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SUPPLY CHAIN BASICS:

Tracking Trucks With GPS



U.S. Department of Agriculture
Agricultural Marketing Service
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Tracking Trucks With GPS

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Introduction

The Global Positioning System (GPS) is a radio navigation system that uses information from satellites to calculate the position of an object on Earth. Its use has widened recently as the cost of the technology has decreased. It is an essential management component of the supply chain because of its ability to locate products while they are in transit. A combination of GPS and Radio Frequency Identification (RFID) can offer real-time information about products, such as their condition and location.

A system of satellites is maintained by the U.S. military for use by the Armed Forces (figure 1). Civilian firms also use these satellites in a variety of applications, all based on knowing exactly where one is on the Earth's surface—at least within a few feet. Similar satellite systems have been put in place by both Russia and the European Union (EU). The EU system will someday allow even greater

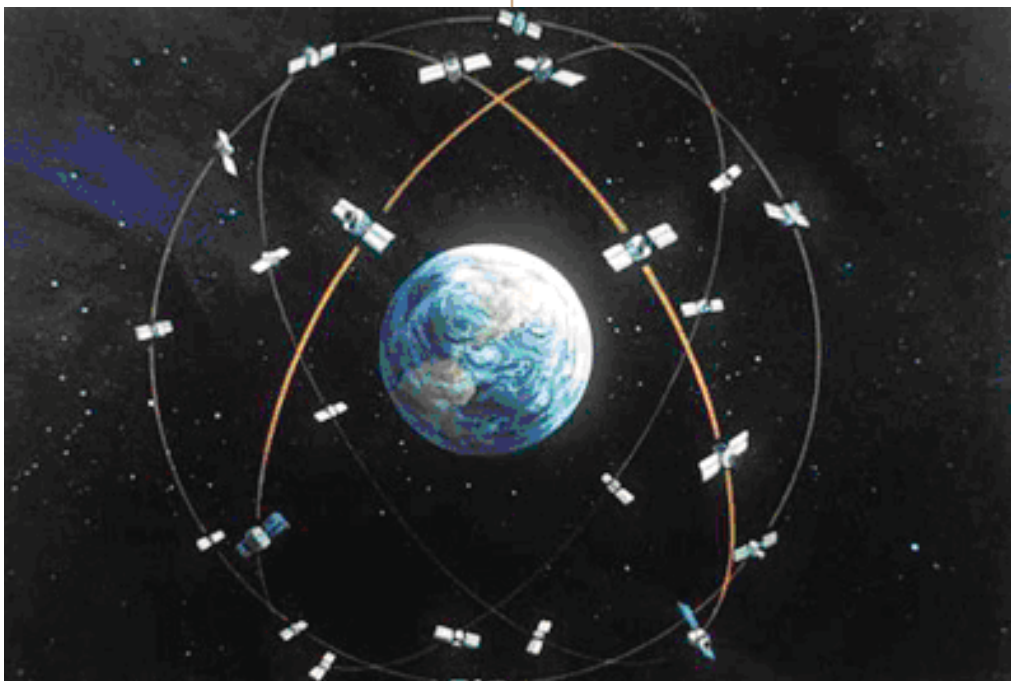
use of the technology. The United States GPS system is the only one commercially available.

In use, information from several satellites is received by a GPS unit, and calculations are performed by the unit to determine a more or less exact position. The location information is then stored, displayed, or used for other purposes. No information is sent to the satellites.

Satellite signals are available for use throughout most of the world. A minimum number of satellites must be available to the GPS unit; occasionally, hills or buildings interfere with its operation.

In its most basic form, GPS provides a vehicle operator with the vehicle's position in latitude and longitude. A mapping program is usually integrated, which correlates the vehicle's position with the location of landmarks, such as cities, State boundaries, rivers, roads, and the like. Routing programs (similar to the commonly used Internet driving directions) are generally added to give vehicle operators directions to their destination.

FIGURE 1. The constellation of GPS satellites



SOURCE: Department of Defense

Using GPS Technology for Food Security

In this country, food often travels thousands of miles from producer to processor to consumer. A lot can happen during that trip, and tracking where it starts, stops, and travels adds another layer of protection to the food security blanket.

The central component of a tracking system is a GPS unit with the ability to locate a container, truck, or railcar carrying a food shipment (figure 2). Tracking systems use GPS data to determine the shipment's location, then store that information and share it in some manner with the shipping management, and—in case of trouble—can be made available to law enforcement. This requires that the GPS-equipped shipment transmit its location information to management on a regular basis, either with cell or satellite transmission equipment. It also requires management to have computers and software that allow the information to be recorded, displayed, and used (figure 3).

FIGURE 2. GPS tracker unit



SOURCE: ©2007 Vehiclepath, Inc.

Types of Systems Available

In the United States, dozens of tracking system providers compete with each other to provide systems with various levels of service. Many require purchasing and installing system components in the vehicle, followed by daily or monthly service charges. A few of the more basic providers work on a “no money down” basis, charging daily or monthly fees only.

The two basic types of systems are “truck tracking” and “trailer tracking.”

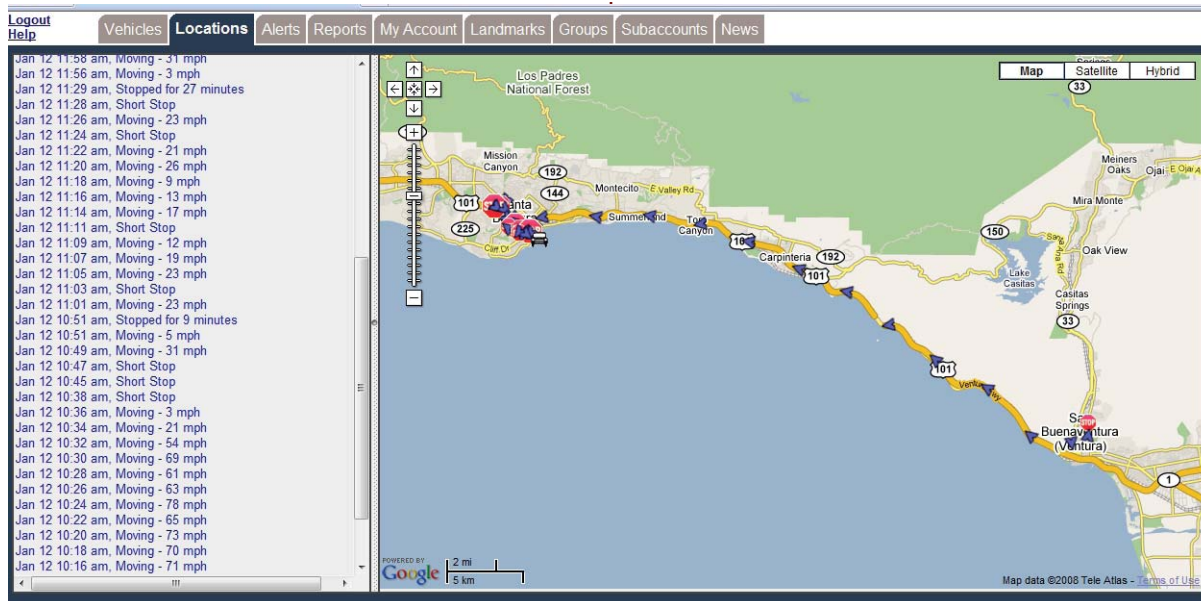
Truck Tracking

Basic in-truck GPS tracking systems simply record the location—and perhaps the direction of travel and speed—of the vehicle. The limitation to these systems is that the trailer and its cargo are not directly tracked. If the trailer is separated from the tractor, further information about its location is lost. In these basic GPS tracking systems, location data is downloaded when the truck arrives at its destination. If the trailer is lost, stolen, or abandoned in transit, it cannot be located with this type of system.

More sophisticated in-truck tracking systems record more information: door openings and closings, hooking and unhooking of trailers, refrigeration unit status, and similar events. The most sophisticated truck tracking systems monitor things like truck performance, speed, and fuel usage, even allowing for remote disabling of the vehicle if it is stolen or improperly operated.

Because in-truck systems require information about the trailer and its cargo to pass from the trailer to the tracking system in the truck, that information is no longer available if the truck and trailer are separated.

FIGURE 3. Tracking software shows the route, position, and speed of trucks.



SOURCE: ©2007 Vehiclepath, Inc.

These in-vehicle systems are very useful, because they can allow drivers to know the status of their truck, trailer, and its cargo and refrigeration unit. Indeed, some systems have handheld remote units that allow drivers to monitor their truck and trailer while a short distance away from the vehicle. A driver making a rest stop can be warned of a malfunction in the trailer, that the truck is being moved, or that someone is entering the trailer.

Trailer Tracking

Trailer tracking systems differ from truck tracking systems in that each trailer or cargo container has its own self-contained, independent GPS tracking unit. Combined with a vehicle tracking system, this can give the truck and trailer independent tracking abilities in case they are separated. This independence allows for better management of trailer resources by businesses and helps retrieve stolen goods. Trailer tracking systems are usually described as being “tethered” (information available only when attached to the tractor) or “untethered” (available at all times).

Trailer-based tracking systems, like truck-based systems, can be supplied in as simple or as complex a form as the customer wants. For example, here are some types of systems:

- ◆ Removable systems that are temporarily attached to a trailer, then removed, read, and attached to another trailer.
- ◆ Tethered trailer systems that monitor the trailer, but communicate to the system unit in the truck cab.
- ◆ Untethered systems with short-range communications ability that automatically download data when the truck returns to the terminal.
- ◆ Untethered systems that report locations up to 4 times per day, and that also report each time a trailer is hitched, unhitched, or opened.

- ◆ “Real time” trailer tracking systems in both tethered and untethered forms. Real time tracking allows location information to be known at any time.
- ◆ “Inquiry” type systems respond when they receive a request for location—they only “speak when spoken to.”

Communications

Many tracking systems send data with cell phone transmitters that are built into the system. As cell users know, there are still many portions of this country where coverage is lacking, and coverage may be even sparser in Mexico and Central America. When the truck enters one of these unserved areas, no data can be transmitted.

Satellite-based communications are used by some tracking systems. These systems also have gaps in their coverage due to interference caused by hills, tunnels, and tall buildings, but they still offer more continuous tracking ability than cell-based systems. Satellite-based communication systems are more expensive to operate than cell-based systems.

User Interface

A variety of methods are used by service providers to inform shippers of the whereabouts of their cargo. A few use proprietary computer networks, but those that use the Internet are far more common.

A Novel Approach

One GPS software developer provides a glimpse into how the cell phone can provide tracking information about *drivers* who carry GPS-enabled cell phones using their proprietary software. Not

only do the cell phones generate maps and transmit information to dispatchers in the main office, but they also report speed and distance. The phones beep and send text-based warnings when drivers exceed 67 miles per hour.¹

Benefits

Suppliers of GPS trailer tracking systems claim that more efficient use of trailers will save money. Some users say they need fewer trailers because of trailer tracking systems. Sales literature for trailer tracking systems abounds with anecdotes involving the recovery of stolen trailers with expensive cargo being pulled by different tractors hundreds of miles from the scene of the crime.


Some of the benefits of trailer tracking systems include:

- ◆ Detection of tampering, schedule discrepancies, and unauthorized stops
- ◆ Increased customer comfort from knowing that their shipment can be located at any time
- ◆ More precise scheduling of deliveries offers customers the opportunity for savings, efficiencies, and fewer halts in production
- ◆ Monitoring breakdowns, equipment failures, operator neglect, and accidents

A list of suppliers of trailer tracking systems and a discussion of how each system works are available online from [Heavy Duty Trucking magazine](#).

An explanation in layman’s terms of how GPS systems use satellite systems to locate positions on Earth can be found in an Internet article in [How Stuff Works](#).

1. “Keep on Trucking,” *Federal Computer Week*, June 6, 2005.

A large white Kenworth truck with a blue and silver grille is driving on a winding asphalt road that curves through a mountainous landscape. The road is bordered by a metal guardrail on the left and a steep, rocky cliff on the right. In the background, there are more mountains under a clear sky. The truck has a logo on its side and a circular emblem on its hood.

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