Handling
- Tire Evaluations
- End Limit Performance Testing
- Safety Barrier Performance Tests
- Impact Tests with Various Highway Structures

## Technology Integration

Highway design, traffic management, human factors engineering and vehicle design must be integrated. Proper validation tests can be developed when these variables are recognized. NATC engineers familiar with congested highways, RF interference, sensors and systems can properly evaluate systems which employ these technologies and make recommendations for potential improvements. More importantly, advanced system and sensor integration, design, modification and optimization are all within NATC's realm of capabilities.

- Anti-Lock Brake Systems and Active Traction Control
- Adaptive Cruise Control (ACC)
- Collision Avoidance (Front and Rear)
- Advanced Vehicle Diagnostics and Networks
- Global Positioning Systems (GPS)
- Guidance Systems
- Commercial Vehicle Operation (CVO)
- Moving Inspections
- Cellular Data Transmission

NATC has performed engineering that has pushed the technical envelope of the automotive, CVO and ITS industries. All of this experience can be applied for companies that have techniques, products and services to be used in the transportation field. NATC understands and can realistically simulate any real-world environment. That is why NATC can prove or disprove the ability of any product to (1) survive in the real world and (2) perform as required.



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