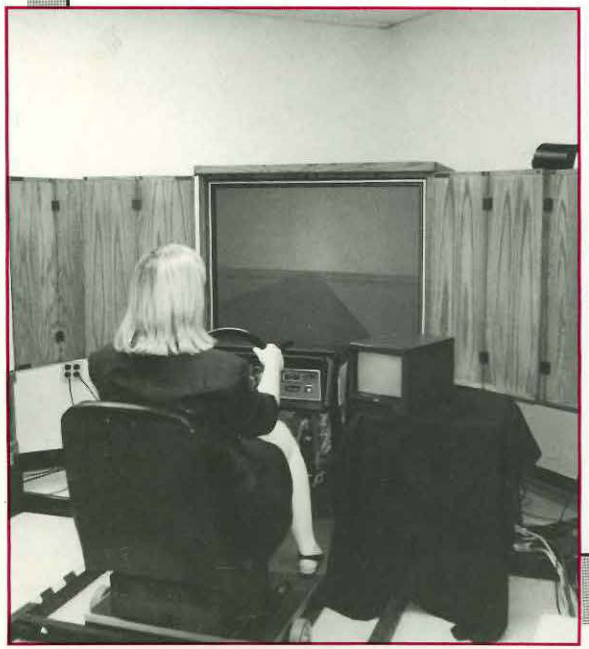
The Human Factors Laboratory

The Human Factors Laboratory provides a variety of environments for research pertaining to driver capabilities and limitations. The laboratory is comprised of an instrumented field test vehicle; two reconfigurable laboratories, called SIGNSIM and VIDSIM; and a Graphics Center, which supports the laboratories.

The SIGNSIM laboratory occupies two sound and light controlled rooms. A rear projection screen is located in the wall separating the two rooms. This area is equipped with a personal computer responsible for both data collection and control of a random access slide projector. The projector can be fitted with a variable aperture zoom lens system capable of dynamically presenting signs at various distances. A tachistoscope, which presents slide images at precisely controlled times, is also available. This laboratory provides researchers with a wide variety of tools to investigate highway safety and efficiency issues in static and partially dynamic situations.



The VIDSIM is a partially interactive driving simulation laboratory. It is equipped with a driving buck and three widescreen projection televisions arranged to allow a 180-degree field of view. Upgrades to the VIDSIM to increase the speed and flexibility with which aspects of in-vehicle display technology can be studied are currently underway. The enhanced system will allow researchers to develop both real-world and animated driving scenarios. These scenarios can be coordinated with information displayed on a small in-vehicle screen, in head-up display format, or announced audibly.

A field test vehicle, currently under development, will enable researchers to collect data on subjects as they drive on roads with normal traffic or in proving ground environments. The vehicle will be equipped with an integrated PC data acquisition system and a fully reconfigurable dashboard for assessing alternative in-vehicle instrument displays.

The Human Factors Laboratory is supported by a Graphics Center. This center produces precisely defined stimulus materials (35-mm slides, photographs, etc.) for use in human factors investigations. In addition, the Graphics Center provides professional quality visual aids (slides, viewgraphs, and hard copies) to FHWA staff for presentations and publications.

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HUMAN FACTORS

Laboratory

U.S. Department of Transportation
Federal Highway Administration

Researching Human Capabilities

Researchers in the Human Factors Laboratory in the Office of Safety and Traffic Operations R&D are currently focusing on two major areas: Intelligent Vehicle-Highway Systems (IVHS) and Highway Safety. This research considers user capabilities and limitations in the design and implementation of new highway safety and efficiency countermeasures. For example, IVHS in-vehicle displays can provide useful and timely information to drivers, but the abundance of information may overload the driver and diminish driving performance. By carefully considering driver characteristics, safe and effective design of these displays can be achieved.

Research addressing issues of older driver safety and mobility is also conducted in the laboratory. The number of older drivers will continue to increase dramatically over the next decades. It is critical that highway safety and efficiency measures accommodate the needs and capabilities of this growing portion of the population.

ATIS Display Perspectives

Part of IVHS research includes development of Advanced Traveler Information Systems (ATIS) which analyze and communicate information about traffic to drivers while they are in their cars. The most important criterion for an ATIS display is that it effectively convey information about the outside world. The usefulness of either a perspective view, similar to what might be seen from a low flying aircraft, or a plan view, as seen on highway signs and typical road maps, is being investigated by researchers in the laboratory.

In an initial experiment, older and younger drivers viewed slides of intersections and computer-generated displays representing intersections in either the perspective or plan view. Subjects were asked if the intersection represented in the computer display matched the photographed intersection. Results of the study showed that subjects were slightly more accurate in identifying intersections presented in the plan view. In addition, the subjects, particularly older subjects, strongly preferred the plan over the perspective view. Plans for followup research using a dynamic driving task are underway.

Driver Spatial Ability and ATIS

Reading ATIS route guidance displays may involve the same abilities as those required for reading maps. The ability to determine where one is in relation to other objects, or spatial ability, has been shown to be related to map reading ability.

This study will investigate the relationship between display type, spatial ability, age, and navigational performance. The aim of the research is to provide recommendations for in-vehicle display designs that take into consideration individual differences in spatial ability. Considering drivers' abilities, particularly their spatial abilities, in the design of ATIS displays will lead to safer and more efficient systems.

Turner-Fairbank Highway Research Center

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Operated by the Federal Highway Administration's (FHWA) Office of the Associate Administrator for Research and Development, the Turner-Fairbank Highway Research Center (TFHRC) is the Nation's primary highway transportation research and development facility. Located in McLean, Virginia, just inside the Capital Beltway, the Center consists of a number of world-class testing and laboratory facilities. The FHWA built and operates these facilities to support the expertise of scientists, engineers, academicians, students, and others who are working on important highway research. Their efforts help make the world's largest highway system safer and more efficient.

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