The U.S. Department of Transportation's rationale for spending hundreds of millions of dollars on ITS (Intelligent Transportation Systems) research is that "ITS saves lives, time, and money." That is also one of the main premises of the ITS America organization, which spent $9.2 million in 1999. Gleaned from various ITS publications and ITS America's Web site, some objective measures of ITS technology that saves lives, time and money include:

- According to the January 1998 ERTICO News, road tests of the VICS traffic information system in Japan have indicated that dynamic route guidance saved about 15% in travel time.
- Electronic toll collection, compared with lanes that have attendants, increases capacity by 200% to 300%.
- In-vehicle devices that would address lane changes, rear-end crashes and roadway-departure crashes are estimated to offset 1.1 million crashes per year in the U.S.

In the area of traffic congestion, much still needs to be done, according to ITS America. The annual cost of congestion has skyrocketed to over $48 billion in lost productivity. Traffic has increased by 30% in metropolitan areas, and in the next 10 years the number of cars on U.S. roads and highways will increase by 50%. To avoid increased congestion in the future, the 50 major U.S. urban areas would need "more than 7,100 new lane-kilometers of roadway every year" over the next decade, yet only two-thirds that amount of roadway is being built. A twenty-year life-cycle cost analysis of 50 major urban areas indicated that by buying smarter and deploying ITS, the need for new roads would be reduced, saving taxpayers 35% of the reduced need for new roads.

Wireless Location Technologies To Provide Traffic Data

In the United States, dynamic route guidance will only come into its own when traffic data throughout the country becomes available. The availability of traffic information is currently spotty at best, varying considerably from metro region to metro region. While comprehensive vehicle speed data is almost nonexistent, consumers say the second-most appealing feature in vehicle information systems is "finding the fastest/shortest route," according to research done for the Consumer Electronics Association. Just slightly more popular was "getting help in an emergency," with "traffic reports on demand," slightly less popular. To provide dynamic route guidance, telematics service providers would need real-time data that indicates the current speed of vehicles flowing throughout a network of roads, not only expressways, but all the arterials that would serve as alternative routes.

Unrelated to traffic information gathering, a 1996 Federal Communications Commission mandate (Docket #94-102) will nonetheless, speed up the development of such technologies. Unlike conventional wired phones, mobile phones don't automatically reveal their location when users call an emergency line, and callers often are unable to tell rescuers how to quickly find them. The FCC mandate, known as E911 (Enhanced 911), has an implementation date of October 1, 2001, by which time carriers must be able to pinpoint within 100 meters (328 feet), 67% of all wireless calls for emergency assistance.

By early May of this year, over 92 million people in the United States were wireless phone subscribers. Widely used by motorists, wireless transmissions will be used to help find the quickest route to a destination by revealing how traffic is flowing. As motorists drive and use wireless devices, their RF emanations can be tracked and matched to digital maps to reveal traffic patterns for each road. Under the E911 initiative, wireless carriers and their technology providers have developed various approaches to achieving the location precision that has been mandated. Some proposals include triangulation of a phone signal between multiple cell towers and building GPS (Global Positioning Satellite) devices into each phone.

On May 2, 2000, the U.S. government stopped jamming GPS signals that civilians use. More location accuracy from the military satellite system will mean cell phone locations can be narrowed down to an area the size of a tennis court, according to the Associated Press. While this would seem to encourage the use of GPS for wireless location technologies, GPS receivers would need to be introduced into existing phones and, even more of a problem, GPS is unreliable whenever overhead obstructions like tall trees or buildings block the signals from satellites.

Wireless-location technologies like those used to implement E911, which are also used to provide real-time traffic information, are far more elegant than conventional traffic information systems that use thousands of sensors positioned permanently at intervals along major roads. Using signals from wireless devices to monitor traffic will give collectors of wireless location information a big edge over service providers who use other approaches to monitor traffic. Wireless approaches will certainly be far less expensive than systems that require installing and maintaining sensors on the roadway. Moreover, service providers who must use only their subscribers' vehicles as floating data probes will have to wait for a critical mass of subscribers who not only must have the right equipment but must...
1999 Consumer Reports Quality Survey

Many Americans looking to buy a car first check with Consumer Reports' Annual Auto Issue, published every April, by Consumers Union, Yonkers, New York. The magazine's Frequency of Repair charts, based on a survey of car owners, show a model's reliability record over several years as well as potential trouble spots. This year's data is based on responses for over 500,000 vehicles. The 1999 models were, on average, six months old with 3,000 miles.

As we have for the past seven years, The Hansen Report analyzed Consumer Reports' results for electrical system problems, which could include problems with switches, controls, lights, audio system, power accessories, wiring, horn, instruments and wiper motors. We weighted the Frequency of Repair data of 1999 models from major carmakers with their total U.S. sales (or registrations, if necessary), and then we calculated what percentage of each carmaker's vehicles had serious electrical system problems. This method allows us to track the carmakers' overall electrical system reliability.

Honda, for the sixth consecutive year had the fewest electrical-system problems per hundred vehicles, although it had slightly more problems than last year. In fact, only Toyota and Mazda improved their scores. This year we combined the results for Chrysler and Mercedes vehicles, to reflect the first full year of operation for DaimlerChrysler. While Mercedes-Benz vehicles offer some of the most advanced electrical/electronics systems in the world, they are also prone to more electrical problems. If ranked independently from Chrysler, Mercedes would be the carmaker with the most electrical system problems in 1999: 6.32 per hundred vehicles.

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Freedonia Group Forecasts North American Auto Electronics

The Hansen Report on Automotive Electronics is published 10 times a year, monthly; July/August and December/January are combined issues. The annual subscription rate is $577 (North America), $617 (elsewhere). Back issues are available for $40 each; see our online index at www.hansenreport.com. Paul Hansen Associates is a strategy and market research firm consulting to the electronics industry.

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give permission to use their vehicles accordingly.

Until now, traffic measurement systems have used fixed roadway sensors in a variety of ways, from electromagnetic loop detectors buried in the road to closed-circuit television cameras that keep watch on strategic road segments. For instance, in the United Kingdom, Trafficmaster’s system works this way: 3,000 cameras have been installed at roughly 4-mile intervals throughout the United Kingdom’s trunkroad network, and they identify license plate numbers as vehicles go by. The tags are time stamped and the data is transmitted at four-minute intervals via radio link to Trafficmaster’s control center, where the time it takes for each vehicle to travel between sensors is calculated.

In some location schemes, service providers ask their subscribers to allow them to monitor their wireless-device transmissions, which carry with them the GPS-determined location of each vehicle. That will give service providers an accurate, real-time picture of current traffic conditions only if enough subscribers giving permission are in that area, an obvious drawback. Not only is a large number of willing subscribers needed, but vehicles must be equipped with GPS receiver, mobile phone and modem. As a company to Tegaron Telematics, the German network of primary highways and primary roads off the freeways could reliably be covered with 250,000 cooperating subscribers, but today, there are only 1,000 subscribers. (The company expects to have 600,000, enough to cover all freeways and German cities in three or four years.)

Furthermore, traffic service providers using location approaches based on fixed sensors to gain traffic information are kidding themselves if they believe concerns about privacy will limit competition from wireless location technology. So far, there appears to be less public outcry about privacy issues around wireless devices than there was over privacy issues with web commerce. In a recent press release, U.S. Wireless Corporation, one of the leading companies that will use wireless location technology to develop traffic data, notes its technology called RadioCamer can identify “the position of radio signatures, or energy flow, but does not have access to a caller’s identity, mobile identification number (MIN) or any content.” Information that might identify a subscriber is protected by law, although it is not illegal to track the location of calls to profile highway traffic conditions, and indeed, U.S. Wireless’ technology is being used in tests sponsored by the U.S. Department of Transportation. Vendors of wireless location information, like U.S. Wireless, are blocked from personal subscriber information by a firewall at the service provider.

Location-Based Service Providers

The following telematics service providers in Germany will use the cars themselves as traffic probes by monitoring wireless phone transmissions containing GPS data: Tegaron Telematics (JV of Daimler-Benz subsidiary Debis Systemhaus and DeTeMobil, a subsidiary of Deutsche Telecom), Gedas Telematics (a division of Volkswagen) and Mannesmann Autocom. In the United States, among companies competing using GPS is SnapTrack (San Jose, California), which was recently acquired for about $1 billion in stock by Qualcomm. SnapTrack has a GPS-based system that currently requires modification to both the mobile unit and the server.

In addition to GPS, the other major category of location technology is network-based. Besides cell of origin (COO), these location-fixing schemes include Time of Arrival (TOA), Enhanced Observed Time Differential (E-OTD) and Location Radio Fingerprint (LRF). U.S. Wireless’ proprietary RadioCamer is based on LRF technology. TruePosition (King of Prussia, Pennsylvania) uses TOA but requires modification of the handset to locate vehicles; location fix is generally to within less than 400 feet. Cell-Loc, Inc. (Calgary, AB, Canada) uses E-OTD, which has some advantages over TOA, one of which is better reception of PCS signals. SignalSoft (Boulder, Colorado) is a service provider that is not locked into a particular location-fixing technology but will compete by selling services using information from multiple location-fixing providers.

Both E-OTD and TOA rely on being able to receive the target signal at multiple locations, and they have a significant disadvantage in remote areas where cell sites may be many miles apart. U.S. Wireless’ RadioCamer requires only a single reception site to locate the source of a cellular signal. ITS technology, already proven, can locate wireless devices to within 20 to 30 meters (66 to 98 feet).

Traffic speed can be estimated since wireless devices emit radio signals each time they are used, and those signals bounce off buildings and other obstacles reaching the base station via multiple paths. RadioCamera looks at the unique characteristics continued on page 8
The Company Profile...

**Lear Corp.**

**Headquarters:** 21557 Telegraph Road, P.O. Box 5008, Southfield, MI 48086-5008, USA; phone: 248-447-1500; fax: 248-447-1722  
**Web Site:** www.Lear.com

**1999 Net Sales:** $12.43 billion  
**EBITDA:** $1.05 billion  
**Operating Margin:** 5.7%

**1999 Major Acquisition:** Lear acquired UTA on May 4, and UTA's electrical/electronics business became LEED (see thumbnail, page 7). UTA had $3.0 billion in sales in 1998. Lear sold UTA’s motors product segment and transferred UTA’s interior products ($560 million in sales in 1998) to other Lear divisions.

**R&D:** 3.8% of sales  
**Products:** Seat systems and other interior trim systems, as well as electrical distribution systems

**Top Customers:** General Motors and Ford

**Employees:** With the UTA acquisition in May 1999, the number of employees grew from 65,316 at the end of 1998 to 121,102 at the end of 1999. (1995 to 1999 annual growth of employees: 36%)

**Earnings before interest, taxes, depreciation and amortization**

**Lear Background**

In 1917, the company began under the name American Metal Products, producing seat frames in Detroit, Michigan. A number of mergers and subsequent name changes occurred over the decades, and in 1989, Lear Siegler Seating Corporation emerged after a management-led leveraged buy-out. At least a dozen acquisitions followed in the 1990s, making Lear the number-one independent maker of interior systems in the world. Lear employs over 120,000 people worldwide at more than 300 facilities, located in 33 countries.

Lear currently ships $478 worth of content, on average, for every vehicle manufactured in North America; $227 per vehicle in Western Europe; and $101 for every vehicle made in South America.

Lear sees three automotive industry trends and hopes to capitalize on them:

- Growing demand for modular assemblies such as cockpits, overhead and door panels
- Carmakers focusing on interiors to differentiate their vehicles
- Continued consolidation and globalization of the automotive supply base

**A Fortune 200 company, traded publicly on the New York Stock Exchange, Lear grew from $160 million in sales in 1983 to $12.4 billion in sales in 1999, an impressive annual growth rate of 31.2% over the 16-year period. Lear has a stable management team: The top three officers at Lear have each worked for the company from 27 to 34 years. Lear’s top four shareholders are financial institutions: J.P. Morgan with 9.0%, Franklin M utal A dvisors with 8.4%, N euberger B ergman with 7.0%, and FMR Corp. with 6.2%.**

**Major Acquisitions**

- In the early 1990s, the company known as Lear Seating Corporation purchased seating businesses from Saab, Volvo and Ford.
- In August 1995, Lear Seating acquired Automotive Industries, a maker of automotive interior systems and blow-molded parts. Lear, a specialist in seating products up until this time, subsequently dropped “Seating” from its name.
- In 1996, Lear acquired M asland C orporation, a producer of flooring and acoustic systems, and Borealis, a W est E uropean supplier of instrument panels.
- In September 1998, Lear bought Delphi Seating from GM for $247 million.
- In May 1999, Lear’s largest acquisition was made: United Technologies Automotive, a maker of instrument panels,

**Lear Net Sales in $ Millions and Operating Margin**

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Sales</th>
<th>Operating Margin</th>
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<tbody>
<tr>
<td>1995</td>
<td>4,714.4</td>
<td>5.2%</td>
</tr>
<tr>
<td>1996</td>
<td>6,249.1</td>
<td>6.0%</td>
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<tr>
<td>1997</td>
<td>7,342.9</td>
<td>6.6%</td>
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<tr>
<td>1998</td>
<td>9,059.4</td>
<td>5.2%</td>
</tr>
<tr>
<td>1999</td>
<td>12,428.8</td>
<td>5.7%</td>
</tr>
</tbody>
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**1999 to 1999 Annual Growth:** 27.4%

**By Product**

- Electrical Distribution Systems & Electronics, 12%
- Interior Trim & Components, 28%
- Seat Systems, 60%

**By Customer**

- DaimlerChrysler, 13%
- Fiat, 6%
- GM, 29%
- Ford, 27%

**Lear Sales**

1999 Total: $12.43 Billion

**By Product**

- Seat Systems, 60%
- Interior Trim & Components, 28%
- Electrical Distribution Systems & Electronics, 12%

**By Customer**

- DaimlerChrysler, 13%
- Fiat, 6%
- GM, 29%
- Ford, 27%

**Lear Sales and Employees by Region**

- Total 1999 Sales: $12.43 Billion
- Total Employees, End of 1999: 121,102

**By Region**

- U.S. & Canada, 62%
- Europe, 31.5%
- Rest of World, 6.5%
- U.S. & Canada, 31%
- Mexico, 31%
- Europe, 29%
- Other, 9%

**EBITDA**: $1,050 million

**Operating Margin**: 5.7%

**1999 Major Acquisition:** Lear acquired UTA on May 4, and UTA's electrical/electronics business became LEED (see thumbnail, page 7). UTA had $3.0 billion in sales in 1998. Lear sold UTA’s motors product segment and transferred UTA’s interior products ($560 million in sales in 1998) to other Lear divisions.

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**Earnings before interest, taxes, depreciation and amortization**
Distinctions Claimed by Lear

Worldwide
- Largest independent supplier of integrated interior systems; Lear says it owns 17% of the global market for interior systems.
- #1 maker of seat systems
- #2 maker of headliners
- #3 maker of electrical distribution systems

North America
- #1 maker of door panels
- #1 maker of multifunction and headlamp switches
- #1 maker of RKE
- #2 maker of flooring and acoustic systems

Lear Corporation is organized into the following 11 segments:
- DaimlerChrysler Division
- Fiat Division
- Ford Division
- General Motors Division
- Lear Electronics and Electrical Division (LEED)
- Manufacturing Operations Division
- Technology Division
- Premium Car Interiors Group
- Asia Pacific Operations
- Scandinavian Operations
- South American Operations

door and overhead interior panels, motors, switches and electrical distribution systems. (UTA was profiled in the April 1998 issue of The Hansen Report.)

Modular Sourcing of Interiors: Slower in U.S. than Europe

Before Lear purchased UTA, UTA had booked what was probably the largest interior module order in North America, the integrated cockpit for GM’s small car platform, including instrument panel and wiring. The GM deal was to start in 2002, and involve 400,000 cockpits per year, but unfortunately GM cancelled it when labor unions refused to go along. The deal would have created enormous cash flow for Lear.

Module makers can enhance the value of the modules and provide lower costs through specialization, but despite its benefits to carmakers, modular sourcing will go much slower in the States than in Europe. According to Lear, two-thirds of the global market for integrated interior modules exists in Europe. U.S. unions fear loss of work, and under current labor contracts with GM, Ford and DaimlerChrysler in the United States and Canada, unions must agree to any significant outsourcing.

Interior Flexibility: Designed for Electronics Upgrades

Lear's interior modules will increasingly employ architectures that allow the interiors to change according to consumers’ tastes, and that allow interiors to be easily updated as new electronics and new software become available. Vehicles may last for decades if improvements in quality continue, so it makes sense for interiors to be periodically refreshed with new features. Standards developed by A MIC (Automotive Multimedia Interface Colaboration) - likely to be accepted by the global automotive industry - will help facilitate plug-and-play electronic/electrical components. Jim Masters, president of the Lear technology division, told us Lear's future interior systems will permit the consumer "to physically change the appearance of the interior completely," including reconfiguring the instrument panel, clusters, displays and even the feel and location of knobs and switches.

UTA Acquisition

Lear paid $2.3 billion in cash for UTA, its largest acquisition. UTA believes, most successful acquisition. UTA's sales, which were $3.0 billion in 1998, broke down as follows: 56% from electrical distribution systems (wiring harnesses, mostly), 19% from interior trim products, 12% from motors, 7% from switches and 7% from remote-keyless-entry systems and body controllers. Lear considered the motors segment of the business to be non-core and sold it immediately to Johnson Electric Holdings Ltd. for $310 million.

Lear placed the remaining three UTA interior businesses — door panels, headliners and instrument panels — into divisions that were already involved in these areas.

James Vandenberghe, vice chairman of the board of Lear, noted: "We combined the two companies and integrated them quickly. ... The key is getting the leaders of the businesses working together, as quickly as possible." The leaders who remained, that is, since all of UTA's top echelon was immediately let go: 10 managers in all.

Even though Lear made UTA's electrical and electronics segment a separate business, with its own P&L, under the title LEED (Lear Electronics and Electrical Division), LEED's top two managers report to different Lear regional organizations. William Pumphrey, president of LEED, reports to Douglas DelGrosso, president of Lear's North America Operations. Rudolpho Kroebel is president of LEED Europe, reporting to Randy Carrone, president of international operations for Lear.

Before the acquisition by Lear, Mr. Pumphrey was in charge of UTA's sales to DaimlerChrysler-Auburn Hills. He sees a big difference between Lear and UTA: "Lear is an automotive company; UTA's parent UTC was not. ... Lear is dedicated to growing and building. ... UTA really didn't invest much in new product development. We [UTA] had some advanced work on the Auto PC and some other things, but we really didn't take some of the current products and invest in their next generation."

Investments by Lear include hiring more engineers and technicians, 10% more now, and still more will be hired. To accommodate R&D for electronics/electrical distribution systems, LEED has invested nearly $2 million in additions to Lear's new $40 million technology center. The center has a software lab, a radiofrequency lab, a materials lab, a static continued on following page

The worldwide market for interior products, worth $70 billion in 1999, breaks down as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Seat systems</td>
<td>35%</td>
</tr>
<tr>
<td>Electrical and electronics</td>
<td>28%</td>
</tr>
<tr>
<td>Instrument panel systems</td>
<td>6%</td>
</tr>
<tr>
<td>Door panel systems</td>
<td>8%</td>
</tr>
<tr>
<td>Floor and acoustic</td>
<td>6%</td>
</tr>
<tr>
<td>Overhead systems</td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
<td>14%</td>
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Data: Lear
LSER Products: Transition to Mechatronics

Wiring cut leads have almost doubled over the last seven years: from 963 cut leads on a 1993 upscale Ford Explorer to 1,800 on the current model Explorer, according to Lear’s 1999 annual report. Each cut lead adds about $.50 to the cost of wiring. At the price of multiplexing, flexible flat cables and printed-circuit wiring declines, these technologies and products will increasingly substitute for wiring harnesses. While the number of cut leads in the typical vehicle has grown quickly over the last decade, the total worldwide market for wiring will probably peak in the next five years.

With its acquisition of UTA, Lear won 10% of the $20 billion global market for electrical distribution systems; or if the market is broken down further, Lear has 15% of the $8 billion market in North America and 12% of the $7 billion European market for electrical distribution systems. Company literature noted that the acquisition of UTA gives Lear a competitive advantage in securing new business “because electrical distribution systems and electrical/electronic products are an increasingly important part of automotive interior modules.” The acquisition of UTA allows Lear to go head-to-head with cockpit-module competitors Delphi and Siemens, both of whom also make electrical distribution systems. According to The Boston Consulting Group and Lear, electrical and electronics components account for 30% of the cost of making a U.S. light vehicle, up from 10% in 1990. The average price of a new passenger vehicle in the U.S. is $21,000 in 2000, compared with $14,500 in 1990.

While 80% of LEED’s sales currently come from wiring harnesses, LEED will look for opportunities to integrate electrical/electronics components in Lear’s products. LEED is focusing on competencies in electrical and electronics distribution systems, in wireless technology for remote keyless entry and in Intertronics, Lear’s name for integration of interiors with electrical and electronics parts, including wiring and switches. LEED considers all its switches—seat, door-panel, instrument-panel and multifunction— as candidates for integration with electronics. “Every single one of these can have some level of integration with electronics... we have working prototypes for nearly all,” added M r. Pumphrey. “I would be surprised if we were doing anything less than 50% in mechatronics [switches] in five years.”

Lear believes eventually carmakers will source all wiring, connectors and electrical/electronic components associated with headliners, instrument panels (cockpits), door panels and seats, as an integral part of interior modules. With modular sourcing, carmakers can reduce costs and weight. By taking on procurement and development of complete modules, Lear will reap higher margins from value-added parts. Such products will include navigation and telecommunications equipment, according to the annual report.

New Products from LEED

Some of the new products below were shown at the grand opening of LEED’s Product Development Center in Dearborn, Michigan, on May 9, 2000. A number of these products combine several functions together. In doing so, they save space and reduce cost, as wiring between separate devices is eliminated, and assembly time and complexity are reduced.

Electrical Distribution Systems

- Smart Junction Boxes: Smart junction-box technology—the integration of both power and signal processing within one unit—was developed in Europe and is coming to North America. Lear expects this centralized-unit packaging approach to be a strong trend. Today there are two boxes—one with a 400-micron printed circuit board for power components and the other, an electronics module—joined with a connector. In development is a product that eliminates the connector and has the electronics placed directly on the power board. A nother version would eliminate the connector but use two boards that are assembled together. Lear’s smart junction boxes are more reliable, save cost and reduce weight. In high-volume production are smart junction boxes for Peugeot and Rover, and Lear is now in development for awarded contracts in the U.S.

- DC/DC Converter: Realizing the need in the industry for a DC/DC converter, Lear’s facility in Vals, Spain, developed and made a working model for a Ford Focus. Integrated within a central junction box, the converter is located in the engine compartment yet shielded from interference and far enough from the engine to stay cool.

- Dual-Voltage, Advanced Smart Junction Box: This centralized unit integrates solid-state circuit protection, power switching elements, power and signal distribution management and vehicle body electronics functions (flasher, wiper, central lock, alarm) for 42-volt DC, as well as 14-volt DC networks and DC/DC conversion.

Interior Control Systems

- Instrument Panel Center Console Control: This thin profile control panel for the entertainment system, switch functions and HVAC has the bulk of its electronics modules located elsewhere so that the panel can tip out. That way, a large storage bin, located directly behind the panel, is accessible to the driver and passengers.

- Integrated Seat-Adjuster Module (ISA M): This mechatronic product combines into one package the customer-interface controls and electronic control module for seat adjustment, power lumbar, memory and heated seat. LEED will soon go into production with an integrated seat module for seats Lear is making for GM.

- Integrated Door Controls: This consolidates controls for window lift, door lock, power mirror, heated seat and electronic control modules into a single, integrated package that connects either directly or through multiplexing to vehicle systems outside the doors. LEED also makes a door/window control unit that is hinged to reveal the less-frequently-used seat-adjuster controls below.

- Multifunction Turn-Signal Switch: The multifunction steering-column switch was developed in collaboration with
LEED Sales by Region

- **Europe**: 44%
- **North America**: 54%
- **Asia**: 2%

**Estimated 2000 Net Sales**: $2.4 Billion

**LEED Sales by Region**

- **Europe**, 44%
- **Asia**, 2%
- **North America**, 54%

**RKE and Immobilizer Module**: Lear has a patent for a device that combines into a single module an RKE receiver and immobilizer key reader. It reads and determines validity of the ignition key and performs traditional RKE features like unlock, lock (trunk also), and panic button. According to Lear, using a single microprocessor reduces system cost and provides excellent range and resistance to jamming.

- **Dual-Range, Dual-Function Remote Keyless Entry**: A device that allows a single RKE transmitter button to operate multiple functions at different distances from the vehicle. For example, if the operator is farther away from the vehicle than the specified distance, the unlock button would function as a car-locator button. Rather than unlocking the vehicle, it would flash the lights or sound the horn. The product provides additional features/functions with minimal increase in cost.

**Alliances in Electronics**

Lear said that while the company is more interested in mechatronics, it has no interest in becoming more vertically integrated in electronics. Rather than developing more electronics in-house, the company will rely on alliances with key electronics partners.

- **Since November 1997, Lear and Donnelly Corporation** have had a 50-50 joint venture called Lear-Donnelly Overhead Systems (Southfield, Michigan). The Lear-Donnelly JV designs, engineers and manufactures integrated overhead systems, including headliner overhead console systems, lighting and switch components. The Technology Division at Lear has a new overhead audio system, which the JV will manufacture, called OASys. Instead of conventional coil and cone speakers, OASys uses flat-membrane speaker technology no thicker than the headliner itself. The audio system integrates all the vehicle’s speakers, except the subwoofer and tweeter, right into the headliner, a process which eliminates much of the vehicle’s wiring for sound. Lear-Donnelly’s system can accommodate as many as 12 speakers. Interior areas that conventionally house speakers, such as the instrument panel, door and rear deck, are free for other uses. A number of OEMs are interested. A according to Mr. Pumphrey, Lear has booked business with one “very interested” customer for an entire interior, including electrical and headliner modules with OASys systems that will be shipped for MY 2004, if that customer relationship proceeds as expected.

- **In February, Lear and Motorola** signed a memorandum of understanding to form a 50-50 joint venture to design integrated interior systems. Based in Dearborn, Michigan, and focused exclusively on Ford Motor Company, the JV will develop concepts for the integration of electronics, electrical and interior trim systems at the earliest stages of design. The JV will involve Motorola’s AIEG (Automotive Industrial and Electronics Group) and Telematics Systems Group; Motorola will bring to the JV capabilities in embedded electronics, telematics and consumer electronics such as cell phones and pagers. A sting as the tier-one supplier to Ford, Lear brings its interior and electrical distribution system capabilities.

- **In a partnership with Panasonic**, LEED has developed a new, multifunction turn-signal control; the integrated mechatronic control is mounted on the steering wheel column. (Please see description above.) The Panasonic collaboration specifically involved the Electromechanical Components Division of Matsushita Electronic Components Co., Otsuka, Japan, and included engineering and manufacturing both in Japan and the U.S. The collaboration with Panasonic began a year ago, although a manufacturing relationship existed two years ago. Lear expects the relationship to evolve further.

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**Employees**: 40,000

**Top Customers**, ranked in order of sales:
- Ford, GM, Peugeot PSA, DaimlerChrysler
- Components Division of Matsushita Electronics
- RKE and body controllers: 10%
- Systems, lighting and switch components: 10%
- Estimated 2000 Net Sales: $2.4 Billion

Panasonic (see below). The mechatronic integrated column control unit, which connects to either to a CAN or J1850 bus, consolidates into one package combinations of the following: clockspring (rotary connector), electronic control module, hazard lamps, headlamps, parking lamps, fog lamps, wipers (front and rear windows), cruise control, high/low headlamp beam and turn signal. Benefits include reduction of system cost by eliminating wires, assembly time and cost, as well as increasing logic inputs and interfaces with other systems.

**Wireless Systems**

**Passive Keyless Entry**: This system allows the vehicle operator to unlock the door without using a key or physically activating the RKE fob. The passive entry technology is embedded in the fob. High security is achieved through challenge/response communication, and a backup system is provided in case of a discharged fob battery. LEED has developed a working prototype that was demonstrated in a Lincoln Navigator.

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**Headquarters**: Southfield, Michigan, USA (Lear’s headquarters)
**High-End Electronics Manufacturing Sites**: Vals, Spain; Tampa, Florida; Kronach, Germany; UT Loewe, Kronach, a UTA division that served BMW and is now the primary manufacturing base for Europe.

**1999 Net Sales**: For the period from May 4, 1999, when UTA was purchased, through December 1999, $1.6 billion; annualized, sales would have been roughly $2.4 billion.

**Products**: Electrical distribution systems: 80% of sales; switches: 10%; RKE and body controllers: 10%

**Employees**: 40,000

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Traffic...

Continued from page 3

of these signals, including the multipath pattern, and compiles a signature that can be compared to a database of previously identified signature patterns and corresponding locations. By continuously updating the location data from multiple callers on a specified road segment, the software computes vehicle speed for that road segment.

Information generated by each RadioCamera base unit is downloaded to centralized database hubs, which route the location information to Public Safety Answering Points (PSA Ps) and other service providers or call centers. Carriers or other providers can also use this information to offer their customers an array of value-added services including traffic updates, roadside assistance, asset tracking, vehicle location, and mobile yellow pages. The system requires no alteration to the base station or subscriber handsets. Subscribers will not need to purchase new phones to access services, and wireless carriers will not need to make expensive infrastructure investments to offer location-based services.

Uday Nagendran, U.S. Wireless director of mobile applications, told us: “We believe that traffic information in the vehicle is more basic than power windows—it’s what most people want in the cars. ... To that end we examined the industry and identified the weak link in the chain—good traffic data.” U.S. Wireless believes it can supply that good traffic data. U.S. Wireless, established in 1996 with headquarters in Ramon, California, intends to build and operate a nationwide traffic information and E911 location data network. U.S. Wireless, located in Rosemont, Illinois, U.S. Wireless’ speed data transfers easily into the navigation domain. Rather than using the default speeds for each road as is done now, the route guidance software will use actual speed data. “There is no paradigm shift in route calculations,” explained Mr. Nagendran.

Largest U.S. Customer: OnStar

Probably the largest potential automotive customer for traffic data in the United States is OnStar, GM’s information service provider. To provide dynamic route guidance, OnStar needs more than coverage of traffic events like accidents; it needs coverage of traffic flows. Verizon Wireless, the largest wireless communications provider in the U.S. and OnStar’s wireless carrier, just announced the completion of successful testing of E911 caller location technology with U.S. Wireless. OnStar has more than 150,000 telematics subscribers and plans to have one-million subscribers by the end of the 2000. OnStar intends to introduce a traffic information service late in 2001, or soon thereafter, as part of its Virtual Audio product and not just in cities, but also in rural areas of the United States. AT&T, which handles telematics services for Mercedes U.S.A. and Ford, is also shopping for traffic data providers.

Coming Soon, But How Good Will Route Guidance Be?

Most experts we spoke with believe that some form of dynamic route guidance—navigation that makes use of traffic flow information—will be available in limited areas of the U.S., within 18 months to two years. There is less agreement on just how effective such systems will be. Etak (Menlo Park, California) is a publisher of digital map databases and service provider of real-time traffic data for 65 metropolitan areas, in cooperation with Metro Networks. Etak’s director of new media sales, Monty Wasch, follows the traffic information industry and speculates that many customers will not like being routed into unfamiliar areas, particularly those that are unsafe, and that the route-guidance service provider could perhaps be held liable for problems that arise from such recommendations.

Further, if too many drivers are given the same recommendation on a particular alternative route to take, then the alternative route will be at least as clogged as the primary route. Local authorities may not want traffic clogging community roads. Unless good information about the traffic conditions on alternative routes exists, users could find themselves worse off than if they stayed on the primary route.

Delphi X Forecast

The Delphi X report is an analysis and tabulation of forecasts made by automotive industry participants. Among the questions asked the panelists for Delphi X was this: “What percentage of North American-produced passenger cars will employ the following electronic and/or electrical features as factory-installed equipment in 2004 and 2009?” Their responses follow.

<table>
<thead>
<tr>
<th>Feature</th>
<th>2004</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antitheft</td>
<td>40</td>
<td>55</td>
</tr>
<tr>
<td>Auto PC Entertainment Systems</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Brake by Wire</td>
<td>1</td>
<td>5</td>
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<tr>
<td>CD Player</td>
<td>45</td>
<td>60</td>
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<tr>
<td>Cruise Control</td>
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<td>88</td>
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<tr>
<td>Drive by Wire</td>
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<tr>
<td>Electronic Throttle Control</td>
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</tr>
<tr>
<td>Electrochromatic Glass</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>Electronic Keyless Entry</td>
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<td>22.5</td>
</tr>
<tr>
<td>High Intensity Discharge</td>
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<td>13.5</td>
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<tr>
<td>Headlights</td>
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</tr>
<tr>
<td>Mini-Discs</td>
<td>5</td>
<td>13.5</td>
</tr>
<tr>
<td>Voice-Activated/Interactive Controls</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

Delphi X Forecast and A nalys is of the North American Automotive Industry is published by the Office for the Study of Automotive Transportation, University of Michigan Transportation Research Institute, Ann Arbor, Michigan, USA.