

find ways to prevent these negative impacts by physical road blocks or traffic calming measures, thus negating the original benefits of the ITS system.

- If the effect of ITS is to reduce the drivers' role in active control of the vehicle then they may adapt to it and over time depend completely on these systems. Then they are likely to be less sensitive and incapable of taking active control in complex situations. Overdependence on ITS systems can also produce task under load and make the driving task very monotonous resulting in attention deficit. The knowledge about these effects is still in its primitive stage and it is very difficult to predict how human beings adapt to such changes over a long period of time.
- Experts concerned with pollution, energy consumption and global warming issues have also cautioned us about the effect of technologies that making driving much more pleasurable and less difficult. Creation of new trips because drivers feel comfortable going to unknown destinations with less uncertainty will lead to an undesired increase in the use of motor vehicles.

The above concerns give us an idea of the complexity of man-machine interaction outcomes and remind us that sophisticated technology alone will not determine the successful deployment of ITS. Bearing in mind these safety considerations and challenges, the sections below, outline some of the benefits of ITS.

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VEHICLE CONTROL AND INFORMATION SYSTEMS FOR SAFE DRIVING

OVERVIEW: Recently, there has been an increase in the practical application of ACC (adaptive cruise control) systems, which measure the following distance to the preceding vehicle by radar and automatically maintain an appropriate following distance, and lane keeping systems, which recognize lanes using vision sensors and keep the vehicle from deviating from the lane. Current systems are based on the premise of highway driving, but in the future, we can expect that these systems will come to be used on regular roads as well, in pursuit of even greater safety and comfort. Achieving this goal will require advancements in various related fields, including: (1) technologies for accurately recognizing the environment surrounding the vehicle. (2) technologies for controlling the vehicle's speed by controlling engine, transmission, and brake operations; and (3) technologies for controlling vehicle dynamics. In "vehicle dynamics control," driving dynamics information is passed

between various components via an onboard network. Services are gradually being developed to analyze and utilize this driving dynamics information based on ITs . Hitachi, Ltd. Is developing three types of sensor technologies for recognizing the conditions around the vehicle: millimeter wave radar, vision sensors, and sensor fusion.

The company is also developing technologies for controlling the vehicle's movements, as well as driving recorder technologies for analyzing vehicle dynamics control information (physical values recorded in the driving recorder that express the vehicle's behavior) and diagnosing driving conditions and drivers' characteristics, and services that apply these technologies.

In the automotive field, universities, automobile manufacturers, and others have been conducting research and development in ASV (advanced safety vehicle) and AHS (advanced cruise-assist highway systems), which establish links between vehicles and roads¹,). The aim of these systems is to improve driving safety and comfort through the use of information communications and control technologies. Autonomous driving is the ultimate form of vehicle be overcome before it will be possible to entirely replace highly intelligent human driving behaviors with computer control, and this can be expected to take some time.

Up to now, laser radar and millimeter wave radar have already been developed as sensors for measuring following distance; collision warning systems and adaptive cruise control systems using these technologies have already moved into the practical application stage. Lane keeping systems that recognize lanes using vision sensors are also being used in practical applications. In the future, we can expect to see collision avoidance systems, as well as systems that will detect a risk of collision before they occur and reduce speed at collision if the collision itself cannot be avoided. Advanced driving support systems, which offer increased driving comfortability by incorporating external infrastructures, navigation, and forms of information, are also expected to enter the practical application phase. In the very near future, the development of these systems may very well bring about the arrival of an era in which autonomous driving systems that were once the stuff of science fiction stories are well within our reach.

Here, we will discuss vehicle dynamics control and information systems, as well as sensor technologies that are installed in vehicles to recognize the surrounding environment, and service business targeting driver support through the use of vehicle dynamics control technologies and driving dynamics information.

Here, we have discussed trends in the development of vehicle dynamics control and information systems, and Hitachi's efforts to respond to these trends, as well as the outlook for the future.

Vehicle dynamics control systems, including lane keeping support systems and adaptive cruise control systems, have recently moved into the practical application stage. These systems can be expected to evolve through integration with information systems and communication infrastructures, in keeping with the development of on-board and off-board communication technologies.

The development of various components — particularly increased performance in environmental recognition sensors — are important in terms of achieving these types of systems. Furthermore, the effective application of information gathered through these sensors can be considered a crucial factor in the popularization and expansion of these systems. In the future, Hitachi will continue to combine infrastructures and on-board components in an effort to develop services and systems that will improve driving comfort as well as safety.

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TRANSPORT AND ITS INFRASTRUCTURE

Transport activity, a key component of economic development and human welfare, is increasing around the world as economies grow. For most policymakers, the most pressing problems associated with this increasing transport activity are traffic fatalities and injuries, congestion, air pollution and petroleum dependence. These problems are especially acute in the most rapidly growing economies of the developing world. Mitigating greenhouse gas (GHG) emissions can take its place among these other transport priorities by emphasizing synergies and co-benefits (*high agreement, much evidence*).

Transport predominantly relies on a single fossil resource, petroleum that supplies 95% of the total energy used by world transport. In 2004, transport was responsible for 23% of world energy-related GHG emissions with about three quarters coming from road vehicles. Over the past decade, transport's GHG emissions have increased at a faster rate than any other energy using sector (*high agreement, much evidence*).

Transport activity will continue to increase in the future as economic growth fuels transport demand and the availability of transport drives development, by facilitating specialization and trade. The majority of the world's population still does not have access to personal vehicles and many do not have access to any form of motorized transport. However, this situation is rapidly changing.

Freight transport has been growing even more rapidly than passenger transport and is expected to continue to do so in the future. Urban freight movements are predominantly by truck, while international freight is dominated by ocean shipping. The modal distribution of intercity freight varies greatly across regions. For example, in the United States, all modes participate substantially, while in Europe, trucking has a higher market share (in tkm1), compared to rail (*high agreement, much evidence*).