Today's adaptive cruise control systems sense what's ahead of the vehicle and automatically vary the vehicle's speed to create a safe following distance. Sophisticated forward-looking detection sensors use either infrared laser or millimeter wave (radar) sensors—and in the not-so-distant future, some ACC systems will use both—to detect/sense various target vehicles ahead. These smart devices assess/measure the kinematic attributes of each target, such as distance, relative speed and velocity. ACC systems automatically adjust vehicle speed by limited applications to the brakes or throttle. Some systems allow the driver to specify an adjustable vehicle-headway distance to the vehicle ahead, for example, three headways.

The driver is still expected to be alert and responsible to hazards in the path of the vehicle, particularly because ACC obstacle-detection algorithms currently disregard nonmoving objects, even if fixed in the vehicle's path. For example, as a vehicle goes around a curve, the ACC system would look straight ahead and sense many fixed objects, such as trees and buildings that are actually beside the road. Such objects are not, of course, hazards to the vehicle, particularly because ACC systems automatically adjust vehicle speed by limited applications to the brakes or throttle. Some systems allow the driver to specify an adjustable vehicle-headway distance to the vehicle ahead, for example, three headways.

The first ACC systems introduced in the West used radar technology—to “see” through fog—but now carmakers are willing to introduce laser technology, less

Turn to ACC, page 2

**LIN: Class-A Open Mux Standard Gains Momentum**

After more than a decade of competitive wrangling that led to few standards and a poor climate for technological advancement, the global auto electronics industry is coming together as never before. Witness standards for 42 volts, CAN, MOST (high-speed fiber-optic communications), OSEK (operating systems), and A/MIC (Automotive Multimedia Interface Collaboration for plug-and-play infotainment electronics). A lack of these, with the exception of A/MIC, came out of Europe, where another promising standard is now emerging: the LIN protocol specification for real-time communications in embedded systems.

LIN, which stands for local interconnect network, is an inexpensive, low-speed (1 to 20 kilobits per second) Class-A, serial multiplexing protocol. It was designed to link switches, actuators and sensors into a sub-bus that connects to the main bus, usually a CAN bus. Vehicle assembly units that could benefit from a LIN sub-bus are door, roof, steering column, seat, climate control, switch panel and intelligent wipers. For example, the mounted switches in a steering wheel assembly—wipers, headlight, turn signal, horn and cruise-control—could be linked digitally on a single wire LIN bus. LIN, not designed exclusively for automotive applications, also applies to industrial electronics.

While SAE has worked unsuccessfully in the past to establish a Class-A standard and while several Class-A multiplexing protocols are in use around the world today, none has sufficient prominence to be considered a global standard. The LIN protocol could become that standard; it has a number of things going for it:

- LIN will reduce the cost of Class-A multiplexing. By complementing, not competing with higher-speed multiplexing standards, like CAN and MOST, LIN will facilitate networks that do not need high bandwidth, complexity and performance.

**LIN Protocol Specification**

**Definition:** An open, Class-A, single-wire, serial multiplexing bus, based on common UART SCI hardware, with speeds from 1 kbps to 20 kbps. LIN (local interconnect network) was designed to link switch changes to actuators such as motors and lights, events which happen at low speeds, measured in hundreds of milliseconds.

**Consortium Founders:** Audi, BMW, DaimlerChrysler, Motorola, Volcano Communications Technologies (LIN’s developer), Volvo

**Web Site:** www.lin-subbus.org

**To Discuss the Specification:** Please contact Antal Rajnak (VCT, Gothenburg Sweden) by phone, 46 31 451 116; email Antal.rajnak@vct.se. Or contact Bernd Rucha (Motorola GmbH, Munich, Germany) by phone, 49 89 92103 395; email Bernd.rucha@motorola.com.
expensive than millimeter-wave radar. With laser sensors, carmakers can bring ACC to a broader range of consumers. Back in August 1997, an infrared laser ACC system was introduced on Toyota Celsiors in Japan. Toyota has added ACC as an option to one model each year, and over that period, about 4,000 ACC-equipped vehicles have sold in Japan. On January 1, 2000, the Estima model was offered with ACC as an option for ¥106,000 ($1,005).

In Europe, Mercedes was the first carmaker to go into production with an ACC system, introduced in October 1998 on the MY 1999 S-Class, priced at about DM 4,000 ($1,960). Distronic is now available on the CL as well. Jaguar, in September 1999, introduced a Delphi Automotive Systems radar ACC system in the MY 2000 XKR in the U.K. and Germany, priced, including VAT, (value-added tax) at £1,400 ($2,212). Just this April, BMW introduced on the 7-series a Bosch radar ACC system for DM 3,800 ($1,862). In the United States in the fall of 2000, Mercedes will introduce Distronic on the S- and CL-C classes. Mercedes expects to expand availability to other models in the United States.

A DC (Adaptive Distance Controls) makes Mercedes ACC systems. A DC (Lindau, Germany) is the joint venture of Temic, a Daimler Chrysler division, with 70% and Leica with 30%. In 2001, A DC will supply a low-cost, laser ACC system, probably to a carmaker in Europe. According to A DC, infrared sensors are nearly half the price of radar, so an IR ACC system might retail for $800 to $1,000. Although IR laser sensors cannot see through dense fog, their sensitivity to the existence of fog is used by A DC as a visibility-limitation feature that advises drivers not to exceed certain speeds in fog.

The other key supplier of production ACC systems in the West is Delphi Automotive Systems (Troy, Michigan). Delphi plans to offer some ACC systems with infrared (lidar) sensors and others with millimeter-wave sensors. By 2002, Delphi will supply a laser ACC system for mid-sized Opel models on the Epsilon platform. Omega and Vectra are built on the Epsilon platform. Delphi will make less-expensive laser sensors so ACC systems can reach beyond upscale consumers. “In general, there are no significant differences that can be perceived by the driver while using an ACC system that uses either object-detection technology,” concluded Delphi engineers in SA E paper 2000-01-0345, “Comparison of Lidar-Based and Radar-Based Adaptive Cruise Control.”

The LIN consortium is providing copies of its protocol specification; later a configuration language description and API (application program interface) specification will be available, as well as a standard development-tool interface. For more information or to register for specifications, visit www.lin-subbus.org.
1999 Automotive Electronics Business Roundup

North America
Autoliv
1999 Consolidated Sales: $3,812.2 million
Change from 1998: up 9.3%
1999 Operating Margin: 9.7% of sales, compared with 10.2% of sales in 1998.

According to Autoliv, operating margin was affected by higher R&D spending. Airbag sales rose by 12% to $2.715 million in 1999, and the company received its first order for rollover protection systems. Autoliv's acquisition of Izumi, Japan's second-largest steering-wheel maker, was completed in January 2000. In February 2000, Autoliv announced plans to acquire the seatbelt business of the Japanese manufacturer NSK, and in March of this year, Autoliv bought airbag-initiator supplier, OEA.

DaimlerChrysler Huntsville
1999 Standard Costs: $1.035 billion
Change from 1998: up 15.6%
Huntsville's business is made up almost entirely of internal DaimlerChrysler sales. There are 2,830 employees with additional support staff at DaimlerChrysler headquarters in Auburn Hills, Michigan. Current product lines are radios, engine control modules, body controllers, transmission controllers and instrument clusters.

Huntsville expects standard costs to remain flat in 2000, partly because product changes to the 2001 model year minivan will result in 4 to 8 weeks of assembly downtime.

Delphi Automotive Systems
1999 Sales: $29,192 million
Change from 1998: up 2.5%
1999 Operating Margin: 5.8% of sales or $1.682 million, compared with a loss of .8% ($221 million) in 1998.

1999 Sales by Product Sector:
- Electronics and Mobile Communications: $5,296 million, up 9.8% from 1998
- Safety, Thermal and Electrical Architecture: $10,512 million, down 6.4% from 1998, due to divesting seating and lighting businesses
- Dynamics and Propulsion: $13,975 million, up 8.7% from 1998

Delphi's separation from General Motors was completed in May 1999. GM remains Delphi's largest customer, accounting for 76% of sales in 1999, although Delphi grew its sales to non-GM customers by 3% in 1999. In January 2000, Delphi completed the acquisition of Lucas Diesel Systems from TRW Inc. According to J.T. Battenberg, CEO and president of Delphi Automotive Systems, electronics and other high-tech systems will account for about 60% of Delphi's business by 2005, compared with 40% today.

Lear
1999 Sales: $12.429 billion
Change from 1998: up 37.2%
1999 Operating Margin: 5.7% of sales compared with a loss of 1.2% in 1998

1999 (May to December) Lear Electronics and Electrical Distribution Systems (LEED)
Sales: $1.6 billion
Lear acquired United Technologies Automotive in May 1999. Shortly after the acquisition, Lear sold the Electric Motor Systems business that came with UT Automotive. LEED encompasses what remains of UTA's electrical and electronics business. UTA's interior trim products business was absorbed into other parts of Lear. Seat systems account for 60% of Lear's sales, and interior trim products and components, 28%. With the integration of the UTA electrical and electronics business, Lear claims to have a 9% share of the $20 billion market for electrical distribution systems, making Lear the third-largest EDS supplier in the world.

TRW Automotive Segment
1999 Sales: $11,329.7 million, including sales from LucasVarity, acquired in March 1999. Excluding LucasVarity's sales, 1999 sales were $7.2 billion, the same as TRW's Automotive Segment sales in 1998.

1999 Operating Margin: 7.2% of sales, compared with 7.9% in 1998. (Excluding the LucasVarity business, operating profit would have declined 11%.)

TRW Automotive Electronics 1999 Sales: $1,631.7 million
Change from 1998: up 44% with the acquisition of LucasVarity

1999 Automotive Electronics Operating Margin: 7.8%, roughly the same as 1998.

If LucasVarity sales are excluded from total 1999 sales, TRW's 11% decline in profit was the result of price reductions, production inefficiencies and the costs associated with new-product introductions, according to TRW. The company expects growth in 2000 to come from new business in airbags, vehicle stability systems and electrically-assisted steering (EAS). TRW currently has 12 production or development contracts for EAS.

Visteon Automotive Systems
1999 Sales: $19.4 billion
Change from 1998: up 9%
1999 Operating Margin: 6.1% of sales, compared with 6.4% of sales in 1998

Electronics Sales in 1999: $2.976 billion, up 2% from 1998
Sales Breakdown by Division:
- Interior/Exterior Systems, 30%; Chassis Systems, 28%; Energy Transformation Systems, 20%; Climate Control Systems, 18%; Glass Division, 4%

Moving toward its goal of increasing to 20% sales from non-Ford customers by 2002, Visteon's business from outside customers in 1999 rose to 12%, from 9% in 1998. During 1999 Visteon signed product development agreements with Bang & Olufsen, 3Com and Sumitomo.

Europe
Bosch Automotive Equipment Business
1999 Sales: DM 35.1 billion ($17.3 billion)
Change from 1998: up 9.7%
Continued on page 8
The Company Profile... ATX Technologies

Background

ATX Technologies is a telematics service provider. “Telematics” has been defined as the marriage of telecommunications systems and computers to transfer data to other computers. In its most basic form, as is used here in this profile, telematics is wireless communication that sends data about the location of a vehicle or portable handset/phone, along with other data, with or without voice, to the response center.

ATX’s major stockholder, Dr. James Leininger is a co-founder of ATX and remains a director on the board. Dr. Leininger also holds a majority interest in more than twenty public and private companies. Today’s company is the result of the August 1999 merger between Dallas-based Protection One Mobile Services and San Antonio-based ATX Technologies. Both merger companies have pioneered in the telematics industry. Prior to the merger, ATX Technologies had been known primarily for its On-Guard tracking systems products.

Protection One Mobile Services began in 1995 as a division of Westinghouse Security Systems, which offered security products for the home. Westinghouse Security Systems had previously applied GPS technology to mobile monitoring based on work that its parent company had done with the U.S. Department of Defense. In 1996, Protection One Mobile Services teamed up with Ford Motor Company and Motorola to launch Lincoln RESCU, the first in-vehicle, emergency-response system. RESCU integrated location-based, GPS satellite technology and hands-free cellular telecommunications to send messages to a 24-hour call center. In 1999, Protection One and Garmin International claimed to be the first to bring telematics to the wireless market.

Meanwhile, in early 1996, ATX introduced telematics to the automotive aftermarket with On-Guard Tracker, a cost-effective, in-vehicle tracking system. The following year, ATX joined forces with AT&T Wireless Services and Standard Communications to provide seamless national cellular coverage for implementation in On-Guard products with embedded cellular phone, creating the first product that allowed simultaneous voice and data transmission. Marketing of On-Guard Tracker went beyond individual car owners, expanding to commercial applications and becoming the first telematics product for fleet management, according to ATX.

“Although it took the [telematics] industry four years to reach 100,000 customers, I’m confident that there will be nearly 1.5 million customers by the end of 2001,” said Steve Millstein, formerly with Protection One Mobile Services and currently ATX Technologies president and chief operating officer.

Product Evolution: From Safety/Security Features to Content Aggregator

Mr. Millstein believes that the telematics industry is much like the PC industry was more than 10 years ago when a few applications like Word and Lotus spreadsheet existed and the potential of the Internet was unrealized. In telematics today, consumers are interested in only a few of the many possible applications, mainly safety and security features, and for at least the next three or four years, most ATX revenues will come from services related to safety and security. Although data about the vehicle’s location and status will be automatically sent, the motorist will always be able to speak directly to an operator at a response center. Mr. Millstein speculated that in the future...
The Company Profile Continued

customers might receive safety features for free in exchange for the ability to do "p-commerce" (position-based commerce) and for the value gained from their location data. Revenues would be realized by providing on-demand, location-based commerce, infotainment and advertising, based on the consumer's permission-based profile.

Today, the way ATX's service provider business works is through the sale of its location services to a carmaker. The carmaker might also buy other services from other providers, and then market all the services to the consumer. As telematics systems advance, great amounts of data will flow in two directions, from the vehicle to service providers and from service providers to the vehicle. At some point in the future, ATX will not have modems at its service center but instead will have routers that append voice to the data communications and provide a faster, more robust way to route the calls. ATX says it has patents to do that.

ATX doesn't necessarily create content, rather ATX is a content aggregator, like AOL on the desktop. After several years, ATX and other telematics service providers will offer their own portals to the world that would provide a revenue stream separate from particular car-centric services. ATX says it will align itself with a branded portal like AOL, Yahoo! or Microsoft's, allowing the motorist access to content that fits his/her own individual profile no matter what vehicle is being driven. Mr. Millstein believes that is what OnStar is trying to create: a brand name for a portal that can be accessed from any vehicle.

Current Finances

ATX is currently negotiating to close a round of equity financing, hoping to raise $60 million. ATX's initial business strategy was to remain independent of any carmaker— unlike 100% GM-owned OnStar. ATX does not rule out, however, a carmaker taking an equity position in the company, as Ford has done with Sirius Satellite Radio, based in New York. (ATX and Sirius recently announced an alliance to provide radio programming for the vehicle.)

GM announced that by the end of this year, one million cars would be OnStar equipped, and a year after that, two million cars would be so equipped. Mercedes announced that TeleAid would be standard across its entire platform, in other words even on non-luxury vehicles, those that sell for under $30,000. Moreover, ATX aims to make its telematics services available to people with wireless handsets. By 2008, according to the Chase memorandum, 25% of all new handheld wireless phones will be able to transmit their location and will be capable of handling data/information. ATX is planning to have 20% of that market, yielding an additional 9.4 million subscribers. By 2008 in all markets, reports Chase, ATX will serve nearly 17 million subscribers, producing $1.39 billion in service revenues.

Strategy

ATX is targeting North America. If the company goes into another market, it would be through an affiliation; currently, GM announced that the end of this year, one million cars would be OnStar equipped, and a year after that, two million cars would be so equipped.

Mercedes announced that TeleAid would be standard across its entire platform, in other words even on non-luxury vehicles, those that sell for under $30,000. Moreover, ATX aims to make its telematics services available to people with wireless handsets. By 2008, according to the Chase memorandum, 25% of all new handheld wireless phones will be able to transmit their location and will be capable of handling data/information. ATX is planning to have 20% of that market, yielding an additional 9.4 million subscribers. By 2008 in all markets, reports Chase, ATX will serve nearly 17 million subscribers, producing $1.39 billion in service revenues.

Sales Projections

In a study just completed by the Dohring Company for ATX Technologies, 74% of current telematics customers said they definitely or probably would install a telematics system in their next vehicle; 84% said they definitely or probably would recommend telematics to a friend. According to sales projections by Chase Securities, published for an ATX fund-raising memorandum, 45% of all new vehicles built in 2008 will have telematics platforms. Further by 2008, 20% of those telematics platforms will involve subscriptions to ATX services, and the company will service 6.1 million subscribers from automotive OEMs. Ultimately, ATX believes that telematics platforms will be standard on all vehicles. According to Mr. Millstein, there are three recent developments that support such optimism:

- In October 1999, Ford CEO Jacques Nasser announced that beginning in MY 2001, RESCU would be standard on Lincoln models sold in North America, as well as on some MY 2001 lower-priced Fords in Europe.

ATX Top Customers

Automotive OEMs
Ford (Lincoln, Jaguar)
Nissan (Infiniti)
Mercedes-Benz USA
Mercedes-Benz Canada

Aftermarket
Alpine

Commercial Accounts
ADT Security Services
Budget Rent-A-Car
Greyhound Bus Lines
Progressive Insurance

The company will use the proceeds from this round of financing for marketing, operations and development as well as to repay a bridge loan taken to purchase Protection One Mobile Services. Despite investing $70 million thus far and its call for $60 million in additional financing, ATX says its cash flow will turn positive in the fourth quarter of 2001 and be positive from that point on.

ATX Subscribers by Market

2008 Total: 16,991,000

Automotive OEM, 36%
Handheld Wireless, 55%
Aftermarket & Commercial, 9%

Data: ATX and Chase Securities Inc.

ATX Service Revenues by Market

2008 Total $1.39 Billion

Automotive OEM ($120/yr per sub.), 49%
Wireless ($72/yr per sub.), 43%
Aftermarket & Commercial ($96/yr per sub.), 9%

Data: ATX and Chase Securities Inc.
the company is having such discussions in Europe. The only other major automotive telematics service provider serving the United States is OnStar, 100% owned by General Motors.

ATX believes three attributes distinguish the company from others in the telematics industry: several years of experience in both automotive and wireless applications, independence from carmakers, and an open architecture with open hardware and open wireless protocols. Since ATX is independent, the company says it is attractive to carmakers who do not want to do business with a competitor's service provider. ATX feels that its past experience with different customer demographic segments and with various platform technologies—Ford, Infiniti, and Mercedes—gives the company unique expertise in managing the entire environment of telematics.

“We designed our technology in a way that would allow us to take on a new hardware platform in the vehicle.... Motorola today or Visteon tomorrow, whatever, without changing our infrastructure,” noted Mr. Millstein. With flexible, open architectures, customers can choose whatever hardware platform is most economical. “Hardware suppliers like Alpine, VDO, Bosch, Clarion, Motorola, and Nokia tell the company that when they go in to talk to GM, they are a vendor, but when they come to talk to us, they are a technology development partner,” suggested Mr. Millstein. ATX customizes each of its programs by contractor. ATX’s data center can handle several formats for wireless data: AMPS, CDMA or TDMA. “I guarantee nobody else can do that,” stated Mr. Millstein.

According to the company, some audio and electronics manufacturers in telematics are at a disadvantage because they are not experts at wireless technology and do not know how to handle the data coming in over a wireless network. The company feels knowing both automotive and wireless data technology is a big advantage. Roadside providers have not proliferated because they are only voice call centers, not data response centers like ATX’s. Plus, ATX surveys of automotive users suggest they want a subset of ATX vehicle services available for handheld devices. ATX has a wireless sales team to serve wireless carriers. While the wireless telematics industry may be two years behind automotive telematics, the wireless industry will eventually move ahead.

Response Center

Since emergency services predominate today, the company employs 82 operators for 90,000 subscribers. ATX believes the optimal ratio for emergency services from a telematics response center will be a bit lower, closer to 4 operators for every 5,000 vehicles. Moreover, the ratio in the future will be even lower because as more non-emergency services are offered, more responses will be automated. Technology is going to reduce operator involvement, predicted Mr. Millstein, but he hastened to add that the motorist would always be able to reach an operator. ATX’s research indicates live operators are critical to motorists’ feelings of security.

The company recognizes that there is a clear need for voice-recognition and text-to-speech technology platforms at the response center, two reasons: safety in the car and lower costs. Voice recognition could take the place of live operators for some services. A car with less hardware and a center with fewer operators and more technology would yield savings, for example, navigation from continuously updated databases at the center instead of CD-ROM equipment and CDs in the car.

ATX Customers

- Ford: ATX and Ford are planning a broad rollout of telematics services on Ford’s mid-level lines starting in 2001. ATX is currently at the end of a four-year contract to provide telematics services for MY 2000 Lincoln Continental, Lincoln LS and Jaguar X-200; RESCU is available as an option on these models. ATX and Ford are currently negotiating a contract to cover beyond MY 2000.
- Mercedes-Benz USA, expected to be the largest ATX customer in the near future, signed a four-year contract in November 1998 and launched ATX services under the TeleAid brand in March 1999. ATX expects to take on about 15,000 new TeleAid subscribers per month in 2000. In 1999 Mercedes-Benz USA and Mercedes-Benz Canada chose ATX as its location services provider. Mercedes-Benz USA plans to offer telematics equipment as a standard, factory-installed feature on all models as of model year 2001; today, TeleAid is standard on all models in the U.S. with the exception of SLK and M-Class. Mercedes total North American vehicle sales was 144,000 units in 1999, according to a automotive news.
- Nissan signed a four-year agreement with ATX in April 1998, for ATX’s emergency service program, an option across the Infiniti line, and is working to develop an enhanced system for more vehicle lines in 2001.
- ADT’s 500-person sales organization distributes ATX services to its commercial security customers.
- Brinks has a contract to sell ATX services as an extension of Brinks’ home security services.
- Budget Rent-A-Car: ATX provides asset-allocation support, car emergency and navigation services.
- Greyhound has an asset protection, driver navigation and emergency system handled by ATX.
- Protection One has a contract to sell ATX services to their home security customers.

Companies Working With ATX

- Alpine resells ATX services to its equipment customers through Alpine’s aftermarket distribution channel. Alpine is an equity investor in ATX.
- Bosch developed the onboard platform for the Mercedes TeleAid systems administered by ATX.
- Clarion AutoPC: A service is provided by ATX.
- Mitsubishi Electric worked with ATX on a voice/data telematics offering for auto OEMs.
- Motorola developed the equipment platform for ATX services for Mercedes, Ford, Jaguar and Nissan. Denso helped develop the equipment platform for Jaguar.
- Nichimen has equity position and supports ATX’s work with Alpine and other Japanese companies.
- Nokia: letter of understanding to...
juxtapose develop telematics products and services

- **Pioneer**: letter of understanding to work on early-stage development of Pioneer's aftermarket telematics products
- **Sirius Satellite Radio**: alliance to integrate ATX's two-way wireless communications and automotive location-based technologies with Sirius' 100-plus commercial-free audio channels broadcast from NYC via satellite
- **TRW**: letter of understanding to work jointly on a telematics product
- **VDO Mannesmann**: letter of understanding to collaborate on ATX developments on behalf of automotive OEM's
- **Visteon**: joint development program in support of Nissan

**ATX Products**

ATX feels it serves both the carmakers' interests and those of the end consumer who has purchased the vehicle. Mr. Millstein explained: "We deliver to carmakers a whole new way of marketing to their customers. On average, carmakers only take in about $20,000 of the total $80,000 consumers spend while they own that vehicle. Telematics services can help them [take in more]." To the consumer, ATX delivers "peace of mind," ensuring assistance to the exact location whenever needed.

In order to receive basic safety and security services, some inexpensive electronics hardware must be embedded in each vehicle: a cellular phone circuit, a GPS satellite receiver for location data and a modem to send that data. This equipment is referred to as a thin client because its capability is limited. Over the next several years, carmakers including GM, Ford and DaimlerChrysler will embed thicker clients in their vehicles, starting with their highest-priced vehicle lines. Such hardware/software computing platforms will handle multimedia, have a display, have digital memory, be capable of recognizing voice commands and convert text messages to speech, emails for instance. As thicker clients are installed in vehicles and as ATX offers more sophisticated services, less involvement by operators will be needed, reducing costs.

Three to four years, however, can pass from the time a design for a new hardware platform is frozen until it is available in the market. "Our ability to create a new product to meet a market requirement is much faster than the electronics manufacturer’s ability to build, and then [after that] the OE’s ability to get it in a car," a frustrated Mr. Millstein told us. "We are merging an industry that has long cycle times with e-commerce, dot coms and Internet industries that have two-month cycles." ATX is developing technologies for its third-generation architecture involving a telematics server and portal.

**Current Services**

- **Emergency Response**: In an emergency, a subscriber presses a button in his/her vehicle or on a wireless handset, or if the airbag inflates (see below), and the caller's location and vital information are transmitted to the ATX call center and displayed on the center's workstation, while an operator establishes voice contact with the caller. After determining what help is needed, the operator contacts the appropriate response agency near the caller and directs it to the caller's location.
- **Automatic Collision Notification**: The emergency response is triggered automatically when a vehicle's airbags or seatbelt pretensioners are actuated or when a collision sensor signals a crash.
- **Roadside Assistance**: With the press of a button, the driver can establish voice contact with the ATX call center. ATX also provides enhanced roadside assistance by electronically sending the subscriber's data file (consisting of the vehicle's location and profile) to the roadside assistance provider.
- **Stolen Vehicle Tracking**: When a vehicle is reported stolen, the ATX response center can locate the vehicle and direct police to its location.
- **Security System Notification**: ATX can notify a subscriber when his vehicle security system has been activated and initiate tracking upon verification that the vehicle is missing.
- **Lost and Found**: A concerned subscriber can have the ATX center locate a teenager or an elderly person, and once the vehicle or handheld device is located, request that the missing person check in.
- **Remote-Vehicle Unlock**: Subscribers can unlock their vehicles by calling an interactive voice response center or by speaking to an operator.
- **Voice Navigation**: Operators can provide turn-by-turn directions and estimated travel times. Since the driver must either remember or transcribe the directions manually, this service is specifically targeted at distressed drivers looking for directions to nearby, essential services.

**Services Under Development**

According to ATX, the following services will be launched by the end of 2000.

- **Traffic information**: On-demand, advance warning of local congestion, road closings and traffic incidents. Initially, depending on the equipment platform in the vehicle, ATX will provide text information but later will add other formats, including text-to-speech and map/graphical displays. Traffic information is now available in about 60 major metropolitan markets.
- **Enhanced Voice Navigation**: The second generation voice navigation will reduce the time needed to generate a route and will offer a larger database of addresses and points of interest.
- **Internet-Accessed Information Services**: Users will be able to select information services such as news, weather, financial data or sports, from a personalized home page, through ATX’s partnerships with national information providers. The information can be delivered to a vehicle's onboard computer or to a mobile device. Initial versions of the service will use the customer's pre-set profile settings, but future offerings will be based on the user's current location and will also be interactive. The initial version will be available by the end of 2000.
- **Email, calendar reminders and messages**: In conjunction with automotive and electronics manufacturing partners, ATX will offer users the ability to access email through the user's home page or any email software, depending on the capability of the in-vehicle hardware. Calendar reminders could also be sent to the vehicle.
Roundup...

Automotive sales in North America for Robert Bosch Corp., the wholly-owned U.S. subsidiary of Robert Bosch GmbH, were $4.2 billion, up 8% from 1998. The Bosch Group attributes the growth in worldwide automotive sales to the growing market for navigation, engine management, fuel-injection technology and electronic stability control systems. Bosch increased its share in Zexel (Japan) from 30% to 50.04% in 1999.

MagnaTrol
1999 Consolidated Net Revenue: 4,062 million euros ($3,970 million)
Change from 1998: up 7.1%
1999 Operating Margin: 2.7% of sales, compared with 1.5% of sales in 1998
MagnaTrol, a subsidiary of Fiat Group, plans to focus on core businesses that include lighting and engine control and to invest further in cockpit modules, suspensions and telematics. The company strengthened its lighting business with the 50-50 joint venture, Automotive Lighting GmbH, set up in October 1999 with Bosch. The acquisition of Seima (Italy), a lighting manufacturer, was finalized in January 2000. In March 1999, MagnaTrol sold its rotating machines division, which includes starters, alternators, windshield wipers and small motors, to Denso. That division’s 1998 sales were 330 million euros ($323 million) in 1998.

Mannessmann VDO
1999 Sales: 3,464 million euros ($3,385 million)
Change from 1998: up 10%
The strongest growth in 1999 came from the Cockpit Systems business unit. Contributing to growth were Car Communications (the business acquired from Philips Car Systems in 1998), Kienzle Car Information Systems and Fuel Systems. The company grew its U.S. business by 20% in 1999, with new orders for fuel systems, instrumentation and engine control systems.

VDO’s parent Mannessmann Group was acquired by Vodaphone Airtouch PLC in February 2000. In March 2000, Mannesmann reorganized its Automotive and Engineering divisions, including VDO, into Atecsis Mannesmann, which was to be IPO’d in June. Later in March, Atecsis Mannesmann and Siemens agreed to merge VDO with Siemens Automotive in a 50-50 joint venture called Atecsis Siemens, to be based in Frankfurt, Germany, with sales estimated at 7 billion euros ($6.8 billion). As we go to press, the fate of the Siemens joint venture and the IPO of Atecsis Mannesmann is uncertain, in light of an offer from ThyssenKrupp to buy all of Atecsis Mannesmann.

Siemens Automotive Systems
1999 Sales (fiscal year ending September 30, 1999): DM 6.4 billion ($3.2 billion)
Change from 1998: up 14.3%
Earnings before interest and taxes: Up 6%, to DM 310 million ($152 million)
Siemens AT growth came from major increases in locking and immobilization systems, ABS controllers, electrical distribution systems, engine control units and airbag electronics, especially in the North American market. Siemens AT employs 27,000 people at over 70 facilities worldwide. In 1999 Siemens formed a joint venture with Navistar International to manufacture diesel injectors. A new joint venture with PSA Peugeot Citroën in France will develop and manufacture high-pressure injection pumps for gasoline direct injection.

In late March 2000, Siemens Automotive and Mannesmann VDO agreed to form a 50-50 joint venture, Atecsis Siemens Automotive AG, but the joint venture has not yet been approved by the Mannesmann Supervisory Board.

TEMIC Automotive Electronics
1999 Sales: 890 million euros ($880 million)
Change from 1998: up 18%

TEMIC, the automotive electronics business unit of DaimlerChrysler (Germany), expects continued growth in 2000. Incoming orders increased by 38% in 1999 to 1 billion euros ($977 million), and 535 new employees were hired. New applications of electronics include CVT (continuously variable transmission), adaptive cruise control and telematics. TEMIC expects strong growth for its voice-recognition system, which was acquired from Daimler-Benz’ Aerospace division (Dasa).

Valeo
1999 Sales: 7,717 million euros ($7.5 billion)
Change from 1998: up 28.2%
1999 Operating Margin: 6.3% of sales, up 14% from 1998
Net income increased 117%, due mainly to the sale of Valeo’s 50% stake in LuK, a German clutch manufacturer. Valeo increased its workforce by 1,300 employees in 1999. According to the company, the 28% sales growth was a result of internal growth, especially by businesses acquired in 1998 and 1999, most notably the electrical systems business of ITT Automotive in 1998. Valeo generates more than 50% of its sales in the Electrical/Electronics sector, which includes Wiper Systems, Motors and Actuators, Electronics, Lighting Systems, Security Systems and Electrical Systems (alternators and starters). In 1999, joint ventures were set up with Zexel (in thermal systems) and Unisia Jecs (transmission systems). In 2000, Valeo will be searching for more investment opportunities, particularly in technology start-ups and Internet-driven automotive businesses. André NAVARRI has been nominated to replace Noel Goutard as chairman and CEO in May 2000. Mr. Goutard has been head of Valeo since 1987.

ACC... Continued from page 2

Concern Systems.”

Today’s ACC systems are not precise enough for stop-and-go traffic; they must turn themselves off at slow speeds. For stop-and-go, sensors would need to accurately measure distances to obstacles located zero meters to 30 meters in front of the vehicle. Radar sensors are not accurate enough, although infrared sensors do near-distance measurement well. To implement stop-and-go obstacle avoidance, an ACC suppliers may well use both sensors. A (automotive Distance Control System) is developing a stop-and-go ACC system that should be ready for the market in 2002 or 2003.

Over time, demand for ACC systems will increase as motorists become accustomed to conventional cruise control, now in 90% of new vehicles in the U.S. A technology improves and prices are reduced, adaptive cruise control will finally evolve into collision avoidance systems. These advanced systems will allow the vehicle’s braking, engine and steering systems to take control automatically from the driver as needed. It will be well after 2003 before collision avoidance systems are acknowledged as safety features that can dependably recognize which objects are hazards and which are not.