

Safety and Security System for Hazmat Transport Vehicles in Singapore

Singapore

AN EMERGING THREAT

The threat of terrorists using hazmat such as highly flammable materials or hazardous chemicals for terror attacks is real and not without precedent. On 11 Apr 2002, terrorists drove a truck carrying liquefied natural gas and ignited the cargo in front of a synagogue in the Tunisian island of Djerba, killing 21 people and injuring 30. Between May and Aug 2002, terrorists attempted to attach remotely triggered bombs to Israeli fuel tankers with plans to detonate them at targeted locations. And in January 2007, Iraqi insurgents adopted a new and ominous strategy of attacking and blowing up trucks carrying toxic chemicals such as chlorine in heavily populated areas. One such attack destroyed a truck and ruptured a chlorine tank, releasing highly toxic fumes that sickened 150 civilians. The attack was followed a day later by a second similar attack that killed 5 and hospitalized 55 who had inhaled the poisonous gas.

THE SECURITY CHALLENGES

Given the current heightened security tensions after the September 11 terrorist attacks, vehicles transporting hazardous materials (hazmat) on the road can potentially be hijacked by terrorists to be used as weapons of mass destruction for their terrorist acts. They may try to hijack and blow up a vehicle transporting bulk quantities of flammable or toxic substances, thereby causing serious damage and harm to lives and property. As Singapore has a vibrant industrial sector where large quantities of hazmat are moved around by road transport daily, hazmat transportation does pose a security threat. To tighten security regarding hazmat transportation and enhance security on the roads, the HTVTS system was introduced.

The system, known as the Hazmat Transport Vehicle Tracking System, or HTVTS, is also able to remotely immobilise a hazmat transport vehicle in the event of an emergency. The key objective of the HTVTS is to reduce hazmat transportation vulnerabilities, and to prepare a system that will protect against, deter and respond to intentional or unintentional violations involving hazmat transport vehicles.

The Fire Safety Petroleum and Flammable Materials Regulations were enacted in Feb 2004 to allow the Singapore Civil Defence Force (SCDF) to track and immobilise hazmat transport vehicles. Figure 1 shows the different types of hazmat transport vehicles that travel on Singapore's roads. All these vehicles are required to have an authorized workshop install a tracking and immobilising device.

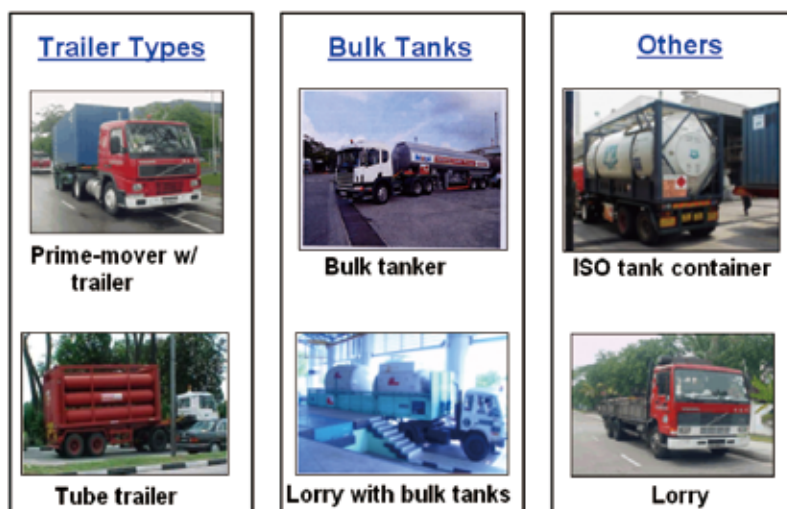


Figure 1. Different types of hazmat transport vehicles

The HTVTS tracking system gives the SCDF an overall picture of the movement and location of all hazmat transport vehicles in Singapore on a 24/7 basis. This traffic is centrally monitored by an SCDF officer in the Operations Centre Control Room via proprietary interface software. The operator at the monitoring console is alerted by an alarm if a vehicle enters a restricted zone or deviates from an authorised route. The SCDF also sets specific sensitive areas as restricted zones using a “geo-fencing” feature and monitors these geo-fenced zones for unauthorised entries.

The immobilising system employs “Limp Mode” technology, which controls the throttle in order to restrict fuel injection and prevent acceleration. This system slows a vehicle gradually and safely without interfering in its power steering and braking systems. Using a process similar to the action of deceleration, the vehicle is safely slowed to 10km/hr before it comes to an eventual stop. The hardware used by the HTVTS to monitor and track the location of vehicles is the Geo-Location Platform (GLP) device (see Figure 2).



Figure 2. GLP tracking device

In addition to the HTVTS, all drivers of hazmat transport vehicles are required to have a valid HazmatTransport Driver Permit (HTDP) (see Figure 3), which allows drivers to be screened for security reasons. Upon successful screening of the driver’s profile, he is required to attend a one-day Hazmat Transport Driver Course. The course covers subjects such as hazards identification, the safe transportation of hazardous goods, transport emergency response plans and the basics of fire-fighting and spill/leak mitigation. If the driver passes the test at the end of the course, he is issued an HTDP. The HTDP also contains fingerprint data and other biometric data, as well as personal particulars such as driver’s name and identification number, company name and address, and the validity period of the permit.



Figure 3. Particulars of driver printed on the permit



Figure 4. Vehicle with orange-colored licence plate

To ensure that other road users are able to recognise hazmat transport vehicles, tracked vehicles are required to carry orange-colored licence plates (see Figure 4). These tracked vehicles must adhere to their respective, authorised routes and hours of transportation (daylight hours) at all times. Failure to do so will result in a violation, which is detected and registered by the HTVTS.

CONCEPT OF OPERATIONS

Once the HTVTS detects a violation and activates the alarm, the operator in the control room activates the immobiliser on the vehicle that is violating the transportation rules to avoid a possible security threat. The operator then notifies SCDF enforcement officers and the Singapore Police Force (SPF), who respond to the incident and determine whether it is a security violation. See Figure 5 for the overall concept of the how system works.

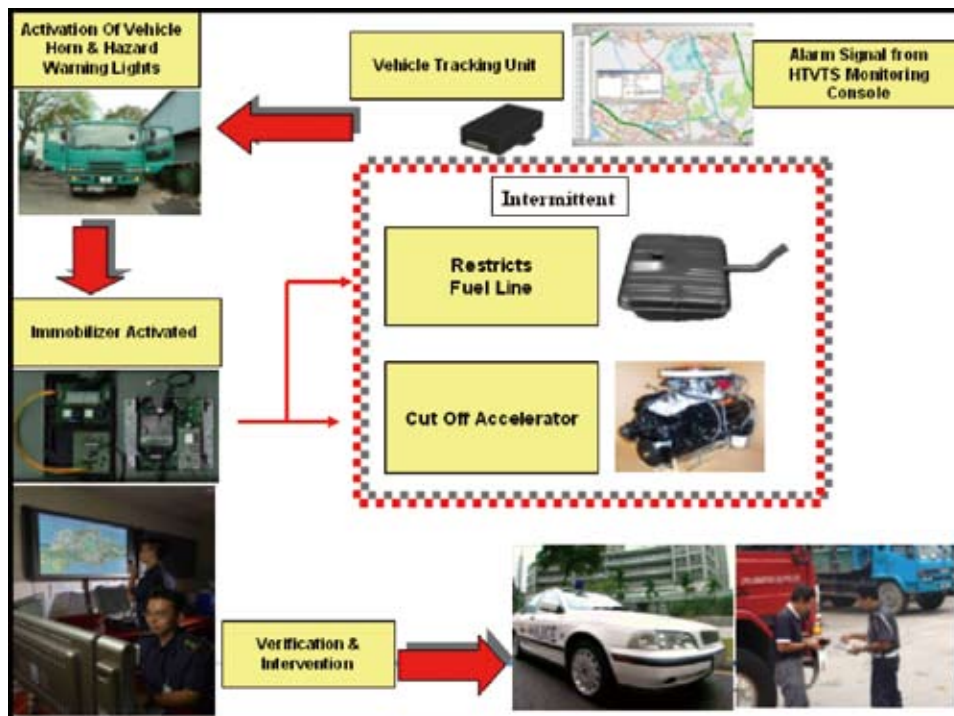


Figure 5. HTVTS operational concept

EFFECTIVENESS OF OVERALL SYSTEM

Before the HTVTS was introduced, the SCDF could not locate or track the movement of vehicles transporting flammable or hazardous cargoes. They also had no way of determining whether a vehicle had been hijacked by an unauthorized person or, in the worst-case scenario, a terrorist using the vehicle to inflict damages on sensitive installations or buildings. In addition, due to limited manpower and resources, the SCDF was unable to ensure absolute compliance of hazmat transport vehicles on the roads.

With the introduction of the HTVTS, the SCDF can now locate and track the movement of all hazmat transport vehicles. The SCDF operator can see the location and movement of all tracked vehicles in real-time, and he can also 'poll' the vehicles to determine a specific vehicle's current status or information such as company name, contact person, and vehicle type. Any vehicle that travels on an unauthorised route, encroaches into a restricted zone or travels during an unauthorized time of day will automatically activate the alarm at the monitoring console to alert the operator. The operator will be able to advise and guide enforcement officers on patrol to effectively track and locate the errant vehicles. With the implementation of the second phase of the system, the immobiliser feature will allow the operator to remotely slow down and eventually stop errant vehicles, preventing them from advancing any further to their destination before the arrival of the enforcement officers.

This system ensures the compliance to the regulated hazmat transportation routes and times, and allows enforcement officers to conduct regular enforcement checks efficiently. The added security measures not only enhance the safety and security of hazmat transportation in Singapore, but also deter terrorists from hijacking these vehicles and using them as weapons to compromise the security of sensitive installations and government buildings. The system plays a critical part in supporting the nation's layered defence strategy to safeguard the population.

CONCLUSION

Since its implementation, the HTVTS has been effective in detecting vehicles that do not conform to hazmat regulations and has improved the overall efficiency of enforcement officers in locating and addressing errant drivers who violate regulations. The number of drivers violating the rules has also decreased steadily since the system was implemented, implying that more and more drivers are conforming to the authorised routes and transportation times. The implementation of the immobilisation phase will achieve the desired objective of tightening up the security of hazmat transportation in Singapore.

CONTACT DETAILS

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