
Is Vehicle Data Recording Auto Insurance's Future?

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Vehicle data recorders and telematics are not a future possibility, but currently available technologies. As costs decrease, many industries, including insurance, are taking a second look at utilizing these devices to improve services, and to develop innovative solutions. Auto insurers need to be aware of what is possible now and in the near future. This paper presents a brief overview of available devices, and their potential future in insurance.

MANY TYPES OF BLACK BOXES

There are four basic types of "black boxes":

1. Trip-logging Devices,
2. Passive GPS Tracking Devices,
3. Crash Data Recording Devices, and
4. Telematic Devices.

1. Trip-logging Devices

These aftermarket devices connect to the diagnostic link of a vehicle's operation systems and record data such as distance traveled, speed, braking and engine status with a time/date stamp. The stored data is then downloaded to a PC or a PDA. This type of device is being evaluated by the Federal Motor Carrier Safety Administration (FMCSA) for use in commercial vehicles to comply with the [Hours-of-Service Rules](#).

Current Market Examples

- [Carchip](#) by *Davis Instruments*, for about \$100, connects to the vehicle diagnostic port in most vehicles manufactured since 1996. *Carchip* tracks 75 hours of data including hard braking, hard acceleration, distance driven, date and time. All information can be retrieved through a simple PC connection.
- [RoadSafety International](#) sells telematics solutions to emergency medical services, police and firefighter fleets. A new version for teenage drivers that retails for \$280 sets off an alarm for speeding, rapid acceleration, braking hard, unbuckled seatbelts and other unsafe driving. Like *Carchip*, the data is easily downloaded to a PC.

Examples of the data and output of these devices is contained in Appendix A to this report. Appendix B contains hyperlinks to referenced sources and products.

2. Passive GPS Tracking Devices

These aftermarket devices are similar to the trip-logging device with the addition of geographic coordinates provided via a GPS system. These devices do not allow real-time access to vehicle locations since the stored data is downloaded after the fact; however, they can offer a higher resolution of data than active tracking systems that charge for each wireless upload of position information.

Current Market Examples

- *FleetBoss* [The Boss 1000](#) is popular with small fleet owners to help monitor hours of service and proper billing by location. It stores about 25,000 miles of data and lists for about \$1100 per vehicle.
- [LandAirSea 3100 INT](#) costs \$295, stores 30 days of driving activity (300 hours) with 4 AA batteries and no installation.

3. Crash Data Recording Devices

These OEM and aftermarket devices, what the National Highway Traffic Safety Administration (NHTSA) calls event data recorders (EDR), record a snapshot of data before and after a crash. Typical data includes speed, brake position, change in velocity and airbag deployment status. Some airbag modules, like *GM's*, record data, and are considered a type of EDR. The [NHTSA proposed rulemaking](#) would require that EDRs (e.g. airbag modules) voluntarily installed in private passenger and other light vehicles record a minimum set of data elements in order to improve vehicle safety research, effective in 2008. Approximately 15% of the 200 million light vehicles on the road today and over 65% of model year 2004 light vehicles have an airbag module that records some pre-crash data.

Current Market Examples

- Many accident reconstruction services now offer analysis of airbag modules using the crash data retrieval device sold by [Vetronix](#). Although mostly *GM* models are currently accessible with this device, several *Ford* models have been added to the list and other automakers plan to allow access in the near future. Their website includes a list of all accessible models.
- [VDO Siemens UDS 2.0](#) is a precise accident data recorder for commercial vehicles that records both high and low-severity impact events (i.e. not limited to airbag deployment events) and also acts as a trip-logging device. List price is about \$856.

4. Telematic Devices (With Real-time GPS Tracking)

A vehicle data recording device that communicates data wirelessly is called a telematic device. *GM's OnStar* is the best-known telematics application in the American auto

market, with *ATX Technologies* the second largest player. In addition to being wireless, these devices can also monitor vehicle data in real-time. The following chart displays the many potential applications.

The Promise of Telematics



With the many potential benefits, one would think that every car would have a telematic device, however the numbers are low. In the U.S., about 3 million consumers subscribe to a Telematics Service Provider (TSP), out of about 200 million registered passenger vehicles. In addition, 30-50% of long-haul trucking companies and public transit entities, approximately 1 million vehicles, use telematics in fleet management (according to the *C.J. Driscoll & Associates' U.S. Fleet Automatic Vehicle Location Market Study*, 6/4/2003). Device costs are still high and, for telematics, drivers typically must subscribe to a TSP for a monthly fee that many are not willing to pay. *OnStar*, for example, has an initial price that varies by vehicle, and ranges from \$500 to \$1200 plus a \$17 to a \$70 monthly fee in the second year. Commercial vehicle tracking services can cost about \$1000 per vehicle plus a \$30 or more monthly fee depending on data usage.

Current Market Examples

- OEM related TSPs for consumers like *GM's OnStar* system, the most well known in the world, and *ATX*, which operates under service brand names like *TeleAid* for *Mercedes*, presently hold the U.S. consumer market of 3 million subscribers. Surveys show that these customers value the security of the automatic crash notification and location services.
- *Qualcomm*, a pioneer in telematics, is the largest TSP for fleet management in trucking and has its own proprietary satellite system.
- *Networkcar*, an aftermarket vendor, provides both fleet and individual services. Their technology allows online vehicle location, updated every 2 minutes, remote diagnostics, navigation and emergency services. (<http://www.networkcar.com/networkcar/pub/main>)
- *AirIQ OnBoard* is a device used by car rental agencies that can lock, unlock doors, determine location and speed, as well as disable the engine starting mechanism. *AirIQ* has planned to enter the consumer market this year.
- *Teen Arrive Alive/Nextel* This program uses a *Nextel* GPS-equipped cell phone that transmits the teen's location, speed, and direction of travel to *TAA* every two minutes. The parent can visit the *TAA* website to view the teen's location and location history or call a number to hear the last known location, speed, and direction of travel.

Large software and hardware companies like *Microsoft* and *IBM* have grown impatient with OEMs and have begun their own efforts:

- *Microsoft* has undertaken two initiatives in telematics. They have introduced a version of *Windows for Automotive* that is used by various auto manufacturers such as *BMW*, *Mitsubishi* and *Volvo*. They have also produced a prototype of the *Tbox* that includes wireless communication, speech technology, hard disk storage, and integration with vehicle systems. *Tbox* is designed to integrate all automotive electronics such as navigation, diagnostics, cell phones, and make them all respond to voice commands.

With characteristic modesty, *Microsoft* has declared the goal of having their operating system in every car on earth. The prototype version costs approximately \$100, although the price is likely to fall with wide adoption.

- *IBM* has created middleware for location-based services and has partnered with *Celestica* to develop the *eDevice*, a black box that provides wireless usage and crash data that costs about \$100.

Vehicle Recorders in Auto Insurance

Vehicle data recorders hold great promise for auto insurance. For underwriters, tracking data devices can provide verification for annual mileage, commute distances, and garaging location: three rating variables *Quality Planning Corp.* audits have shown to cause \$4.2 billion in annual industry-wide premium leakage due to rating error. For actuaries, it can provide modeling data to determine new rating variables, and improve the quality of current variables. For claims adjusters, crash data can help weed out bodily injury and physical damage fraud, help determine negligence, and generally speed up the adjusting process. In addition, telematic devices can seamlessly stream these data to ensure quality data capture, and provide real-time accident alerts.

Safety

Safety has always been a concern of auto insurers. Worldwide, telematic monitoring of driver performance pilot programs have demonstrated major reductions in accidents. Berlin taxi accidents fell 66 percent after installation of telematic tracking. A European Union telematics pilot found telematics reduced the accident rate by 28 percent and costs by 40 percent. Emergency services and fleet users of telematics report accident reductions over 20 percent. These driving modification safety benefits, the so called "halo-effect" would impact future loss costs only with widespread use of such devices, which looks unlikely in the near future due to the high costs involved.

Auto Insurer Initiatives

Despite the cost of the devices and services, the cost of revising an IT system, the lack of standardized data elements, privacy concerns, and the low demand from auto customers both private and commercial, some auto insurers here and abroad are taking a second look at the field:

- In 1998, *Progressive* pioneered *Pay-as-you-drive* variable auto insurance using a telematic GPS tracking device. The pilot program was cancelled in 2001 due to high device and IT costs. Recently *Progressive* has re-entered the field with a new pilot program in Minnesota. A trip-logging device attached to a vehicle's diagnostic port records miles driven, speed, and time of day. Unlike their earlier program, the telematic communication and GPS tracking of where the vehicle goes are not included in the current pilot. Data from the recorder can easily be downloaded to a PC and transmitted to *Progressive* via the Internet. At their option, *Progressive* customers may download the data to *Progressive* in exchange for premium discounts up to 25% based on mileage, speed and time of day.

- [*Kingsway General Insurance*](#) offers special truck insurance pricing based on a vehicle data recording device in Canada.
- [*GMAC Insurance*](#) is conducting a mileage-based discount pilot program in Arizona, Indiana, Illinois, and Pennsylvania for *OnStar* customers that can save customers up to 40%.
- [*Norwich Union Insurance*](#) in the UK is doing a *Pay-As-You-Drive* pilot based on *Progressive's* patented rating methodology developed for the pilot program in 1998. *Norwich*, working with *IBM's* latest technology and installing the inexpensive *eDevice* in 5,000 volunteer cars, believes its pilot will result in a cost effective program.
- [*AXA Insurance*](#), Ireland's leading auto insurer, has a telematic discount program for young males that compares speed driven to the speed limit using a GPS telematic tracking device.
- [*Aioi Insurance*](#) in Japan has just introduced a *Pay-As-You-Drive* program that targets young drivers and utilizes *Toyota's* GPS telematic *G-book* system.
- [*American Transit Insurance*](#) offers an insurance discount for New York City taxis that use *IBM's eDevice*. This version of the *eDevice* also records crash data that can be used in claims adjustment.
- [*Grange Mutual*](#) is analyzing crash data obtained from airbag modules to improve liability determination on select claims.

The data from the above usage-based programs could vastly improve the accuracy of auto risk rating and provide those telematic-savvy insurers with a major competitive advantage. The detailed usage data offer a whole new level of risk measurement, in addition to verifying underwriting data, by monitoring variables like average speed, rapid acceleration and braking, hours of vehicle use, and types of roads driven.

For example, it is possible to know that an insured driver left his home at 12:00 AM, drove to a bar, left the bar at 2:00 AM, drove down a 25 mile-per-hour street at 55 MPH and ran three stop signs on the way home. Such information, however, immediately raises important privacy concerns.

Privacy Concerns

Privacy concerns tend to dominate any discussion of vehicle data recording and insurance. Would the average driver want his or her insurer to have access to the type of personal information listed above? The answer in most cases is likely to be no. Therefore, resolution of the privacy issue is likely to be a major shaping influence on the future of vehicle data recording in insurance.

One way to address the privacy concern is to allow the owner of the data to choose who has access to the data in return for benefits. With access to the data in the hands of the insured, several paths toward widespread implementation of usage-based insurance become conceivable. First, owners of commercial fleets do not have the same privacy concerns as individual drivers. They want to know exactly where their vehicles are located, how fast they are being driven, and so on. If they could reduce their insurance

costs through telematics it is reasonable to expect a majority will take the opportunity. Second, parents of teenage drivers may also desire the joint benefits of monitoring their children's driving and reducing premiums. Third, individuals with seldom-used vehicles may provide a large market for *Pay-As-You-Drive* insurance with mileage verified through vehicle data recording. Fourth, individuals with good driving habits might desire the opportunity for lower premiums associated with vehicle data recorder verification of their safe habits. Fifth, a graded usage-based insurance approach could be adopted where different levels of discounts apply based on the amount of data the insured permits their carrier to access. Sixth, telematics insurance may come in as an add-on to other consumer telematic features such as navigation, road safety services, traffic control and toll collection. Seventh, the privacy issue might just go away. Remember the privacy concerns that were raised with the introduction of price scanners in supermarkets? At the time, privacy advocates were alarmed that matching purchase databases with credit or membership card identifications would produce big-brother databases with major corporations tracking all of their life-style information. Today, price scanners are just an accepted part of life. Perhaps, in the future, the telematics-equipped car will be just one more element of an all-encompassing information system. Eighth, legislation may resolve the competing privacy issues in a way that protects insureds and opens secure and private pathways for usage-based insurance.

Vehicle Data Recording's Uncertain Future

The future of telematics and vehicle data recording development remain uncertain. Market analysts have reduced their forecasts. To date, consumer demand has been low at the prices offered. Exactly how much auto consumers are willing to pay by type of device or service is unknown at this time. Many technical issues are unresolved. For example, is the primary communication channel likely to be cell phone, satellite, dedicated short-range communication (DSRC), WiFi or other? We do not know how much this market will be controlled by auto manufacturers, aftermarket vendors, or government services. Before insurance uses can be even considered, many more cars have to be equipped and many more drivers have to subscribe.

Even when these devices do become cost-effective, we still do not know how best to rate auto risk using recorded vehicle data. In addition, especially important for personal auto, the regulatory environment of usage-based auto insurance is in its infancy; its dimensions can only be guessed.

Therefore, since the number of equipped vehicles is low, and will remain low in the near future, insurers cannot afford to wait for new technology while watching billions of dollars in premium and claims leakage. Insurers must enhance monitoring and verification of auto rating, improve the claims process, and fight fraud through available technologies to gain the competitive advantage.

Quality Planning and *ISO* continue to research telematics and vehicle data recording as part of our larger program to promote rating integrity in auto insurance. Given the great

promise of these technologies in auto insurance, and their great uncertainties, our recommendation is to utilize technology and data that are within our reach.

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Appendix A

Examples of output data from the four types of black boxes.

1. Trip-logging Devices

Data Example 1

No.	Start Date	Start Time	Stop Date	Stop Time	Total Time	Parameter	Set Limit	Max Value
1	2/9/04	1:22:40	2/9/04	2:16:16	0:56:36	Distance Traveled	N/A	55.6
2	2/9/04	1:23:40	2/9/04	1:23:41	0:00:01	Throttle	47	47.5
3	2/9/04	1:27:19	2/9/04	1:27:21	0:00:02	Throttle	47	61.6
4	2/9/04	1:27:46	2/9/04	1:29:02	0:01:16	Speed	44	72.7

Data Example 2

Driver	Mileage	Avg. Monthly Mileage	Weekend mileage	%	Night Mileage	%
Bob	1805	233	607	33	751	41
Betty	4826	21	2475	51	1604	30

2. Passive GPS Tracking Devices

Date	5/1/2004
Total Driving Time	6 hours, 7 minutes, 2 seconds
Total Mileage Driven	217.7 miles
Highest Speed Driven	79.6 mph
Above Limit Duration	Over 65 mph for 46 minutes, 12 seconds

Departed	Driving Time	Arrived	Location Arrived	Distance (Miles)	Stopped Time
5/1/2004 8:15:32 AM	1h:08m:42s	5/1/2004 9:24:14 AM	314-339 Lake St., Crystal Lake, IL	41.0	1h:19m:04s
5/1/2004 10:43:18 AM	1h:34m:37s	5/1/2004 12:17:55 PM	1673-1699 Greenbriar Dr., Schaumburg, IL	35.8	0h:57m:30s
5/1/2004 1:15:25 PM	1h:09m:19s	5/1/2004 2:24:44 PM	3600-3699 N. Leavitt St., Chicago, IL	38.5	0h:20m:46s
5/1/2004 2:45:30 PM	0h:30m:04s	5/1/2004 3:15:34 PM	5644-5699 W. West End Ave, Oak Park, IL	15.4	0h:15m:40s
3/3/2004 3:31:14 PM	1h:44m:20s	3/3/2004 5:15:34 PM	1200-1250 Butler St., Morris, IL	87.0	End of Day

3. Crash Data Recording Devices

The table below shows the minimum set of recorded data elements to be required in NHTSA's proposed EDR rulemaking.

Minimum Required Recorded Crash Data Elements

<i>Data Element</i>	<i>Recording Interval / Time</i>
<i>Longitudinal acceleration</i>	-0.1 to 0.5 sec
<i>Maximum delta-V</i>	Computed after event
<i>Speed, vehicle indicated</i>	-8.0 to 0 sec
<i>Engine RPM</i>	-8.0 to 0 sec
<i>Engine throttle, % full</i>	-8.0 to 0 sec
<i>Service brake, on/off</i>	-8.0 to 0 sec
<i>Ignition cycle, crash</i>	-1.0 sec
<i>Ignition cycle, download</i>	At time of download
<i>Safety belt status, driver</i>	-1.0 sec
<i>Frontal air bag warning lamp, on/off</i>	-1.0 sec
<i>Frontal air bag deployment level, driver</i>	Event
<i>Frontal air bag deployment level, right front passenger</i>	Event
<i>Frontal air bag deployment, time to deploy, in the case of a single stage air bag, or time to first stage deployment, in the case of a multi-stage air bag, driver</i>	Event
<i>Frontal air bag deployment, time to deploy, in the case of a single stage air bag, or time to first stage deployment, in the case of a multi-stage air bag, right front passenger</i>	Event
<i>Multi-event, number of events (1,2,3)</i>	Event
<i>Time from event 1 to 2</i>	As needed
<i>Time from event 1 to 3</i>	As needed
<i>Complete file recorded (yes, no)</i>	Following other data

4. Telematics Devices (With Real-Time GPS Tracking)

Data Example 1

Date/Time	Latitude	Longitude	Location	City	ST	Zip	Status
Aug 4, 2004 6:28:47 PM EDT	33.1331	-96.7838	6540 - 6567 Fairlawn Dr, 85 meters SW of Fairlawn Dr and Waterbury Dr	Frisco	TX	75035	Current The vehicle has been stationary for 310 minutes.
Aug 2, 2004 12:12:01 PM EDT	33.1178	-96.7952	9700 - 9830 Cr-19, 156 meters E of Cr-19 and Colby Dr	Frisco	TX	75035	Current Speed: 36 Direction: West
Aug 2, 2004 8:46:15 AM EDT	33.1523	-96.7805	11200 - 11889 Fm-720, 81 meters E of Fm-720 and Taft Powell Rd	Frisco	TX	75035	Current Speed: 42 Direction: East
Aug 1, 2004 9:43:43 AM EDT	33.1188	-96.7687	5500 - 5599 Cr-66, 141 meters N of Cr-66 and Coit Rd	Frisco	TX	75035	Current Speed: 18 Direction: South West

Data Example 2

09/09/04 – 10:57 AM	Cortez Rd W, Bradenton, FL heading S at 14 MPH
09/09/04 – 10:55 AM	4465 26th St W, Bradenton, FL heading N at 25 MPH
09/09/04 – 10:53 AM	4945 23rd St W, Bradenton, FL
09/09/04 – 10:51 AM	4908 26th St W, Bradenton, FL heading N at 24 MPH
09/09/04 – 10:49 AM	1283 53rd Ave W, Bradenton, FL
09/09/04 – 10:46 AM	784 53rd Ave E, Bradenton, FL heading W at 42 MPH
09/09/04 – 10:44 AM	Route 301, Bradenton, FL heading W at 30 MPH
09/09/04 – 10:42 AM	53rd Ave E, Bradenton, FL heading W at 44 MPH
09/09/04 – 10:40 AM	53rd Ave E, Bradenton, FL heading W at 50 MPH
09/09/04 – 10:38 AM	Route 70, Bradenton, FL heading W at 22 MPH
09/09/04 – 10:36 AM	Route 75, Bradenton, FL heading N at 57 MPH
09/09/04 – 10:33 AM	Route 75, Bradenton, FL heading N at 73 MPH
09/09/04 – 10:32 AM	Route 75, Sarasota, FL heading N at 70 MPH
09/09/04 – 10:29 AM	Fruitville Rd, Sarasota, FL heading N at 3 MPH

Appendix B: Hyperlinks

Aioi Insurance	http://www.ioi-sonpo.co.jp/en/comp_profile.html
AirIQ OnBoard	http://www.airiq.com/airiqnewweb2/index.cfm
American Transit Insurance	http://www.american-transit.com/Main.asp
ATX	http://www.atxtechnologies.com/
AXA Insurance	http://www.axa.ie/
Carchip	http://www.davisnet.com/drive/products/carchip_products.asp
Fleetboss	http://www.fleetboss.com/factsheet.asp
FMCA Hours of Service Rules	http://dmses.dot.gov/docimages/pdf89/294828_web.pdf
Grange Insurance	http://www.grangeinsurance.com/about.asp
IBM Automotive	http://www-1.ibm.com/industries/automotive/us/en/
Kingsway General Insurance	http://www.kingsway-general.com/
LandAirSea	http://www.vehicle-tracking.com/index.html
Microsoft Automotive	http://www.microsoft.com/automotive
Networkcar	http://www.networkcar.com/networkcar/pub/main
Nextel	http://www.nextel.com/about/enterprise/wbs/gps/track.shtml
NHTSA Proposed Rules	http://www.nhtsa.dot.gov/cars/rules/rulings/EDRNPRM4--June1/part2.html
Norwich Union	http://www.norwichunion.com/pay_as_you_drive/what_is_payd.htm
OnStar	http://www.onstar.com/us_english/jsp/index.jsp
OnStar/GMAC Insurance	http://www.onstargm.com/promo/html/promo_mileage.htm
Progressive Insurance	http://www.progressive.com/
Qualcomm	http://www.qualcomm.com/
Road Safety	http://www.roadsafety.com/
Teen Arrive Alive	http://www.teenarrivealive.com/index.htm
VDO Siemens UDS	http://www2.vdo.com/vdo/sycomax/files/508131_UDS2.0_gb.pdf
Vetronix	http://www.vetronix.com/diagnostics/cdr/