Introduction

The use of telematics data has increased dramatically in the last few years for several reasons, including: the cost of systems has decreased, the greater number of services being offered and the widespread acceptance of this technology in the transportation industry. Knowing more about the types of data that are available and how to get this data can be important in investigating and reconstructing a motor vehicle crash case. This paper is not meant to be an exhaustive compendium of all of the different telematics service providers and their services. Rather, this paper should serve as a guide to inform the reader as to the types of systems that are available, the types of data that they may record, how to get the data and how to use the data.

Definitions

Telematics is defined by Fleetmatics (a telematics service provider) as:

“Telematics is a combination of the words telecommunications and informatics. Telematics, in a broad sense, is any integrated use of telecommunications with information and communications technology. It is the technology of sending, receiving and storing information relating to remote objects – like vehicles – via telecommunication devices. Under the “telematics” umbrella is the integration of Global Positioning System (GPS) technology and computers and mobile devices. The term “telematics” has even evolved to refer specifically to GPS vehicle tracking and, at no coincidence, inspired the name for Fleetmatics.”

The telematics systems currently in use typically send data from the vehicle to a central data storage location, where it can be accessed via web-based interfaces.

Types of Systems in Use

How do you determine if a vehicle has any type of telematics system installed? Typically there will be an external antenna, an internal screen/keyboard or a windshield mounted camera/recording unit. See Figures 1, 2, 3 and 4 for examples.
Figure 1 - GPS Antenna Mounted to Roof Of Tractor

Figure 2 - Qualcomm Terminal
Figure 3 – Peoplenet Terminal

Figure 4 - DriveCam Unit Installed in a Vehicle
The types of systems currently in use provide the following services: electronic hours of service, asset tracking, maintenance monitoring, driver performance monitoring, incident recording, video recording and driver coaching. It is important to note that these systems are constantly evolving and the services that each telematics service provider offers often change.

Popular telematics service providers include:

- Qualcomm (bought by Omnitracs)
- Peoplenet
- Fleetmatics
- Xatanet (bought by Omnitracs)
- Omnitracs
- Fleetboard
- Actsoft (asset tracking)
- Lytx (DriveCam)
- Geotab
- Telogis
- Janus

Examples of data from several of these telematic service providers are shown below. Examples are not shown from all providers listed above. Omission or inclusion of any service provider does not constitute an endorsement of any service provider.

**Peoplenet**

Peoplenet currently offers a comprehensive system called “Video Intelligence”. This system incorporates forward facing and side view cameras, as well as logging vehicle speed, driver hours of service, driver behavior, FMCSA CSA (Federal Motor Carrier Safety Administration Compliance, Safety Accountability) violations and more. An example of the scope of data captured in the “Video Intelligence” system is shown in Figure 5.
Peoplenet also offers real-time weather alerts and road conditions for the entire US via their “myRoads” weather alert system. See Figure 6 below for an example of the types of weather data offered. As drivers may travel hundreds of miles in one day, this feature could be greatly beneficial in providing drivers with current and forecasted weather conditions along their intended route.
Omnitracs

Omnitracs offers multiple fleet management services including “Critical Events Video”, which is further described in the Omnitracs Critical Events Video brochure, excerpts of which are shown in Figures 7 and 8 below.

Figure 7 - Omnitracs Critical Events Video Brochure Excerpt

Figure 8 - Omnitracs Critical Event Video Hardware
Geotab offers easy-to-install GPS tracking devices and driver training services. They even offer in-cab verbal coaching for drivers using their “Go Talk” service. This service can provide real-time verbal feedback to drivers that can improve dangerous or poor driving habits. The “Go Talk” system can notify drivers of excessive speed and other pre-determined company policy violations. See Figures 9 and 10 below.

![Geotab Go Talk Brochure Excerpt](image)

**Figure 9 - Geotab "Go Talk" Verbal Coaching System Brochure Excerpt**

<table>
<thead>
<tr>
<th>FLEET GOAL</th>
<th>EXAMPLE MESSAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve Driver Safety</td>
<td>+ Exceeding a speed limit</td>
</tr>
<tr>
<td></td>
<td>+ Unknown driver</td>
</tr>
<tr>
<td></td>
<td>+ Harsh driving</td>
</tr>
<tr>
<td></td>
<td>+ Seat belt unbuckled</td>
</tr>
<tr>
<td>Strengthen Compliance</td>
<td>+ Reminder: conduct post trip vehicle inspection</td>
</tr>
<tr>
<td></td>
<td>+ Driving outside of State/Province</td>
</tr>
<tr>
<td>Improve Productivity</td>
<td>+ Entering a restricted area</td>
</tr>
<tr>
<td></td>
<td>+ Entering a customer zone</td>
</tr>
<tr>
<td>Reduce Fuel Costs</td>
<td>+ Idling for too long</td>
</tr>
<tr>
<td></td>
<td>+ Revving over the set limit</td>
</tr>
</tbody>
</table>

**Figure 10 - Geotab "Go Talk" Brochure Excerpt**
**Lytx (DriveCam)**

The DriveCam unit is one of the most recognized telematics devices used on the road today. According to the Lytx website, this device is, or has been, in use in over 650,000 vehicles. The DriveCam system typically includes a GPS sensor, accelerometers and two cameras - one facing outward and one facing inward towards the driver. The DriveCam system will typically record an event when certain acceleration thresholds have been exceeded. There will be video and data recorded before the threshold trigger and after the trigger. The length of video recorded will depend on the generation of the unit installed in the vehicle. The video files can be uploaded shortly after the event has occurred.

A typical frame of DriveCam video is shown below in Figure 11. The system can show the front facing and driver facing videos side by side or separately. The video will have time and speed data shown for each frame. Note that the speed displayed is GPS based. Several other papers, which discuss the use of this DriveCam data, are listed in the reference section at the end of this paper.

DriveCam data can be used in the event of a crash, but the video and corresponding data can be used for driver monitoring and training, since the recording of events does not have to include a crash. A hard braking event or swerve of the vehicle can cause an event to be stored; which can be reviewed and used for driver evaluations and training.

*Figure 11 - Drive/cam Video Frame*
**Janus**

Janus systems are very popular in taxi companies. These are video recording systems that typically employ two cameras, similar to DriveCam systems. One camera faces forward and one faces inward, towards the occupants. These systems use GPS based speed. An example of the Janus V3 viewing software is shown below in Figure 12. Janus systems use infrared LED’s to allow for nighttime interior recording.

The 2017 SAE paper by White & Merala tested several different versions of Janus systems, including the latest version, Janus V3. They found that the GPS position and speed were updated every ½ second and that the displayed speed corresponded to the preceding ½ second and did not report the speed at the time the video image was taken. Version V3 of the Janus system includes a tri axial accelerometer. The video, GPS data and accelerometer data is stored to a micro SD card in the unit.

![Figure 12 - Janus V3 Viewing Software Example (From SAE 2017-01-1420)](image-url)
How to Get the Data and Other Information to Obtain

The telematics data is often transmitted in near real time to a central data storage repository. The vehicle owner (transportation company) typically has web-based access to the data. This telematics data is not typically obtained by a download through the vehicle diagnostic port, as is engine ECM data. However, some video recording systems also store the video/data on-board and the video/data can be downloaded directly from the unit in the vehicle.

Each telematics service provider may not offer the same services as other service providers, so it is important to understand what each one offers. The best source is to research what telematics service providers offer on their websites and to download any brochures. Be careful, as service providers roll out new services frequently. Try to determine what was being offered on the date of the crash or when the service contract was initiated. The data will need to be obtained from the transportation company that the telematics devices were installed in.

In order to determine the type of data that might be available after a crash, you will need to know what the owner of the vehicle (transportation company) has purchased. There are usually multiple levels of subscription services that each telematics service provider offers. The contract between the telematics service provider and the vehicle owner will spell out the level of data gathered, how it is accessed and how long the data is stored. The component regarding data storage time limits is critically important, as data may not be routinely stored past a certain date. Timely letters of preservation or requests to preserve data are key. For an example, see Figure 11 below, which is from an Omnitracs Critical Event Video brochure. As seen in this Omnitracs brochure, the end-user has the ultimate decision in what gets recorded and for how long it is stored.

- Extremely configurable — you decide:
  - What types of events trigger video
  - How much video to include with each event, and how long it should be preserved
  - Which users have what access
  - Whether or not to add driver-facing, or install now and activate later

Figure 13 - Omnitracs Critical Event Video Brochure Excerpt
Discovery requests to transportation companies regarding telematics data should include asking for the service contracts, the time length of data storage, the location of data storage, how the data is accessed, the type of reports that can be generated, user manuals and system installation manuals. Whether you are representing a plaintiff or a defendant, you should be aware of what is potentially being recorded and stored.

Telematics Data Usage

Transportation companies use telematics for various reasons, including asset tracking. They are able to locate their vehicles and their customers’ cargo on a real-time basis. Transportation companies also use telematics data for driver monitoring and training. They are able to analyze aggressive braking and acceleration events and use this data to help train their drivers. Systems that record video as well as speed data are extremely useful in this regard.

The inward facing camera component of some of these systems (DriveCam, Janus, PeopleNet, etc.) documents any driver distractions, potential driver fatigue, driver cell phone usage and other events happening inside the vehicle.

Of course, transportation companies also use telematics data in the event of a collision. This is primarily the type of data usage that the reader will be interested in. Several examples of the use of telematics data are included below.

One thing to be aware of is how the various telematics systems obtain their “speed” and “location” data points. If one wants to rely on the speed data contained within a telematics report, one should know what the stated accuracy of these data points are and how they are obtained. Some systems report a GPS based speed and other systems use the engine ECM reported speed (See the list of references at the end of this paper for more information on peer-reviewed studies related to the use of vehicle telematics and GPS data).

In summary, if the reported speed is GPS based, then the speed is usually calculated based on the time difference between two GPS location “pings”. This means that this speed displayed may be an average speed over the last interval, as opposed to an instantaneous speed. Other systems will display engine ECM calculated speeds that are broadcast over the in-vehicle network. It may be important to know how the involved telematics system is obtaining speed data.

Some basic systems simply provide GPS locations and times (that are often minutes apart). If the system you are analyzing contains just basic data like this, then an average vehicle speed can be calculated. This may not tell you the speed of a vehicle at impact, but it can be used to check testimony regarding travel speeds, compare against posted speed limits, etc. This data can also be used to compare driver logbook entries. For example, if a driver’s logbook has an entry that he/she is in the sleeper berth or off-duty at a certain time, the
telematics data will show whether the vehicle is being driven at that time. See Figure 14 for an example of telematics location data.

![Vehicle Trip Report]

Some systems will provide vehicle speed data every second. This data can be used to create vehicle time-distance plots to determine vehicle impact speeds, location of braking, etc. For more information on how this can be performed see the NUCPS textbook listed as a reference to this paper. If a telematics system is recording and transmitting engine ECM based speed, then an inspection of the involved vehicle and download of the engine ECM is recommended. Analysis of the engine ECM parameters and vehicle setup will help verify the accuracy of the ECM based speed data. The acquisition, usage and analysis of engine ECM data will not be covered in this paper. See Figure 15 for an example of telematics data that is broadcasting ECM based speed.
The presentation to accompany this paper will use real-world telematics data and video to illustrate how this data is used in analyzing a crash.

Summary

Telematics data usage in the transportation industry is becoming more widespread as telematics service providers are offering a greater array of services. The determination of what data that might be available for a particular crash is a key issue to be answered early on, before any contractual data storage time limits have expired. A timely inspection of the involved vehicles that includes the identification of any telematics devices as well as the download and analysis of any on-board EDR devices is also highly recommended.
About the Author

Thomas Green founded Dynamic Safety in 1997. With a degree in mechanical engineering and extensive hands-on experience in automotive systems analysis, diagnosis and repair, he has more than 31 years of experience investigating and reconstructing collisions. He is also an adjunct faculty instructor at the Northwestern University Center for Public Safety and co-authored two chapters in the Northwestern University Center for Public Safety textbook “Traffic Crash Reconstruction.” He has obtained a Class A CDL with air brake, tanker, and double/triple endorsements. He and his partners routinely investigate and reconstruct motor vehicle crashes nationwide. He can be reached at:

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References


