



Preventing and Managing Ghost-Driver Incidents: The French Experience

By *Pierre Vicedo*

The recent movie *Ghost Rider* is a fictional portrayal of a bounty hunter beholden to the devil, but there's a much scarier—and very real—kind of ghost to contend with on the highway these days: the ghost driver.

A ghost driver, by definition, is a motorist who travels in a lane against the flow of traffic. This includes drivers who back up in an attempt to get to an exit they've missed, even if doing so endangers their own safety and that of others.

Incidents involving ghost drivers are of special concern on France's motorway network, where from 1999 to 2003 they represented 0.2 percent of all accidents involving injuries and 4.4 percent of those involving fatalities (see chart below), according to the Association Professionnelle Autoroutes et Ouvrages à Péage (ASFA), a lobbying and highway information organization.

The scope of the phenomenon goes beyond accident rates, however, as the vast majority of ghost drivers don't cause accidents. Yet, little information is available on ghost driver incidents that are "resolved" by themselves. Data collected by motorway operators show that, on average, a ghost driver incident is observed every 1 to 15 days on France's network. About 25 percent of these incidents are confirmed by on-site operating staff, and only 1 percent to 3 percent result in an accident.

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Unstable Behavior

Not surprisingly, ghost drivers don't generally exhibit stable driving behavior. Indeed, compared with motorway accidents overall, accidents involving ghost drivers are more often characterized by certain compromising factors. Specifically, they:

- Occur more often in open toll sections (interchanges without toll barriers) than in sections with tollbooths;
- Occur mostly (50 percent to 60 percent) at night, probably because of the poorer legibility of interchanges after dark and the lighter traffic after hours;

- Involve a higher proportion of drivers with an illegal blood-alcohol level;
- Are overrepresented by elderly drivers; and
- Are overrepresented by drivers who exhibit psychological problems or are under the influence of medication or other drugs or are attempting suicide.

Tackling the Problem

French motorway operators have come to deplore ghost driver incidents, particularly because of their unpredictable nature, and have attempted to prevent and manage such events through various measures.

Signs and Road Markers

At the infrastructure level, the most common preventive steps entail using signage and road markings at the entrance points to motorways; namely, at interchanges (see Figure

	2002	2003	1999–2003	Percentage of Total 2002	Percentage of Total 2003	Percentage of Total 1999–2003
Accidents	46	26	218	0.2%	0.2%	0.2%
Fatalities	10	9	57	3.6%	4.0%	4.4%
Severe injuries	13	5	58	1.7%	1.0%	1.5%
Light injuries	15	7	99	0.4%	0.2%	0.6%

Chart source: "ASFA Safety File—Processing of Ghost Driver Accident Data on the French Motorway Network, from 1999 to 2003"

1). Additionally, traffic lanes are well separated on two-way interchange roads.

Detection and Alert Systems

On average, vehicles on the French motorway travel at speeds of 120 kph (75 mph), or 2 kpm (1.24 mpm), at a pace of 200 vehicles per hour, which is quite low. The speed of vehicles being driven in the wrong direction is not known, but it can be assumed that drivers driving the wrong way are traveling more slowly, about 60 kph (37 mph), or 1 kpm (0.62 mpm). Even if traffic were light, with a density of one vehicle per kilometer, for example, a car driving the wrong way could encounter

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or cross over five correctly traveling vehicles a minute, representing equally as many potentially serious, and likely, accidents. The speed of detection and response is thus essential in limiting the risk of an accident.

The French motorway network maintains several types of alert systems for ghost drivers, with or without detection devices (see chart below). These systems are designed to notify drivers when they are traveling against

the normal flow of traffic. Systems with detection devices also signal the appropriate motorway command post as to the ghost driver's presence so that measures can be taken to stop the driver.



Figure 1: To indicate the correct path to motorists, two “B1” red no-entry signs and a “J5” blue directional marker in the diverging area are positioned side by side. Additionally, directional arrows are painted on the pavement. Both the B1 and J5 signs are well known among French drivers.



Figures 2–4: The French motorway network employs a combination of mini-GBA (glissières béton armé), or reinforced concrete, systems and mini-BOA (barrières ouvrages d’art), or protective barrier, systems to help prevent ghost driver incidents.



Figures 5–6: Directional arrows painted on the road indicate the correct (left) and incorrect (right, with no-entry signs) paths.



Figure 7: When a ghost driver alert is sent out, motorway operators attempt to confine the problem immediately by activating electronic signs at roadway entry points and closing access to the road using physical barriers.



Figure 8: When drivers approach a tollway during a ghost driver alert, the toll attendant hands them a brochure explaining the reason the road is being temporarily closed. The pamphlet pictured above was recently distributed by attendants with Autoroutes et Tunnel du Mont-Blanc (ATMB), the highway concessionaire contracted by the French government.

We don't yet know how to evaluate the impact of these systems on drivers whose attention is deficient. The systems undoubtedly aren't 100 percent effective in preventing ghost driver incidents, but they at least allow immediate detection of the problem when it occurs and send an alert to the applicable command post, at which point patrol cars are automatically sent out to apprehend the offender. This is essential for enabling the highway patrol to respond in the best manner possible and ensure the safety of other drivers.

Response Procedures

When a ghost driver alert is sent out, command post operators trigger a set of procedures to confine the offender and prevent additional motorists from entering the road involved. These procedures include closing appropriate toll plazas, tunnels, and motorway access points using physical barriers and electronic signs (see Figure 7).

Specially adapted software permits toll transactions to take place and lane assignment lights to remain unchanged while the barriers stay down during the emergency. (Allowing normal toll transactions during the emergency enables drivers to save time once the barriers are lifted.) During the closure, flashing “traffic jam” lights are activated by GSM upstream from the toll barriers to slow approaching drivers. Toll atten-

dants are provided with a brochure (see Figure 8) to give to drivers indicating the cause of the disruption.

Limits of the Current Solutions

The accuracy of information alerting other drivers to the presence of a ghost driver and the speed at which it is delivered are essential in managing this type of incident. This is true whether the information is broadcast within the motorway system or sent to the highway police and relayed to other drivers via remote-controlled variable message signs or an FM radio station.

Although during an alert the motorway operator closes the entryways to the network to prevent other drivers from entering, this doesn't protect those vehicles already driving inside the confined area. The only way these drivers can receive ghost driver alerts is by radio or variable message panels (VMPs) controlled by the highway command center. VMPs, however, are general in nature and intentionally

imprecise as to the positioning of the vehicle driving the wrong way, to avoid potentially panicking other motorists.

To overcome the limits of the current ghost driver alert system, the French motorway network can consider several ITS (intelligent transportation systems) options, including:

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- Infrastructure-to-vehicle communication systems that relay ghost driver alerts to other drivers, along with suggestions on how to avoid the offender (for example, pulling over to a rest stop, making a U-turn, and so on); and

Alert Systems without Detection Devices	Alert Systems with Detection Devices	
	Detection device	Ghost driver alert system
<ul style="list-style-type: none"> • Conventional signaling • Additional signaling • Luminous signaling (diode panels) • Light barriers (solar-powered light poles) 	<ul style="list-style-type: none"> • Doppler radar • DAI (détection automatique d'incidents, or automatic incident detection) video • Loops embedded in the road surface that detect vehicles via electromagnetic technology 	<ul style="list-style-type: none"> • Luminous signaling (diode panels or flashing lights) coupled with a detection system • Light barriers (solar-powered light poles) coupled with a detection system • Audible alarms



- Vehicle-to-vehicle communication devices that alert other vehicles, as well as the command post, to the ghost driver's location.

An invitation to tender on these topics and on the detection and management of ghost drivers in general has been launched throughout Europe under the GO-SAFE (GhOst driver SAFETY, detection and management) project as well as under a Cooperative Vehicle Infrastructure System (CVIS) project. CVIS is financed by the European Commission under the multisector, public-private partnership ERTICO – ITS Europe. It is hoped that such programs will yield more-expansive solutions to the ghost driver problem.

Combating Future Incidents

The problem of ghost driver incidents is complex because of the nature of the drivers involved. Because they are often driving under the influence of alcohol or drugs or simply are inattentive because of age-related factors, ghost drivers are generally not very aware of the alerts provided by signaling systems. Designing future infrastructure and signaling systems specifically with legibility and simplicity in mind could certainly limit the number of ghost driver incidents. It is also essential to design and construct new roadways in such a way as to minimize the chances of a driver traveling the wrong way.

When ghost driver incidents can't be avoided, their rapid detection followed by the immediate broadcast of alert and response information to network users is critical. Users, whose protection is a primary objective of every motorway operator, also have a role to

Once the utmost has been done to perfect roadway infrastructure by improving the clarity of signaling and message systems and drivers' understanding of them, subsequent developments can concern, as alluded to above:

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play in combating ghost driver incidents. Network drivers, therefore, should undergo training in motorway driving, not only to limit their potential for becoming ghost drivers themselves but also to learn how to react when they encounter such motorists. Such training should be initiated by the state or the appropriate institution or administration in charge of highway codes and their enforcement.

- Improving communication between vehicles and infrastructure and the ways in which alerts can be immediately triggered for transmission to other vehicles;
- Educating populations (such as the elderly) that are at risk of causing ghost driver incidents; and
- Training drivers in the proper response to a ghost driver alert.

Pierre Vicedo is the deputy executive director of Autoroutes et Tunnel du Mont-Blanc, in Bonneville Cedex, France. He was recently made managing director of the GEIE-TMB (Tunnel du Mont-Blanc) in Chamonix, France, where he is now based. He may be reached at p.vicedo@tunnelmb.com.