



Best Practice: Road Safety Solutions through Vehicle Hardening Programs (Engine Immobilizers)

Purpose

The purpose of the document is to provide a strategic focus for Auto Theft Prevention Authorities (ATPAs) when considering funding programs focused on the use of vehicle hardening solutions through vehicle immobilization. Vehicle immobilization is a method of taking a vehicle with proven weak or ineffective security and through modification brings these vehicles into today's current level of security performance standards.

Immobilizer Definition

An "immobilizer means a device that, when activated, is intended to prevent a motor vehicle from being powered by its own propulsion system"¹. When activated, an immobilizer device disables the vehicle's communication/electrical system that enables the engine or motor's ability to run. This immobilization is normally completed through the CAN BUS² or through an electrical systems interface that affects the ignition, starter and fuel systems at several points thus preventing the vehicle from starting unless the correct code is received by the immobilizer." The vehicles described in this document applicable to immobilizers are passage cars, SUVs and light-duty trucks with a 12-volt electrical system.

Why Immobilizers

When a vehicle has been added to our roads, there are times when it is discovered to have an OEM³ security design that is ineffective to prevent its theft; this may be due to the thieves having technical equipment to bypass the OEM security systems. Stolen vehicles pose a public and law enforcement safety risk when they are being driven on our shared roads. Aftermarket theft prevention solutions are available, but not all solutions are equally effective regarding safety concerns and/or prevent theft. Alarms and vehicle tracking solutions are not considered immobilizers in and of themselves. Immobilizers are generally designed to prevent the vehicle from being driven, primarily with elevated electronic securities. Immobilizers are a foundation of theft prevention to increase road safety through modification.

Practice Element 1: Selection of a Solution

There are a variety of methods, techniques, and programs that tout addressing vehicle theft prevention. Some solutions only make noise, some only track a stolen vehicle, so they can be recovered later and others are a simple "kill switch", which is no longer effective to prevent theft due to our more educated thieves of today. All products add some value, so the question becomes how you select a safe and effective solution for vehicle hardening. The answer is to use a product that has been certified, vetted and approved via a recognized world-wide vehicle theft prevention standard. Performance standards have been established to provide known safe and effective solutions by third-party industry stakeholders/experts. These experts have researched what a product must have in performance to provide safe and reliable operation for the harsh vehicle environment.

¹ NHTSA: [49 CFR part 543](#))

² A Controller Area Network (CAN bus) is a vehicle bus standard designed to allow microcontrollers and devices to communicate with each other in applications without a host computer. This video explains the basics of the CAN BUS protocol in a fun and easy way.

³ OEM is the original equipment manufacturer or an organization that makes devices from component parts bought from other organizations.



A. Product Safety

When an engine immobilizer has been fitted to a vehicle it interfaces into its electrical system for fuel, spark, and engine management systems. The design must, therefore, not have any weaknesses that place the vehicle at risk or has electrical performance abilities that are poorly suited to the extremes the vehicles electronic systems endure. These safe products have only been approved and certified after they have met critical performance testing that has been specified by those qualified to measure what is a safe and not what is just a “sales pitch” made by a company.

B. Product Effectiveness

When a solution has been fitted to a vehicle how can we know what system will be able to withstand an attack of a “would be” thief? It is ineffective to have a vehicle fitted with a product that does not have the ability to stop a theft. The immobilizer hardware and its design must, therefore; meet minimum performance criteria to be considered effective. Both performance concerns for safe and effective immobilizers have been addressed in North America.⁴ In conclusion, the most effective measure of general vehicle theft prevention is the use of vehicle security hardening and through its use thwarting the efforts of a thief from being able to start and move a vehicle under its own power.

Practice Element 2: Selection of Target Vehicles

Not all vehicles require a security modification for two reasons. Some vehicles are equipped with proven effective OEM and others are simply not a historically high-risk vehicle that for some reason or another thieves simply don't target these vehicle's (year/make/models). To maximize investment return on vehicle hardening, it is necessary to perform crime analysis to identify a target area and Most-at-Risk or “MaR” vehicles (vehicles that do not appear as MaR may appear later due to thieves changing and adapting as we move forward). Depending upon available funding, selecting target areas can assist to minimize costs, yet maintain cost effectiveness when utilizing crime analysis to target ‘hot spots’ of high auto theft crime. In addition, crime analysis can provide the assistance in identifying the type of vehicles that may be targeted within the hot spot area. For example, an analysis may be able to identify MaR vehicles which have demonstrated a repetitive theft occurrence, over a period of one year. These vehicles may be ideal to target for vehicle hardening. Analysis should be able to provide the leading vehicle thefts by make and model and then narrow the results to those having the highest occurrence by manufactured year. Your analysis can identify the repetitive risk exposure by year, make and model of targeted vehicles within the scope or hot spot of a funded project. Once MaR vehicles have been identified, it is advisable to perform research with the OEM specifications for determining the original OEM security platforms. Those that are being stolen by overcoming ineffective OEM security platforms may be the ideal target vehicles for a vehicle hardening solution investment.

Practice Element 3: Establishing Immobilization Network

Once the MaR vehicles are selected and the product solution is identified, the next step is to address key components for an immobilization network. Key components include:

1. Public Education and Awareness. Safer roads and vehicle theft prevention must be seen as a group effort. Your solution needs to include both the education of the public on the importance of good safety habits, such as their key control and working with a corporate partnership that can leverage the message. Special thought should be given as to what organizations should be approached, e.g., AAA or Crime Stoppers. Consider organizations that have similar goals and mandates for road safety to venture into a joint partnership, enabling the ability to achieve a greater impact along with a higher return on investment.

⁴ See [Appendix A: CAN/ULC-S338-1998R2018](#)



2. Most-at-Risk (MaR) Ownership Outreach. Consideration should be given to reaching to MaR owners. Standards should be established for vetting owners to avoid installation devices on criminal owners. Special thought should be given to what organization would approach, and the tactics that may be most effective, to inform MaR vehicle owners of the opportunity to minimize the risk of theft.
3. Installation Facility. Consideration should be given to the selection of an installation facility that meets vetting requirements by local law enforcement and local community business leaders. Expectations and requirements should be clearly identified as to the level of commitment and service quality for installation of immobilization devices.
4. Technical Installation Team. The technical team needed to complete the hands-on portion of the vehicle hardening. It is critically important any vehicle hardening solution include attention to both training and quality assurance inspections. If these steps are missed you will not know if the workmanship is meeting the safe and effective specifications. The first step for any technical team selection needs to begin with a Police Clearance check. We certainly do not desire to train known automotive thieves or gang members to discover the inner working of the security solution. The second step is to build your team on qualified and licensed technicians. While each jurisdiction has their own criteria, if you want quality 'out' you must put quality 'in'. This should be the foundational thinking in the selection of these individuals.
5. Quality assurance inspections will require a centralized database and good documentation of the vehicles that have been modified. It is important that all parts of the modification be recorded so in the event there is a product recall, failure to meet installation expectations or vehicle design update. Each installation should have the following recorded for accountability and review.
 - The installation facility,
 - Who installed the system,
 - What product was used including the identification of its production batch details,
 - What vehicle was modified, including the year, make, model and VIN,
 - The owner's name,
 - The insurance company insured the vehicle, and
 - Any repairs on this vehicle in the event the security system has had an attempt.

Practice Element 4: Evaluation

Once the program has been implemented, consideration should be given to monitoring and reporting the progression of the project. At the conclusion of the project, consideration should be given to performing an impact evaluation in regards to the number of immobilized vehicles, experiences before and after installation, concerns and challenges during the installation and any identified resolutions, and cost-effectiveness outcomes demonstrating levels of investment return.

The above strategy is provided to assist in the continuation or initiation of ATPA to seek road safety solutions through vehicle hardening systems projects to prevent, educate and inform the public regarding prevention of motor vehicle theft and related crimes.



Appendix A

CAN/ULC-S338-1998R2018 (May 1998)

Standard for Automotive Theft Deterrent Equipment and Systems: Electronic Immobilization

This standard requires the following of an approved & certified immobilizer:

3.1 GENERAL

3.1.1 The primary focus of the electrical or *electronic immobilization system* is for theft-of- vehicle, drive away protection, accomplished through disengagement of multiple engines operating circuits or vital engine control units.

3.1.2 The *electronic immobilization system* shall not degrade the safe operation of the vehicle in which the *electronic immobilization system* is installed.

3.1.3 Any optional equipment available with the *electronic immobilization system* shall not conflict with the theft deterrent function of the *electronic immobilization system* or the safe operation of the vehicle.

3.1.4 Subject to Clauses 3.1.5 and 3.1.9, the *arming* of the *electronic immobilization system* shall be *passive arming*.

3.1.5 The *arming* protocol of the *electronic immobilization system* shall include provisions for the immediate restart of the vehicle in case of an unintentional stall, without compromising the *passive arming* operation of the *electronic immobilization system*.

3.1.6 *Disarming* of the *electronic immobilization system* shall be accomplished by means of a coded key or secure combination allowing the engine to start by normal means.

3.1.7 A minimum of two *coded disarming keys* or one *secure disarming combination* shall be supplied with the system.

3.1.8 The manufacturer of the *electronic immobilization system* shall have the option to supply to the end user additional *coded disarming keys* and *secure disarming combinations* through a secure distribution method.

3.1.9 The *electronic immobilization system* and all optional accessories shall be powered solely by the main vehicle battery when in *armed* mode. Optional accessories and *disarming* keys may incorporate internal power sources.

5.1.1 All system wiring shall be uniform in colour for *non-OEM systems*.

5.2.2 The system shall not have any permanent identifying marks on the outside of any enclosure which may serve to identify wires and other inputs or outputs to any component of the *electronic immobilization system*.

5.2.3 All enclosures shall resist abuses to which they are likely to be subjected during normal operation without affecting their performance and continue to meet the requirements of Section 12, Performance Testing.

6.1.1 *Arming* of the immobilization function of the *electronic immobilization system* shall be *passive arming* and initiate no sooner than 30 s and no later than 60 s after the ignition power is turned off.