



National Motor Vehicle
Theft Reduction Council

ENGINE IMMOBILISERS: HOW EFFECTIVE ARE THEY?

Robert Potter and Paul Thomas¹,

During the last decade, upward trends in motor vehicle theft across the world have led to significant advances in vehicle security. Features such as alarms, superior locks and complex vehicle identification systems that are difficult to reproduce are now common Original Equipment Manufacturer (OEM) products in new vehicles. In addition to these and other security features is the development of the engine immobiliser.

An engine immobiliser is an electronic device that acts to isolate the ignition system, the fuel system, the starter engine, or a combination of these three systems. As most new vehicles control these systems via the engine management system, immobilisers on newer vehicles tend to interface with this component. The immobiliser will not allow the vehicle to be started without first receiving the correct signal from the person starting the vehicle. This signal can be communicated to the immobiliser unit in a number of ways:

1. Transponder - an electronic proximity device that converts electronically coded signals into radio signals. Requires no action by owner to set or unset. Usually built in to original keys.
2. Remote key - usually a hand-held device which, when activated, transmits a radio or infra-red frequency to control the immobiliser.
3. Electronic key - a coded key, which enables the engine to start.
4. Coded keypad - requires a code or PIN to be entered to disable the immobiliser.
5. Key switch - a switching method to disable the immobiliser.

The transponder system is favoured by manufacturers of the newer immobilisers and is generally perceived to be the most impervious to theft.

Prior to 1992, the only immobilised vehicles in the Australian fleet were a limited number of imports, or those fitted with an after-market system. In 1992 Ford and Holden introduced the first OEM immobilisers on their biggest selling models and since that time many advances in the technology have taken place, leading up to the encrypted transponder systems that are seen in present models. In 1999 the National Motor Vehicle Theft Reduction Council (NMVTRC) worked with the Federal Office of Road Safety and vehicle manufacturers to fast track an Australian Standard for immobilisers. From July 2001 it has become compulsory for all new vehicles to be fitted with an immobiliser that meets the new Australian Design Requirements (AS/NZS 4601:1999).

¹ Robert Potter is Senior Research Officer with the National Comprehensive Auto-theft Research System (CARS) and Paul Thomas is the project's Director. The National CARS Project is based within the South Australian Office of Crime Statistics but is a fully funded initiative of the National Motor Vehicle Theft Reduction Council.

As a consequence of rising vehicle theft numbers prior to 1997 the Western Australian government introduced a subsidy scheme during 1997 to persuade vehicle owners to install engine immobilisers. This scheme was reasonably successful encouraging many vehicle owners to install an immobiliser. By 1999 however, the take-up rate of this voluntary scheme was declining and the government decided to make the scheme compulsory in order to speed up the rate at which the fleet was becoming protected. As such, in 1999 legislative amendments were passed in Western Australia, which forced the installation of an immobiliser on any new passenger vehicle registered, or any secondhand vehicles when transferred to a new owner. Light commercials were also required to be immobilised upon a change of ownership.

While engine immobilisers have undergone extensive electrical, mechanical and other engineering tests there is little publicly available data regarding the effectiveness of these devices in the 'real world'. Furthermore, community surveys reveal that the general motoring public place high levels of confidence in engine immobilisers. For example, in a survey conducted by the NMVTRC in 1999 seventy-seven percent of the sample questioned stated that they believed engine immobilisers were '*very effective*' in preventing vehicle theft and 56% supported them being made compulsory for all vehicles.

Is this high level of confidence justified? How well do immobilisers perform in the real world, away from the engineer's controlled environment? Are all immobilisers equally effective in preventing theft? This paper addresses these questions through comprehensive field study of OEM immobilisers within the Australian vehicle fleet.

Theft data and registration data from across Australia was used to evaluate the functionality of immobilisers and compare the different types of systems used by manufacturers. The systems analysed in this study have been categorised according to the following list developed by NRMA Insurance.

1. **Encrypted** – The immobilisers given this rating are all transponder systems with an encrypted code that is highly resistant to cloning.
2. **Encrypted Radio Remote** – These systems are immobilisers with encrypted codes, but also have a radio remote keyless entry or alarm system.
3. **Encrypted Timed Override** – Transponder systems that will deactivate after an unsuccessful attempt to start (usually between 30 & 120 minutes).
4. **Encrypted Radio Remote Timed Override** – Very common in post 1992 Holdens. The immobiliser is controlled by an encrypted radio remote signal, and there is a timed override.
5. **Read Only** – Usually transponder systems that are read only and therefore, susceptible to cloning.
6. **Read Only Radio Remote** – A transponder immobiliser (read only) and an alarm system controlled by a radio remote.
7. **Radio Remote** – Immobiliser system controlled by radio remote. Can be passive arming or active set.
8. **Radio Remote Timed Override** – Only the Holden Apollo (1995 onwards) and the Subaru Impreza WRX 1999 onwards have this system. Both are passive arming systems deactivated by a radio remote. The Impreza has 6 cutout points in the engine management and fuel systems.
9. **Radio Remote Active Set** – Many of the Porsches manufactured after 1989 have systems that only become active when the door is locked. The systems are deactivated by radio remote.

10. **Ignition Dependent** – During 1997 the Falcons, Fairlanes and LTDs had the timed override taken off the immobiliser system leaving a unit that was simply ignition dependent.
11. **Timed Override Ignition Dependent** – Falcons, Fairlanes and LTDs manufactured between 1992 and 1997 have this system which requires the key inserted in the ignition to deactivate the immobiliser. The system will also deactivate a fixed time interval after an unsuccessful attempt to start.
12. **Active Set** – Systems that require some action from the user to be activated.
13. **Passive Arming PIN to Unset** – Systems that arm automatically but require the user to input a personal identification number to deactivate the system.

Of the above systems the following were classified as meeting Australian Standards (AS/NZS 4601:1999):

- Encrypted
- Read Only
- Radio Remote
- Encrypted Radio Remote
- Read Only Radio Remote

The rest were classified as immobilised, but not to Australian Standards.

The following paper evaluates these systems in terms of their ability to prevent theft. This is done using police data from all states and territories of Australia for the calendar year 2000, and a snapshot of registration data from all states and territories taken at 31/12/2000. Western Australia is treated separately due to the introduction of the voluntary immobiliser scheme in 1997 and the subsequent compulsory immobiliser scheme that commenced in July 1999. Analyses have been performed on both the entire passenger/light commercial fleet as well as those manufactured after 1991 as this controls, to some degree, the influence that the age of vehicles has on theft rates.

Vehicles were only assumed to have an immobiliser fitted if manufacturers listed it as standard equipment (OEM). If an immobiliser system was listed as optional then it was assumed that the vehicle did not have one. The analysis also does not account for any immobiliser that may have been fitted after market.

The next section of this report presents an overview of the finding between non-immobilised and immobilised vehicles as well as between the different categories of immobilised vehicles. Sections 2 – 8 then profile a number of the different categories of immobiliser systems in further detail. Finally, section 9 looks at the theft patterns in Western Australia where government initiatives have resulted in a significantly higher proportion of the vehicle fleet are fitted with engine immobilisers.

Section 1: Overview

During the calendar year of 2000 a total of 116,906 passenger/light commercial vehicle thefts were recorded throughout Australia (excluding Western Australia). Of these, a total of 106,620 (91.2%) had no immobiliser fitted, 5,749 (4.9%) had an immobiliser that did not meet Australian Standards, and 4,537 (3.9%) had an Australian Standard immobiliser fitted as OEM. In order to control for the popularity of certain models of vehicles, which would bias the sample, the number of recorded thefts of each model, have been converted to a rate per 10,000 registrations.

Table 1 shows theft rates of vehicles by immobiliser presence for all passenger vehicles and passenger vehicles manufactured after 1991. The table shows clearly that vehicles fitted with Australian Standard Immobilisers as OEM were stolen at a significantly lower rate (29.1 thefts per 10,000 registrations) than vehicles with no immobilisers fitted (140.1). These Australian Standard immobilisers also recorded significantly lower theft rates than vehicles fitted with immobilisers that did not meet current Australian Standards (55.5).

It is reasonable to assume that the age of a vehicle may be a significant factor in its theft risk, for example, older vehicles may be more likely than newer vehicles to be stolen for parts. That being the case, engine immobilisers are a relatively recent introduction and are more likely to be found on younger vehicles. Therefore, the lower theft rate reported in Table 2 might simply be an artifact of the age of the vehicle. To attempt to control for the 'age' factor the theft rate of only post 1991 vehicles was compared (see Table 2) and although slightly diminished, a significantly lower theft rate was again recorded for AS immobilisers (29.0) compared to both non-immobilised (52.8) and immobilised vehicles that did not reach Australian Standards (47.8).

Recovery rates suggest that professional theft is higher for vehicles with immobilisers than for vehicles without immobilisers. If it is assumed that any vehicle not recovered was a professional theft (which may not always be the case) then clearly there was a higher percentage of professional thefts for immobilised vehicles when looking at all years of manufacture ($\underline{z}=42.4, p<.001$). A similar, though less acute, pattern emerged when thefts of vehicles manufactured after 1991 were examined. While recovery rates were all in the 60% - 70% region, vehicles with an immobiliser (both Australian Standard and not Australian Standard) showed significantly lower recovery rates than those with no immobiliser ($\underline{z}=7.5, p<.001$). Rather than suggesting that professional thieves prefer vehicles with immobilisers, it is likely that this result indicates only that joyriders are probably less able to steal vehicles with immobilisers.

Table 1 also shows that amongst post 1991 vehicles, those with immobilisers that do not meet Australian Standards have significantly lower recovery rates than those that do meet Australian Standards (AS) ($\underline{z}=2.4, p<.05$). While the difference is not large it does suggest more professional activity with the models that have non-AS immobilisers fitted as OEM. As the newer models tend to have AS immobilisers and the slightly older models have non-AS immobilisers it is possible that there is a larger market for used parts for these vehicles due to the larger number of them on the road and their slightly older condition. Hence there may be more of them stolen and broken up for parts. There is probably also a larger demand for rebirthed vehicles of this type, as they are more affordable for the average family also making professional theft more likely.

Table 1 Passenger vehicles stolen and recovered in Australia (excluding WA) by immobiliser presence for vehicles manufactured after 1991 and all vehicles, 2000.

	AUSTRALIA					
	Vehicles manufactured after 1991			Vehicles manufactured in all years		
	Stolen passenger vehicles	Percentage recovered	Rate per 10,000 registered	Stolen passenger vehicles	Percentage recovered	Rate per 10,000 registered
No Immobiliser	11,861	68.5	47.8	106,620	81.9	140.1
Immobilised – AS	4,498	64.9	29.0	4,537	64.9	29.1
Immobilised – Not AS	5,403	62.6	52.8	5,749	64.2	55.5
Total	21,762	66.3	43.1	116,906	80.4	114.5

* Registration snapshot as at 31/12/00.

Table 2 shows the theft numbers of vehicles by immobiliser type for all passenger vehicles and passenger vehicles manufactured after 1991. As in Table 1 the data indicate that the immobilisers more resistant to theft were the ones that were manufactured to Australian Standards. All of these immobiliser types (Encrypted, Encrypted-radio remote, Read only, Radio remote, Read only-radio remote) with the possible exception of 'radio remote' systems tended to have the lower theft rates. Conversely, many of the systems that had timed overrides built in to the immobiliser (and therefore do not meet the Australian Standard) showed theft rates at least as high, or higher, than those seen for vehicles with no immobiliser manufactured after 1991.

Table 2 Passenger vehicles stolen in Australia (excluding WA) by type of immobiliser fitted, 2000.

	AUST					
	Stolen passenger vehicles (1992 on)	Percentage recovered (1992 on)	Rate per 10,000 registered (1992 on)*	Stolen passenger vehicles (all)	Percentage recovered (all)	Rate per 10,000 registered (all)
Radio Remote – Timed Override	4	50.0	8.5	4	50.0	8.5
Encrypted	1,964	66.5	23.4	1,969	66.6	23.5
Read Only – Radio Remote	7	71.4	28.8	7	71.4	28.8
Radio Remote – Active Set	1	0.0	29.3	5	40.0	70.9
Read Only	1,160	64.7	29.6	1,167	64.8	29.8
Encrypted – Radio Remote	670	62.1	34.7	670	62.1	34.7
Ignition Dependent	606	68.1	41.5	606	68.1	41.5
Timed Override – Ignition Dependent	1,490	64.9	45.0	1,490	64.9	45.0
No Immobiliser	11,766	68.5	47.8	106,835	82.0	140.3
Radio Remote	617	63.2	48.3	644	63.0	48.4
Active Set	119	59.7	62.6	120	60.0	63.0
Encrypted – Radio Remote – Timed Override	3,254	60.1	63.0	3,285	60.3	63.6
Encrypted – Timed Override	9	77.8	66.7	9	77.8	66.7
Total	21,762	66.3	43.1	116,906	80.4	114.5

* Registration snapshot as at 31/12/00. Shading indicates that the system meets Australian Standards.

Section 2: Encrypted Immobilisers

- Theft rate – 23.4 per 10,000 registrations.
- The immobilisers given this rating were all transponder systems with an encrypted code that is highly resistant to cloning.

Encrypted immobilisers are fitted as OEM to most of the new models by the majority of vehicle manufacturers and are widely perceived to be one of the most secure systems available. The rates reported in Table 2 confirm this assertion that the system is extremely secure. Only vehicles fitted with a Radio remote – Timed override system were stolen at a lower rate. Note, however, that only the Holden Apollo (1995 on) and Subaru Impreza WRX STi (1999 on) have this system (Radio remote – Timed override) fitted meaning there were less vehicles with this system on the road as potential targets.

Table 3 shows that passenger vehicles fitted with encrypted immobilisers were stolen at a rate of less than 20 thefts per 10,000 vehicles registered in every state except New South Wales. NSW reported a much higher rate of theft (35.1 per 10,000) and represented almost 60% of all encrypted immobiliser thefts in the country. The fact that NSW had a significantly lower recovery rate than all other states also suggests that there was a real problem with professional thefts in the state. These higher recovery rates in most states suggest that opportunistic thefts were still a major concern for vehicles with encrypted immobilisers.

Table 3 Passenger vehicles with an Encrypted immobiliser by state stolen (all years of manufacture).

State	Stolen		Recovered*	
	Number	Rate per 10,000 registered	Number	% Recovered
ACT	22	14.2	15	68.2
NSW	1,148	35.1	680	59.2
NT	16	19.1	12	75.0
QLD	275	16.3	203	73.8
SA	99	19.2	93	93.9
TAS	20	13.9	18	90.0
VIC	389	15.4	290	74.6
Total	1,969	23.5	1,311	66.6

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

Table 4 shows that the majority of vehicles fitted with an encrypted immobiliser that were stolen were manufactured from 1998 on. However, recovery rates were lower for vehicles manufactured earlier. As mentioned earlier, this may be the result of a bigger stolen parts market for the slightly older models.

A breakdown by make, model and series is shown in Table 5 and reveals some interesting patterns. Passenger vehicles manufactured by Audi were stolen at a rate consistently above the 23.5 per 10,000 seen for all vehicles with encrypted immobilisers. The A4 in particular was stolen frequently and had a low recovery rate (53.8%) compared to the 66.5% seen for all vehicles with encrypted immobilisers.

Table 4 Vehicles with an Encrypted immobiliser by year of manufacture of the vehicle (all years of manufacture).

Year of manufacture	Stolen		Recovered*	
	Number	Percentage	Number	% recovered
1994	12	0.6	7	58.3
1995	106	5.4	69	65.1
1996	120	6.1	72	60.0
1997	163	8.3	104	63.8
1998	416	21.1	271	65.1
1999	812	41.2	549	67.6
<i>Subtotal 1990s</i>	<i>1,629</i>	<i>82.7</i>	<i>1,072</i>	<i>65.8</i>
2000	333	16.9	233	70.0
Unknown	7	0.4	6	85.7
Total	1,969	100.0	1,311	66.6

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

The 19 BMW M3 E36 that were stolen were also particularly interesting. The rate of theft for these vehicles was extremely high in spite of the fact that so few were registered (269.5 per 10,000 registered). 16 of those were stolen in NSW and the recovery rate was extremely low suggesting that these vehicles were purposely targeted by professional thieves for either steal to order or stolen parts operations. Other vehicles with exceptionally high theft rates and low recovery rates that were manufactured by BMW with encrypted immobilisers included the 316i E36, 318is E36, 318ti E36, and the 328i E36.

Ford vehicles showed the AU Falcon, Fairmont and Fairlane stolen at a rate greater than the overall figure. The AU II, Explorer and the smaller 4 cylinder Laser and Ka were all stolen at a rate lower than expected from the overall 23.5 seen for all vehicles with encrypted immobilisers.

The Mazda MX-5 was stolen at a high rate but also recovered at a higher than expected rate. The Porsche Boxter 986 seemed to be targeted by professionals with a high risk of theft being associated with the vehicle (81.9 per 10,000 registrations stolen).

Table 5. Vehicles with an Encrypted immobiliser by make, model and series of the vehicle (1992 models onwards).

Make/Model/Series	Stolen		Recovered	
	Number	Rate per 10,000 regist [†]	Number	% recovered
Alfa Romeo GTV	1	19.8	1	100.0
Alfa Romeo Spider	1	25.4	0	0.0
Audi A3	12	61.3	9	75.0
Audi A4	26	32.2	14	53.8
Audi A6	5	41.5	4	80.0
Audi A8	2	172.4	2	100.0
Audi TT	2	26.3	2	100.0
BMW 3 Series (series unknown)	3	-	1	33.3

Continued over the page

Table 5. Vehicles with an Encrypted immobiliser by make, model and series of the vehicle (1992 models onwards). (Continued)

<i>Make/Model/Series</i>	<i>Stolen</i>		<i>Recovered</i>	
	<i>Number</i>	<i>Rate per 10,000 regist^t</i>	<i>Number</i>	<i>% recovered</i>
BMW 316i E36	18	46.0	10	55.6
BMW 318i E36	6	8.4	5	83.3
BMW 318i E46	17	25.6	13	76.5
BMW 318is E36	24	58.7	15	62.5
BMW 318ti E36	5	38.0	2	40.0
BMW 320i E36	8	90.8	5	62.5
BMW 323Ci E46	3	24.7	2	66.7
BMW 323i E36	6	24.5	2	33.3
BMW 323i E46	6	18.2	4	66.7
BMW 328Ci E46	1	23.6	1	100.0
BMW 328i E36	14	52.5	9	64.3
BMW 328i E46	2	25.7	0	0.0
BMW 523i E39	7	31.0	6	85.7
BMW 525i E34	1	34.5	1	100.0
BMW 528i E39	9	27.3	8	88.9
BMW 535i E39	5	57.3	3	60.0
BMW 540i E34	1	57.5	0	0.0
BMW 730iL E38	1	37.3	1	100.0
BMW 735iL E38	2	39.7	2	100.0
BMW 740iL E38	1	16.8	1	100.0
BMW M3 E36	19	269.5	9	47.4
BMW M5 E39	1	76.9	0	0.0
Ford Explorer UP	2	4.1	1	50.0
Ford Explorer US	1	11.1	1	100.0
Ford Fairlane AU	16	34.2	11	68.8
Ford Fairmont AU	69	37.7	50	72.5
Ford Fairmont AU II	2	4.5	2	100.0
Ford Falcon AU	291	33.7	203	69.8
Ford Falcon AU II	32	12.8	27	84.4
Ford Falcon Ute AU	32	38.6	24	75.0
Ford Falcon Ute AU II	8	14.5	7	87.5
Ford Ka TA	2	11.2	1	50.0
Ford Laser (series unknown)	1	-	1	100.0
Ford Laser KJ III	25	24.0	16	64.0
Ford Laser KN	20	13.3	15	75.0
Holden Jackaroo U8	15	16.1	14	93.3
Holden Vectra JR	14	17.9	10	71.4
Holden Vectra JS	19	10.8	9	47.4
Hyundai Accent	7	6.0	3	42.9
Hyundai Grandeur	4	19.0	4	100.0
Jaguar XJ8 X300	2	23.1	2	100.0
Jeep Cherokee XJ	16	24.3	8	50.0
Kia Cremos	1	17.4	1	100.0
Lexus GS300	2	13.6	2	100.0
Lexus IS200	7	23.9	7	100.0
Lexus (model/series unknown)	4	-	2	50.0

Continued over the page

Table 5. Vehicles with an Encrypted immobiliser by make, model and series of the vehicle (1992 models onwards). (Continued)

<i>Make/Model/Series</i>	<i>Stolen</i>		<i>Recovered</i>	
	<i>Number</i>	<i>Rate per 10,000 regist^t</i>	<i>Number</i>	<i>% recovered</i>
Mazda 323	2	-	2	100.0
Mazda 323 Astina	37	29.7	25	67.6
Mazda 323 Protege	21	14.5	14	66.7
Mazda 626	32	20.5	19	59.4
Mazda MX-5	17	46.6	12	70.6
Mercedes-Benz A140 W168	1	59.2	0	0.0
Mercedes-Benz A160 W168	6	35.7	5	83.3
Mercedes-Benz C180 W202	11	26.2	5	45.5
Mercedes-Benz C200 W202	8	20.1	3	37.5
Mercedes-Benz C200T S202	1	28.3	1	100.0
Mercedes-Benz C36 W202	1	555.6	1	100.0
Mercedes-Benz CLK C208	4	17.8	2	50.0
Mercedes-Benz E230 W210	2	25.5	0	0.0
Mercedes-Benz E230T S210	2	202.0	2	100.0
Mercedes-Benz E240 W210	3	14.7	1	33.3
Mercedes-Benz E280 W210	1	19.3	1	100.0
Mercedes-Benz E36 W210	1	555.6	1	100.0
Mercedes-Benz E430 W210	1	24.5	1	100.0
Mercedes-Benz E55 W210	3	197.4	1	33.3
Mercedes-Benz ML270CDI	1	40.3	0	0.0
Mercedes-Benz ML320	4	12.8	3	75.0
Mercedes-Benz S320 W140	1	84.7	1	100.0
Mercedes-Benz S430 W220	2	79.1	2	100.0
Mercedes-Benz SL320 R129	1	243.9	1	100.0
Mercedes-Benz SL500 R129	1	102.0	1	100.0
Mercedes-Benz SLK230 R170	5	32.2	1	20.0
Mercedes-Benz 280 (series unknown)	2	-	2	100.0
Mercedes-Benz 500 (series unknown)	1	-	1	100.0
Mercedes-Benz (model/series unknown)	7	-	6	85.7
Mitsubishi Challenger PA	8	15.6	5	62.5
Mitsubishi Magna (series unknown)	2	-	1	50.0
Mitsubishi Magna TH	67	23.2	50	74.6
Mitsubishi Magna TJ	4	13.3	2	50.0
Mitsubishi Pajero IO QA	4	85.1	3	75.0
Mitsubishi Pajero NM	1	3.4	1	100.0
Mitsubishi Verada KH	8	21.8	4	50.0
Mitsubishi Verada KJ	2	28.6	2	100.0
Nissan Maxima A33	2	6.6	2	100.0
Porsche 911	1	-	1	100.0
Porsche 911 Carrera 996	4	51.6	2	50.0
Porsche Boxster 986	10	81.9	6	60.0
Saab 9-3	7	20.6	6	85.7
Seat Cordoba	3	59.9	3	100.0
Subaru Forester	11	7.6	8	72.7
Subaru Impreza	26	19.3	15	57.7
Subaru Liberty	10	9.0	6	60.0

Continued over the page

Table 5. Vehicles with an Encrypted immobiliser by make, model and series of the vehicle (1992 models onwards). (Continued)

Make/Model/Series	Stolen		Recovered	
	Number	Rate per 10,000 regist ^t	Number	% recovered
Toyota Avalon MCX10R	5	8.9	3	60.0
Toyota Camry 20 Series	240	23.6	161	67.1
Toyota Camry 20/21/22	1	61.0	1	100.0
Toyota Camry SDV/VDV 10	1	0.3	1	100.0
Toyota Camry SXV10	68	10.7	50	73.5
Toyota Corolla 112	69	20.0	42	60.9
Toyota Echo	32	23.7	21	65.6
Toyota Landcruiser 100 Series	41	17.9	22	53.7
Toyota Landcruiser 70 Series	31	16.5	14	45.2
Toyota Landcruiser Prado VZJ95R	44	16.6	25	56.8
Toyota Landcruiser (series unknown)	4	-	2	50.0
Toyota Paseo EL54	3	14.3	0	0.0
Toyota Rav4	2	-	2	100.0
Toyota Rav4 ACA21R	2	8.5	1	50.0
Toyota Rav4 SXA10R	20	41.8	13	65.0
Toyota Rav4 SXA11R	51	22.9	33	64.7
Toyota Tarago	14	12.8	10	71.4
Toyota Vienta MCV20R	20	16.6	13	65.0
Toyota Vienta VZV10	50	22.3	35	70.0
Volkswagen Bora	1	14.3	1	100.0
Volkswagen Caravelle T4	1	21.2	0	0.0
Volkswagen Golf	34	28.9	23	67.6
Volkswagen New Beetle	2	19.2	1	50.0
Volkswagen Passat	5	15.8	3	60.0
Volkswagen Polo	14	30.5	10	71.4
Volkswagen Transporter	20	37.2	12	60.0
Volvo S70	2	11.0	1	50.0
Volvo S90	1	59.5	1	100.0
Volvo V40	3	17.9	1	33.3
Volvo V70	6	19.4	4	66.7

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

* Theft rates were calculated based on registration snapshot as at 31/12/00.

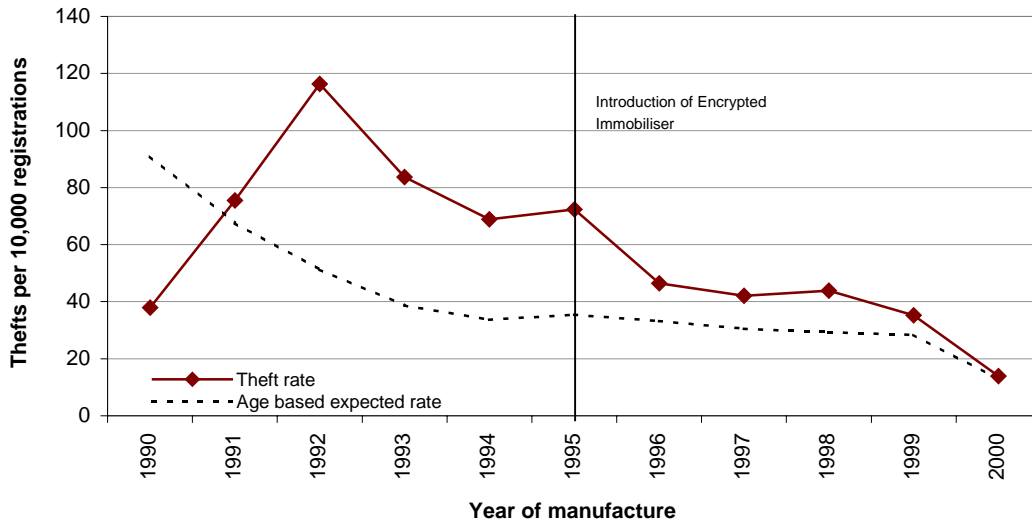
Shaded figures were calculated on known registration numbers of less than 1,000.

Figure 1 shows the theft rates of BMW 3 Series vehicles by year of manufacture. This demonstrates exactly how the installation of an immobiliser has influenced the theft risk of a particular vehicle. The graph shows that Encrypted immobilisers were fitted to BMW 3 Series vehicles from 1995 (vertical line on graph) and that vehicles manufactured after that year had a much lower theft risk than those manufactured earlier. Theft rates of BMW 3 Series vehicles (unbroken red line) were well above the expected theft rate (broken black line) before the installation of the immobiliser, but after systems were fitted theft rates drop to close on the expected theft rate.

Expected theft rates are plotted on all of these graphs in order that they can be used as a baseline to assess the effectiveness of immobiliser systems in reducing the theft risk of examined models. These expected rates were calculated with data for 3 calendar years (1998 – 2000) for

all states except New South Wales, Northern Territory, and the Australian Capital Territory where only 2000 data were available. Rates were calculated for vehicles ranging from 0 to 10 years of age and then averaged to provide the expected rates plotted in the graphs. In other words, vehicles manufactured during 1992 would be eight years old during the 2000 calendar year. At the 1992 point on the x-axis the dotted line represents the average theft rate (calculated over the last 3 years) of all eight year old vehicles.

Figure 1 Thefts per 10,000 registrations of BMW 3 Series vehicles during 2000 in Australia by year of manufacture.



The pattern shown in Figure 2 for Ford Falcons is not as simple as that seen for the 3 Series vehicles. Immobilisers (Smartlock – ignition dependent, timed override) were originally introduced in 1992 for the Falcons. During 1997 the timed override was removed, and then Encrypted systems introduced during 1999. During this period theft risk has remained quite steady at a rate higher than what was expected overall reflecting the popularity of Falcons amongst thieves.

Figure 2 Theft rates per 10,000 registered of Ford Falcon vehicles during 2000 in Australia by year of manufacture.

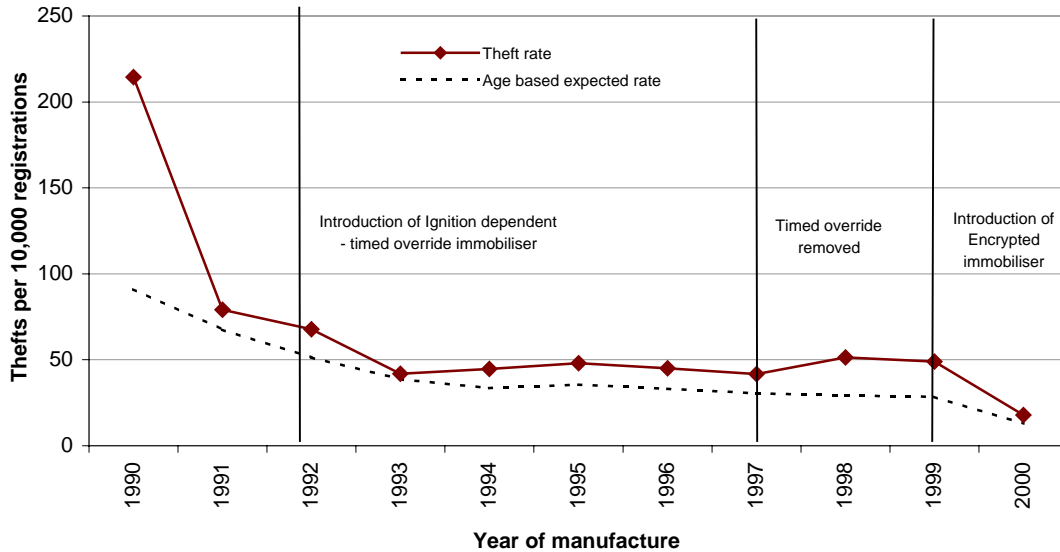
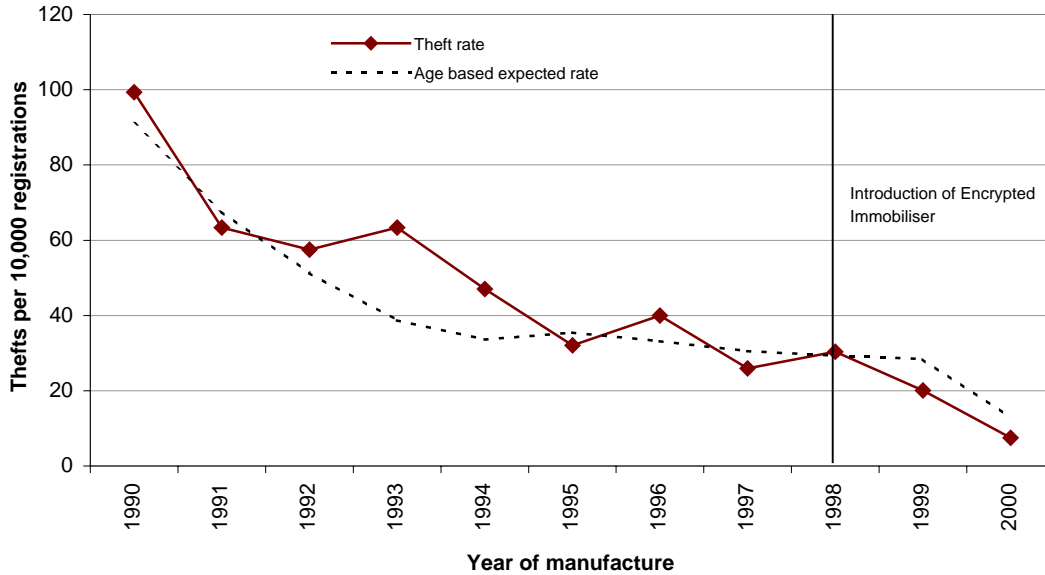


Figure 3 shows that Ford Lasers manufactured before the installation of immobilisers as OEM were consistently close to, or just above, what was expected overall. However, after the immobiliser system was introduced theft rates fell below expected levels for both years of manufacture.

Figure 3 Theft rates per 10,000 registered of Ford Lasers during 2000 in Australia by year of manufacture.



The Mitsubishi Magna changed from a Read only system introduced in 1996 to an Encrypted system in 1999. It is difficult to tell yet whether the change has had a significant influence on thefts, although the trend does appear to be going down. Rates have closely followed those that would be expected both before and after the installation of the immobiliser system.

Figure 4 Theft rates per 10,000 registrations of Mitsubishi Magnas during 2000 in Australia by year of manufacture.

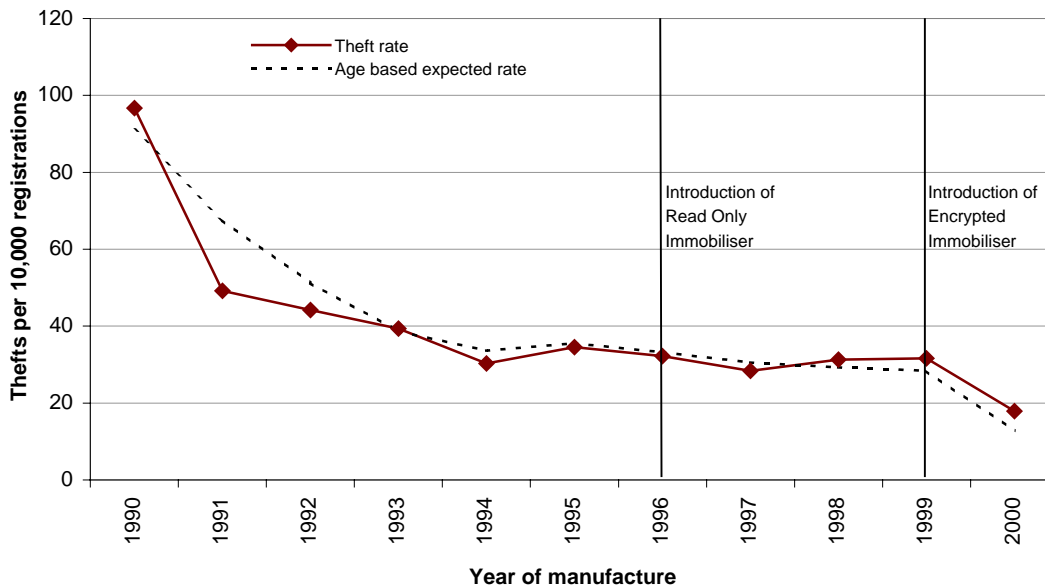
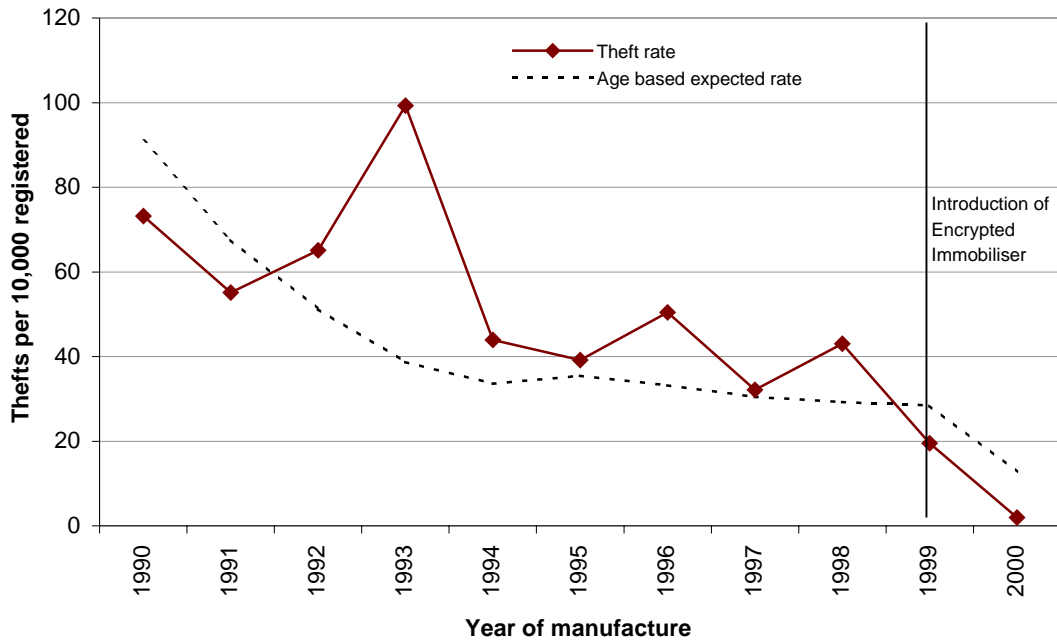


Figure 5 shows the theft rates of Subaru Liberty vehicles by year of manufacture. It appears that the installation of Encrypted immobilisers as OEM has reduced the theft rates seen in the model. Before the installation of the immobiliser system, rates were higher than would be expected. However, after installation, theft rates drop below that which is expected overall.

Figure 5 Theft rates per 10,000 registered of Subaru Liberty vehicles during 2000 in Australia by year of manufacture.



Given that so many vehicles with these encrypted immobilisers were stolen during the 2000 calendar year it is important to understand how the security systems were defeated. The South Australian Police operational system has provided some insight into this, providing details of how particular vehicles were stolen. Examining the details of the 99 vehicles stolen in South Australia that were fitted with encrypted immobilisers showed that keys had become the weak link in the security of these vehicles. Of the 99 vehicles stolen 57 were taken because the thieves had access to the keys for one reason or another. Of the remaining 42 only 19 were clearly reported as being secured at the time of theft. The final 23 thefts did not contain enough information to make a judgement about access to keys.

Of the 57 thefts where offenders gained access to keys 4 included an assault of the victim. Twenty-five involved a break in at a home or business to get the keys. Fourteen incidents occurred because victims left their keys in the ignition of their vehicles (13) or unsecured in a public location (1). Five thefts were by people known to the victim (usually a family member or close friend). Seven were thefts of rental vehicles and there were 3 thefts where it was unknown how offenders got the keys.

In summary, the Encrypted immobilisers were very effective deterrents to opportunistic theft. The immobiliser makes these vehicles unattractive targets for opportunistic thieves who would probably move on to a vehicle that is easier to steal when faced with this level of security. However, it does appear that professional thefts still occur but the method of theft is unknown to the present authors. It is likely that some vehicles could have been towed away or taken on

trucks; keys may have been accessed in some way, or the immobiliser defeated. It does appear though that the weak link in the security of these vehicles is the keys. Owners need to be made aware of the fact that their car is very easy to steal if their keys are not secured properly. In the face of improved security features such as the immobiliser thieves are becoming more creative in the ways that vehicles are stolen.

Section 3: Read Only Immobilisers

- Theft rate – 29.8 per 10,000 registrations.
- Read only immobilisers are usually transponder systems that are read only and therefore, susceptible to cloning.

Vehicles fitted with Read only immobilisers include Citroen Xantia (1998 on), Daewoo Korando (1998 on), Ford Taurus (1995 on), Holden Barina (1997 on), many recent model Hondas, Mitsubishiis and Peugeots, Nissan Patrols (1997 on), many Subaru Imprezas and many of the later model Volvos and Volkswagens.

Overall, vehicles fitted with a read only immobiliser were stolen at a rate of 29.8 per 10,000 registrations, which was second only to the encrypted immobilisers discussed in the previous section. Table 6 shows that 68.1% of thefts of these vehicles takes place in New South Wales. Theft rates in NSW were also high, being up to 3.5 times higher than those recorded in other states. The fact that theft rates for vehicles with read only immobilisers in all other states were extremely low suggests that these immobilisers are very effective in reducing thefts. Recovery rates were again quite low in NSW and the two territories. In spite of this, in the 3 other states where theft numbers were greater than 20 (QLD, SA, VIC) recovery rates were substantially higher than the 60.4% seen in NSW. It gives the impression that NSW was once again the centre for professional thefts of vehicles with Read only immobilisers.

Table 6 Vehicles with a Read only immobiliser by state stolen.

State	Stolen		Recovered*	
	Number	Rate per 10,000 registered	Number	% Recovered
ACT	16	18.0	8	50.0
NSW	795	50.8	480	60.4
NT	5	16.8	3	60.0
QLD	117	16.1	96	82.1
SA	54	19.5	43	79.6
TAS	11	14.6	11	100.0
VIC	169	14.6	115	68.0
Total	1,167	29.8	756	64.8

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

Table 7 shows that the majority of vehicles with Read only immobilisers that were stolen were manufactured between 1997 and 1999 inclusive.

Theft rates for models with read only immobiliser systems were relatively low (see Table 8). The exceptions to this pattern were the Mitsubishi Mirage CE, which were stolen at the rate of 46.4 per 10,000 registrations, and the Peugeot 206, which was stolen at 52.1 per 10,000 registrations. Subaru Imprezas also had a relatively high theft rate and coupled with the low recovery rate suggest a significant problem with professional theft of these vehicles.

Table 7 Vehicles with a Read-only immobiliser by year of manufacture of the vehicle.

Year of manufacture	Stolen		Recovered*	
	Number	Percentage	Number	% recovered
1995	1	0.1	0	0.0
1996	154	13.2	109	70.8
1997	278	23.8	189	68.0
1998	345	29.6	226	65.5
1999	270	23.1	163	60.4
<i>Subtotal 1990s</i>	<i>1,048</i>	<i>89.8</i>	<i>687</i>	<i>65.6</i>
2000	113	9.7	65	57.5
Unknown	6	0.5	4	66.7
Total	1,167	100.0	756	64.8

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

Table 8 Vehicles with a Read-only immobiliser by make, model and series of the vehicle (1992 models onwards).

Make/Model/Series	Stolen		Recovered	
	Number	Rate per 10,000 regist [†]	Number	% recovered
Holden Astra (series unknown)	3	-	1	33.3
Holden Astra TR	5	6.2	4	80.0
Holden Astra TS	15	6.8	10	66.7
Holden Barina (series unknown)	1	-	1	100.0
Holden Barina SB	68	29.1	46	67.6
Honda Accord	28	21.0	15	53.6
Honda Civic	126	30.3	82	65.1
Honda CR-V	51	17.8	40	78.4
Honda HR-V	11	25.4	6	54.5
Honda Integra	1	4.4	1	100.0
Honda Legend	2	17.8	2	100.0
Honda Odyssey	13	22.1	7	53.8
Honda Prelude	24	49.6	14	58.3
Mitsubishi Lancer (series unknown)	2	-	2	100.0
Mitsubishi Lancer CE	172	30.2	112	65.1
Mitsubishi Magna (series unknown)	7	-	6	85.7
Mitsubishi Magna TE	114	34.6	86	75.4
Mitsubishi Magna TF	129	25.5	94	72.9
Mitsubishi Mirage CE	125	46.4	81	64.8
Mitsubishi Pajero (series unknown)	2	-	1	50.0
Mitsubishi Pajero NJ	5	14.5	3	60.0
Mitsubishi Pajero NK	7	17.5	3	42.9
Mitsubishi Pajero NL	29	21.7	21	72.4
Mitsubishi Verada KE	6	20.5	1	16.7
Mitsubishi Verada KF	19	31.8	11	57.9
Nissan Patrol (series unknown)	2	-	1	50.0
Nissan Patrol GU	11	5.1	6	54.5

Continued over the page

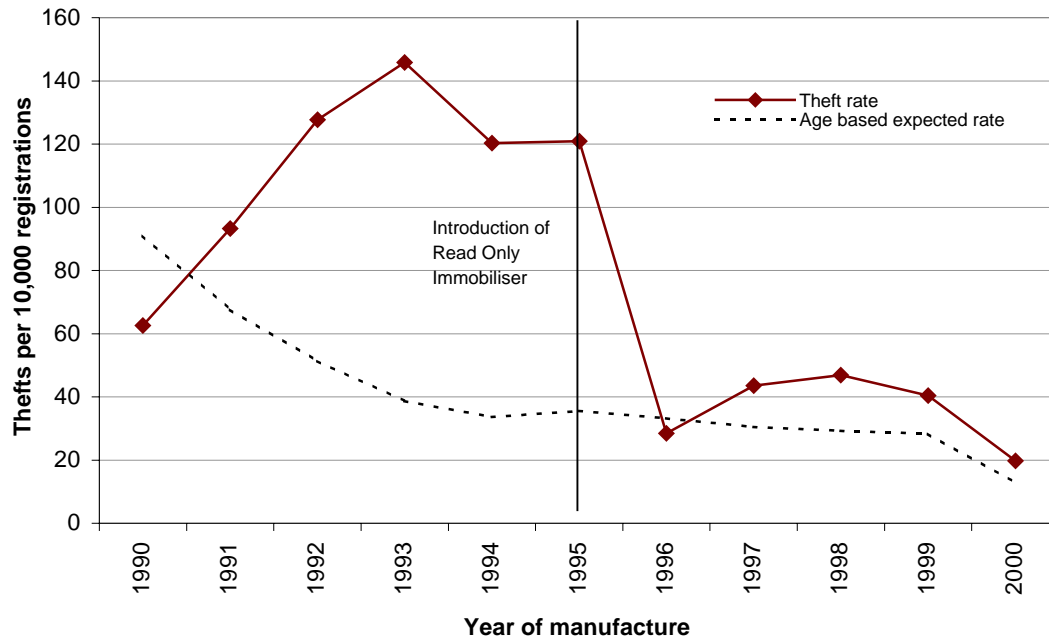
Table 8 Vehicles with a Read-only immobiliser by make, model and series of the vehicle (1992 models onwards). (Continued)

Make/Model/Series	Stolen		Recovered	
	Number	Rate per 10,000 regist ^t	Number	% recovered
Peugeot 206	7	52.1	6	85.7
Peugeot 306	1	1.8	1	100.0
Peugeot 306 N5	12	24.0	7	58.3
Peugeot 406 D8	4	19.2	4	100.0
Peugeot 406 D9	2	41.2	2	100.0
Saab 9-5	2	17.5	2	100.0
Subaru Impreza	132	117.8	56	42.4
Volkswagen Golf	10	16.0	6	60.0
Volvo 850	7	14.6	5	71.4
Volvo S40	4	12.2	4	100.0
Volvo S40/V40	1	-	1	100.0

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000. Shaded figures were calculated on known registration numbers of less than 1,000.

Thefts of Honda Civics as shown in Figure 6 clearly demonstrate the effectiveness of immobilisers in reducing opportunistic theft. During the early 1990s anecdotal evidence suggested that opportunistic thieves were targeting the Honda Civic as a target that was easy to steal. Honda responded to this problem by fitting a read only immobiliser as OEM from 1996 onward, and it can be seen in the graph below that the result was an outstanding reduction in theft numbers.

Figure 6 Theft rates per 10,000 registrations of Honda Civics during 2000 in Australia by year of manufacture.



Examination of the 54 vehicles fitted with Read only immobilisers that were stolen during 2000 in South Australia suggests that the security system made the vehicles very difficult to steal without keys. Of the 54 stolen 28 (51.9%) were taken because thieves gained access to the keys. Three of these involved an assault on the victim and 8 involved a break in to the victim's home or business. A further 8 cases were because victims either left keys in the ignition (6) or failed to secure them in a public place (2). Three thefts were perpetrated by persons known to the victim who had access to the keys, 3 were rental thefts and 3 gained access to the keys but their method was unknown.

In twenty cases victims reported that the thieves did not have access to keys and that the vehicle was secured. However, one of these was a suspected false report and in 3 others it was claimed that the immobiliser was not operating at the time of theft. There was a further 6 cases where it was unknown whether thieves had access to the keys.

In summary, it appears that the read only immobiliser system is highly effective in reducing the propensity of opportunistic theft and seems to be equal to the encrypted immobilisers discussed in Section 2. Once again, however, it was the security of keys that has become the weak link in the security of the vehicle and owners of these vehicles need to ensure that appropriate steps are taken to ensure their safekeeping.

Section 4: Encrypted – Radio Remote Immobilisers

- Theft rate – 34.7 per 10,000 registrations.
- These systems are immobilisers with encrypted codes, but also have a radio remote keyless entry or alarm system.

Encrypted – Radio Remote systems were fitted as OEM to many of the Holdens including the Commodore, Berlina, Calais and Statesman from 1999 and many of the HSVs from the middle of 1996. Other models utilising a similar system include the Hyundai Sonata from 1998, the Hyundai Lantra from 1999, the Jeep Grand Cherokee from 1996 and the Rover Discovery from late 1998. Like the Encrypted Immobiliser systems these are also perceived to be very secure and meet the Australian Standard (AS/NZS 4601:1999).

Table 9 shows once again that more than 50% of all thefts of vehicles with these security systems occurred in New South Wales. With a theft rate of 52.5 per 10,000 registered there appears to be a problem with professional theft in NSW compared to all the other states combined where the theft rate was 24.8 per 10,000 registrations. The recovery rate of only 52.1% supports this assertion. Recovery rates in all other states except Victoria were well in excess of 80% suggesting that it was joyriders having the majority of impact in these states.

Table 9 Vehicles with an Encrypted - Radio Remote immobiliser by state stolen.

State	Stolen		Recovered*	
	Number	Rate per 10,000 registered	Number	% Recovered
ACT	9	30.2	8	88.9
NSW	365	52.5	190	52.1
NT	1	7.2	1	100.0
QLD	77	21.8	64	83.1
SA	50	30.1	44	88.0
TAS	4	13.5	4	100.0
VIC	164	25.6	105	64.0
Total	670	34.7	416	62.1

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

The majority of vehicles stolen with Encrypted – radio remote immobilisers were manufactured in 1999 or 2000. Table 10 shows that 86% of thefts of these vehicles were cars that were manufactured in these years. The result does not suggest that the newer vehicles were being targeted, only that there were more vehicles with this type of security system manufactured in these years.

Table 11 shows that the bulk of thefts of vehicles with Encrypted – radio remote were in the form of VT Commodores. All of the VT Commodores and Calais (including HSVs) accounted for 79.0% of all thefts with this security system. It is doubtful that there is a major weakness in the security of these vehicles and more likely due to the fact that they are particularly popular targets among the population of car thieves. Recovery rates of the 3 HSV models included in Table 8 were all extremely low (less than 45%) suggesting a flourishing market for rebirthed or stolen parts for these vehicles. The Hyundai Lantra also exhibited a low recovery rate with slightly less than half (48%) of the 25 Lantras stolen being recovered by the end of the year.

Table 10 Vehicles with an Encrypted - Radio Remote immobiliser by year of manufacture of the vehicle.

Year of manufacture	Stolen		Recovered*	
	Number	Percentage	Number	% recovered
1996	22	3.3	10	45.5
1997	24	3.6	12	50.0
1998	45	6.7	21	46.7
1999	403	60.1	274	68.0
<i>Subtotal 1990s</i>	<i>494</i>	<i>73.7</i>	<i>317</i>	<i>64.2</i>
2000	176	26.3	99	56.3
Total	670	100	416	62.1

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

Table 11 Vehicles with an Encrypted - Radio Remote immobiliser by make, model and series of the vehicle (1992 models onwards).

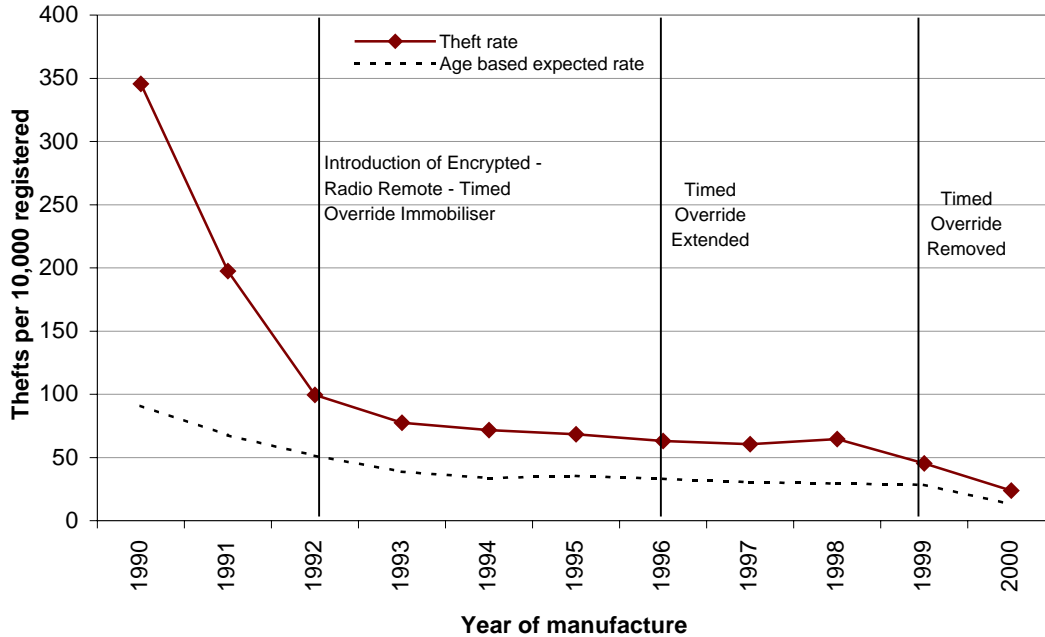
Make/Model/Series	Stolen		Recovered	
	Number	Rate per 10,000 regist [†]	Number	% recovered
Holden Calais VT [#]	26	37.0	17	65.4
Holden Caprice WH	4	36.9	3	75.0
Holden Commodore VT [#]	439	35.1	292	66.5
Holden Commodore VX	3	6.3	3	100.0
Holden Statesman VS	14	141.0	8	66.7
Holden Statesman WH	24	33.6	14	58.3
HSV Commodore VS	16	334.7	6	37.5
HSV Commodore VT	64	146.9	28	43.8
HSV Maloo VS	17	295.1	6	35.3
Hyundai Lantra (series unknown)	6	-	5	83.3
Hyundai Lantra J3	12	22.0	5	41.7
Hyundai Lantra Sportswagon J3	7	14.0	2	28.6
Hyundai Sonata (series unknown)	8	-	3	37.5
Hyundai Sonata EF	12	22.7	9	75.0
Jeep Grand Cherokee WJ	3	12.0	2	66.7
Jeep Grand Cherokee ZG	15	28.5	12	80.0

* Recovered is based on the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

[†] Theft rates were calculated based on registration snapshot as at 31/12/00. Shaded figures were calculated on known registration numbers of less than 1,000. # Holden VT models manufactured from January 1999 onwards had the time override removed. This table only represents VTs manufactured from this point onwards. Earlier model VTs are covered in Section 8, Table 23.

The Holden Commodore has had 2 upgrades to its immobiliser system since the original system was installed in 1992. The original system was the same as the current system except with a timed override. During 1996 the timed override was extended and then abandoned completely in 1999. It appears from the graph shown in Figure 6 that the original system did reduce theft rates significantly (note the distance between broken line and unbroken line before immobiliser introduction and in 1992 when introduction occurred). Between 1992 and 1999 when the timed override was extended the gap remains fairly constant. However, after removal of the timed override in 1999 the gap begins to shorten again suggesting that the timed override was the weak link in the system and its removal was the correct option.

Figure 7 Theft rates per 10,000 registered of Holden Commodores during 2000 in Australia by year of manufacture.



It appears from Figure 8 that thefts of HSV Commodores actually increased after the Encrypted – radio remote immobilisers were introduced during June 1996. The fact that registration numbers increased markedly at this point in time suggests that these models were extremely popular with consumers and hence popular targets for professional thieves making thefts difficult to reduce through security technology alone.

Figure 8 Theft rates per 10,000 registered of HSV Commodores during 2000 in Australia by year of manufacture.

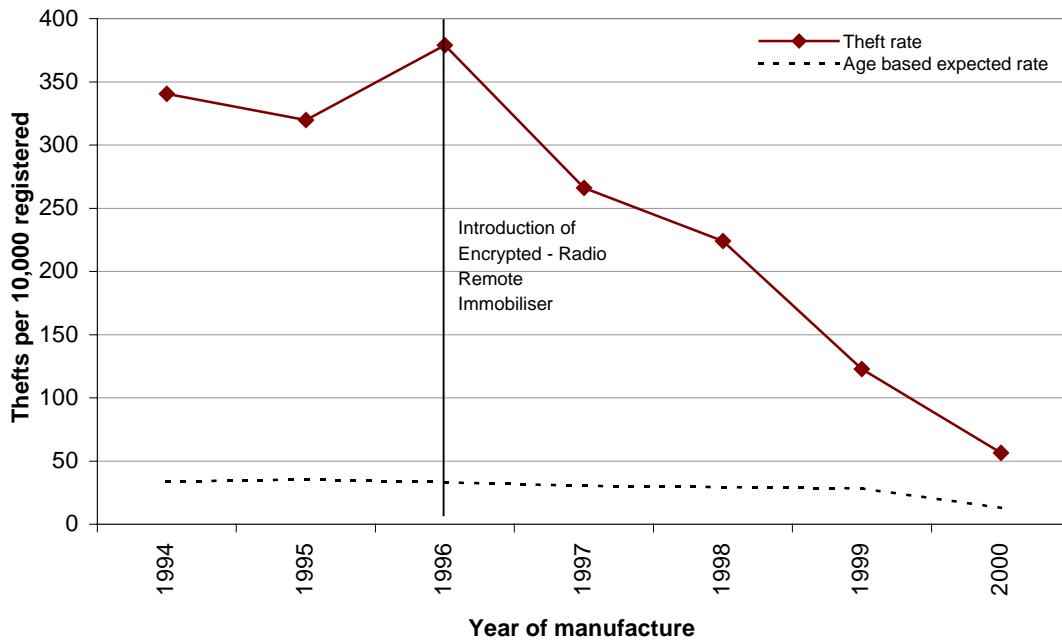
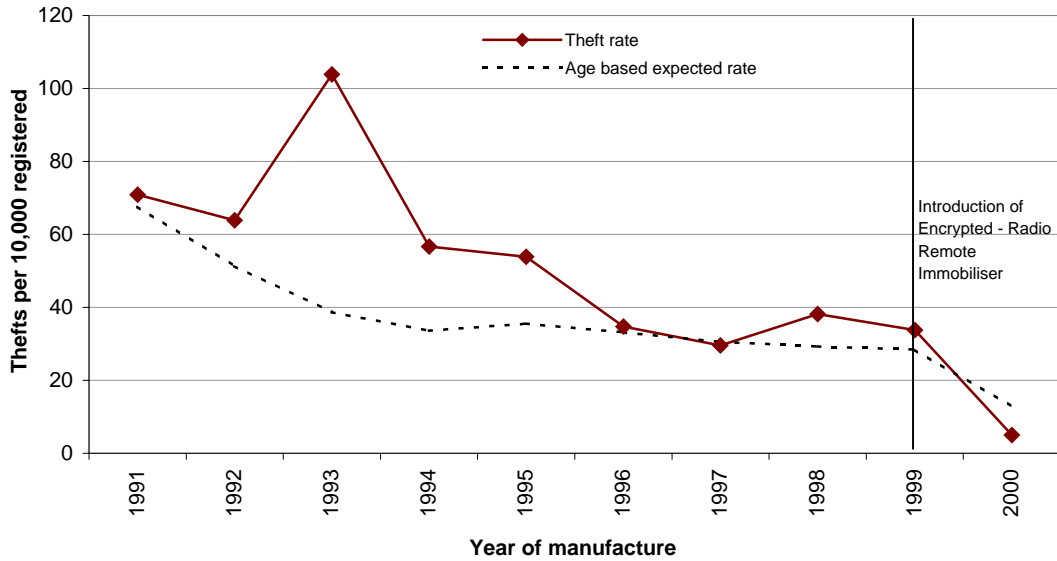


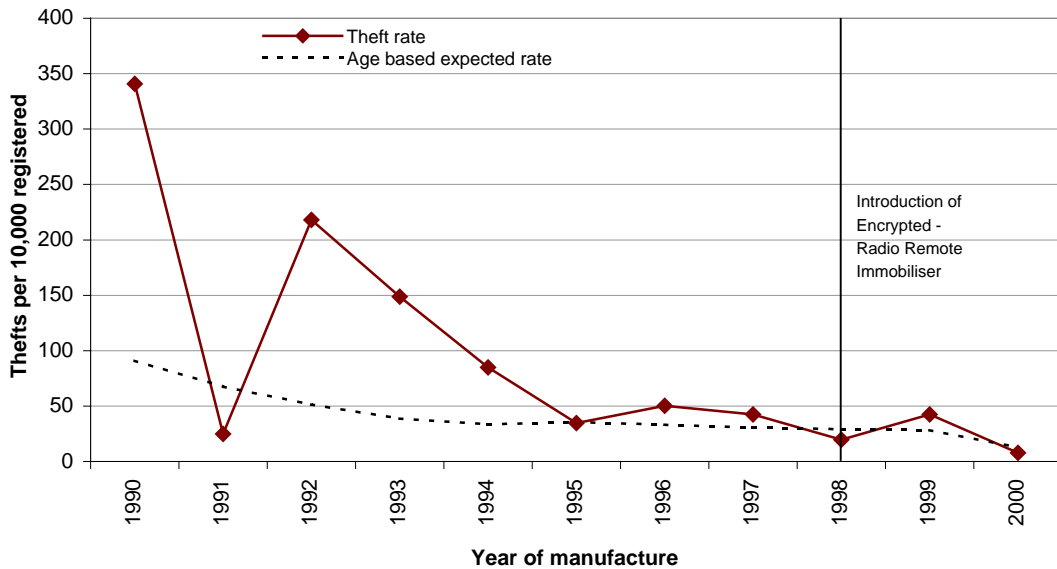
Figure 9 shows that thefts of the Hyundai Lantra appeared to be quite high until the immobiliser was introduced in 1999 particularly for vehicles manufactured between 1992 and 1995. However, as there is only one year of manufacture (2000) to compare the rates of previous models against it is difficult to say this for certain even though the pattern suggests a positive effect.

Figure 9 Theft rates per 10,000 registered of Hyundai Lantras during 2000 in Australia by year of manufacture.



Hyundai Sonatas give a better view than the Lantra of the influence of encrypted – radio remote immobilisers, as they were included as OEM one year earlier. The graph in Figure 10 shows that models made from 1992 to 1994 were stolen in relatively large numbers, but have remained close to the average expected rate for vehicles manufactured after that time. The impact of the immobiliser for this model is therefore more difficult to gauge.

Figure 10 Theft rates per 10,000 registrations of Hyundai Sonatas during 2000 in Australia by year of manufacture.



Closer examination of the 50 thefts of vehicles with Encrypted – radio remote immobilisers in South Australia provides some insight to how these vehicles were stolen. Twenty-nine of the 50 (58%) vehicles stolen during 2000 were taken by thieves who had access to the keys. Of the remaining 21, one was reported as having an immobiliser that was not functioning at the time of the theft, 11 thefts did not contain enough information to make a judgement about access to keys and only 9 were clearly recorded as being secure at the time of theft.

Of the 29 thefts where offenders gained access to keys 1 included an assault of the victim. Fourteen involved a break in at a home or business to get the keys. Seven incidents occurred because victims left their keys in the ignition of their vehicle (5) or unsecured in a public location (2). Two were thefts of rental vehicles and there were 5 thefts where it was unknown how offenders got the keys.

Like the encrypted immobilisers covered in Section 2 Encrypted – radio remote immobilisers proved to be a good deterrent to opportunistic thieves. The HSVs were stolen at a high rate but it was likely that this was the result of substantial demand for these vehicles and their parts. Once again the majority of thefts were in New South Wales where professional car theft seems to be a major problem for law enforcement. The weak link in the security system appears to be the keys again and it is apparent that something needs to be done about this. Overall though, the Encrypted – radio remote immobiliser systems examined in this section demonstrated an ability to counter theft of an opportunistic level making the technology valuable on these grounds alone.

Section 5: Ignition Dependent Immobilisers

- Theft rate – 41.5 per 10,000 registrations.
- Ignition dependent systems require the key inserted in the ignition to deactivate the immobiliser.

From 1997 to June 1999 Ford Falcons, Fairlanes, Fairmonts and LTDs continued to be fitted with the Smartlock but without the timed override in place. No other vehicles had this type of security system fitted.

In contrast to the security systems covered in previous sections, Victoria had the majority of thefts of these vehicles, with over half of the thefts in the entire country being reported in Victoria (see Table 12). Recovery rates were again low in New South Wales and Victoria suggesting a high level of professional thefts in these states. In Queensland and South Australia, where there were enough thefts to make a meaningful comparison, recovery rates were well above 80% showing the vulnerability of vehicles with these security systems to opportunistic theft.

Table 12 Vehicles with an Ignition Dependent immobiliser by state stolen.

State	Stolen		Recovered*	
	Number	Rate per 10,000 registered	Number	% Recovered
ACT	4	15.1	3	75.0
NSW	200	39.5	124	61.4
NT	0	-	0	-
QLD	43	16.3	36	83.7
SA	22	19.5	19	86.4
TAS	4	15.8	4	100.0
VIC	333	66.0	228	68.5
Total	606	41.5	414	68.3

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

Table 13 Vehicles with an Ignition Dependent immobiliser by year of manufacture of the vehicle.

Year of manufacture	Stolen		Recovered*	
	Number	Percentage	Number	% recovered
1997	299	49.3	202	67.6
1998	289	47.7	199	68.9
1999	18	3.0	13	72.2
Total	606	100.0	414	68.3

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

Table 14 shows that the Falcon EL had the highest number of thefts over the year but a relatively low rate of theft. The Fairlane NL with a theft rate of 50.2 per 10,000 registrations and LTD DL with a rate of 63.7 appeared to be the superior models of choice for thieves. The two utility models (XH and XH II) were both particularly popular targets with theft rates of over 50 per 10,000 registrations. Both of these models also had relatively low recovery rates suggesting a professional interest in the theft of these vehicles.

Table 14 Vehicles with an Ignition Dependent immobiliser by make, model and series of the vehicle (1992 models onwards).

<i>Make/Model/Series</i>	<i>Stolen</i>		<i>Recovered*</i>	
	<i>Number</i>	<i>Rate per 10,000 registered</i>	<i>Number</i>	<i>% recovered</i>
Ford Fairlane NL	32	50.2	26	81.3
Ford Fairmont AU	20	33.3	12	60.0
Ford Fairmont EL	68	36.5	40	58.8
Ford Falcon AU	58	28.5	38	65.5
Ford Falcon EL	334	33.7	237	71.0
Ford Falcon Ute XH	25	52.3	14	56.0
Ford Falcon Ute XH II	52	53.6	34	65.4
Ford Falcon XH	2	37.5	2	100.0
Ford Falcon XH II	2	17.9	1	50.0
Ford Ltd DL	5	63.7	3	60.0
Ford Falcon Unknown	8	-	7	87.5

** Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.*

Of the 22 vehicles with ignition dependent immobilisers stolen in South Australia during 2000, eight (36.4%) were stolen because offenders had access to keys. In six of these cases keys were gained from a break-in and two resulted because victims had left their keys in the ignition. There were only 4 where it was claimed that the vehicle was secured and offenders did not have access to keys. The final 10 reports were not detailed enough to know one way or another whether keys were available to offenders at the time of theft.

In conclusion, the ignition dependent immobilisers did have some impact on thefts but there appears to be a significant problem with these vehicles in Victoria with very large numbers of these vehicles being stolen in that state giving them a rate more than twice as large as that seen in all states except New South Wales.

Section 6: Timed Override – Ignition Dependent Immobilisers

- Theft rate – 45.0 per 10,000 registrations.
- Timed override – ignition dependent systems require the key inserted in the ignition to deactivate the immobiliser, but will disarm automatically fixed time after an unsuccessful start attempt.

Ford Fairlanes, Fairmonts, Falcons and LTDs manufactured between 1992 and 1997 were fitted with an Ignition Dependent immobiliser system that also had a timed override. Table 16 shows that once again theft rates were particularly high in New South Wales and Victoria when compared to the rest of the country. Recovery rates also suggest that this difference would partly be due to the large number of professional thefts in these states.

Table 15 Vehicles with a Timed Override – Ignition Dependent immobiliser by state stolen.

State	Stolen		Recovered*	
	Number	Rate per 10,000 registered	Number	% Recovered
ACT	22	37.2	13	59.1
NSW	610	57.3	366	60.0
NT	2	13.1	1	50.0
QLD	176	27.1	135	76.7
SA	87	30.5	68	78.2
TAS	15	24.4	13	86.7
VIC	578	49.6	371	64.2
Total	1,490	45.0	967	64.9

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

Table 16 shows that thefts of vehicles with timed override ignition dependent immobilisers were most common for vehicles manufactured during 1995 and 1996. Vehicles manufactured during 1997 were extremely low but this was most likely due to a programming difficulty which allocated ignition dependent immobilisers to vehicles manufactured in this year except when the VIN could be used to allocate it with a timed override (i.e. when a VIN number is matched this data takes precedence over information derived from the police record by year of manufacture alone). Recovery rates remained quite stable across years of manufacture suggesting that professional thieves targeted no specific years.

Table 16 Vehicles with a Timed Override – Ignition Dependent immobiliser by year of manufacture of the vehicle.

Year of manufacture	Stolen		Recovered*	
	Number	Percentage	Number	% recovered
1992	195	13.1	130	66.7
1993	239	16.0	150	62.8
1994	310	20.8	191	61.6
1995	377	25.3	259	68.7
1996	365	24.5	234	64.1
1997	3	0.2	2	66.7
Unknown	1	0.1	1	100.0
Total	1,490	100.0	967	64.9

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

The highest number of vehicles stolen with timed override – ignition dependent immobilisers were EF Falcons (see Table 17). The 514 thefts actually accounted for nearly one third of all thefts of vehicles with timed override – ignition dependent immobilisers. The EB II and ED Falcons also had high theft numbers. Looking at theft rates suggests that the EF Fairmont is at the highest risk of theft. This is followed by the NF Fairlane and the DC LTD. Recovery rates suggest that professional thefts are quite heavily concentrated on the light commercials including the XG utilities and vans and the XH utility. Recovery rates for all three of these models are around 50%. The NC Fairlane also showed relatively low recovery rates (53.7%).

Table 17 Vehicles with a Timed Override – Ignition Dependent immobiliser by make, model and series of the vehicle (1992 models onwards).

<i>Make/Model/Series</i>	<i>Stolen</i>		<i>Recovered</i>	
	<i>Number</i>	<i>Rate per 10,000 registered</i>	<i>Number</i>	<i>% recovered</i>
Ford Fairlane NC	42	42.4	22	53.7
Ford Fairlane NF	39	56.1	35	89.7
Ford Fairlane NL	8	18.2	5	62.5
Ford Fairmont EB II	74	45.1	43	58.1
Ford Fairmont ED	39	37.4	25	64.1
Ford Fairmont EF	184	58.5	123	66.8
Ford Fairmont EL	21	13.7	13	61.9
Ford Falcon EB II	241	43.4	166	68.9
Ford Falcon ED	155	31.8	97	62.6
Ford Falcon EF	514	42.8	330	65.5
Ford Falcon EL	61	9.2	42	68.9
Ford Falcon Ute XG	59	35.7	31	52.5
Ford Falcon Ute XH	24	19.6	11	45.8
Ford Falcon XG	13	38.5	6	46.2
Ford Falcon XH	1	7.2	1	100.0
Ford LTD DC	7	53.8	6	85.7
Ford LTD DF	8	73.8	4	50.0

Of the 87 vehicles stolen in South Australia during 2000 that were fitted with ignition dependent – timed override immobilisers, 28 (32.2%) were stolen as a result of offenders gaining access to keys. One involved an assault on the victim, 9 resulted from break-ins, 10 were the result of people leaving keys in their ignition, 7 were stolen by a person known to the victim and one gained access to the keys by a method unknown to the victim.

Forty-four (50.6%) of the 87 thefts were taken by thieves who did not have access to keys and vehicles were claimed to be locked and secure at the time of theft. Fifteen vehicles were stolen by a method unknown to police or the victim.

In summary, the ignition dependent – timed override immobilisers were reasonably effective deterrents to opportunistic theft. However, theft numbers of these vehicles were high enough to suggest that the security system is relatively easy to defeat. Furthermore the lower proportion of thefts occurring via the use of original keys reinforces this theory. It does appear that professional thefts still occur, particularly for the vans and utilities for which there appears to be a lucrative rebirthing or stolen parts trade.

Section 7: Radio Remote Immobilisers

- Theft rate – 48.4 per 10,000 registrations.
- Vehicles fitted with radio remote immobilisers usually require a signal to be sent from a hand held device to disarm the immobiliser. The systems are either activated by the same device, or passive arming in some cases.

Radio remote immobilisers were fitted as OEM by many manufacturers on a variety of vehicles including the Citroen Xsara from 1999, the Daewoo Musso from 1998, the Holden Calibra from 1994, the Kia Sportage from 1997, the Mercedes Benz C class and E class from 1994 – 1996, the S class Mercedes Benz in 1996, the Mitsubishi Verada from 1991 – 1994, the Nissan Maxima from 1995 – 2000, some Nissan Pulsars, the Nissan 200SX from 1994, the Porsche 911 from 1995 – 1996, all Proton models after Sept. 1999, the Saab 900 and 9000 models from 1994, the Toyota Celica from December 1993 and the Toyota Corolla from 1996 – 1998.

More than 80% of the thefts of vehicles with radio remote immobilisers occurred in New South Wales. Theft rates ranged from 6.6 – 21.0 per 10,000 registrations in all jurisdictions except NSW where the recorded theft rate was 89.8. While theft rates in NSW have been consistently higher for other types of immobilisers, the difference between NSW theft rates and other jurisdictions for radio remote immobilisers was very large by comparison. Recovery rates were also lower in NSW (60.3%) suggesting a problem with professional theft in NSW and probably Victoria as well which also recorded low recovery rates (61.3%).

Table 18 Vehicles with a Radio Remote immobiliser by state stolen.

State	Stolen		Recovered*	
	Number	Rate per 10,000 registered	Number	% Recovered
ACT	6	21.0	4	66.7
NSW	516	89.8	311	60.3
NT	1	6.6	1	100.0
QLD	43	17.8	36	83.7
SA	11	12.6	11	100.0
TAS	5	15.6	5	100.0
VIC	62	17.7	38	61.3
Total	644	48.4	406	63.0

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

Thefts of vehicles with radio remote immobilisers were distributed across the years of manufacture, as would be expected based on registered targets available. The majority of thefts were of vehicles manufactured in the latter half of the 1990's and this was when many manufacturers began installing these immobilisers as OEM.

As can be seen in Table 20 thefts of Nissan 200SX and Toyota Corollas made up a large proportion of thefts of vehicles with radio remote immobilisers. Of the 139 Nissan 200SX vehicles stolen during 2000, 124 were stolen in NSW. It is also apparent that this group of vehicles is predominantly in the luxury/sports class making them attractive targets for professional thieves. Recovery rates were particularly low for Holden Calibras, Nissan Pulsar and the 200SX and Toyota Corollas.

Table 19 Vehicles with a Radio Remote immobiliser by year of manufacture of the vehicle.

Year of manufacture	Stolen		Recovered*	
	Number	Percentage	Number	% recovered
1991	20	3.1	12	60.0
1992	28	4.3	17	60.7
1993	21	3.3	14	66.7
1994	41	6.4	23	56.1
1995	54	8.4	28	51.9
1996	100	15.5	59	59.0
1997	125	19.4	78	62.4
1998	148	23	105	70.9
1999	92	14.3	60	65.2
<i>Subtotal 1990s</i>	<i>629</i>	<i>97.7</i>	<i>396</i>	<i>63.0</i>
2000	8	1.2	6	75.0
Unknown	7	1.1	4	57.1
Total	644	100	406	63.0

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

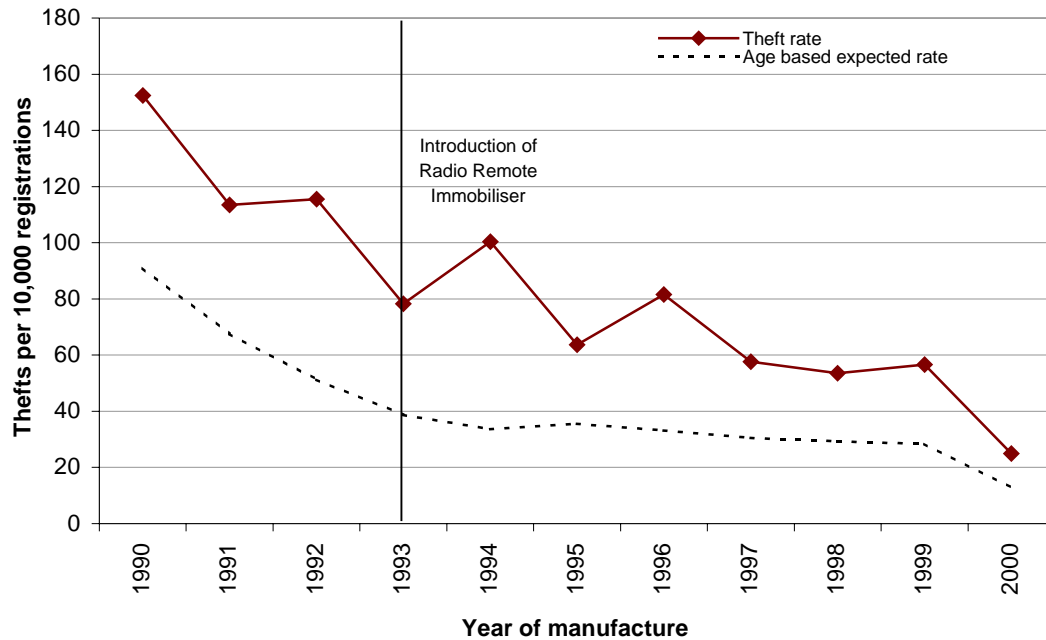
Table 20 Vehicles with a Radio Remote immobiliser by make, model and series of the vehicle (1992 models onwards).

Make/Model/Series	Stolen		Recovered	
	Number	Rate per 10,000 registered	Number	% recovered
Chrysler Voyager	12	28.4	8	66.7
Daewoo Musso	1	10.6	1	100.0
Holden Calibra (series unknown)	1	-	0	0.0
Holden Calibra YE	13	141.6	6	46.2
Kia Sportage	18	24.0	9	50.0
Mercedes-Benz C180 W202	3	10.3	1	33.3
Mercedes-Benz C220 W202	4	40.0	4	100.0
Mercedes-Benz C280 W202	1	23.5	0	0.0
Mercedes-Benz E220C C124	1	90.9	1	100.0
Mercedes-Benz E280 W124	1	19.9	1	100.0
Mercedes-Benz E320 W124	1	74.6	0	0.0
Mercedes-Benz E320 W210	4	41.8	3	75.0
Mercedes-Benz SL280 R129	1	87.7	1	100.0
Nissan 200SX	139	394.3	92	66.2
Nissan Pulsar (series unknown)	93	-	56	60.2
Porsche 911 Carrera 993	2	33.3	2	100.0
Proton M21	4	303.0	3	75.0
Proton Satria	6	24.2	5	83.3
Toyota Celica (series unknown)	2	-	2	100.0
Toyota Celica ST204/ST204R	64	67.9	41	67.2
Toyota Celica ZZT231/ZZT231R	7	29.0	3	60.0
Toyota Corolla 101/102	239	38.8	148	61.9

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.
Shaded figures were calculated on known registration numbers of less than 1,000.

Figure 11 shows the theft rates of Toyota Celicas during 2000. Immobilisers were fitted to Celicas from December 1993 onwards. The figures suggest that immobilisers have had little impact on the theft rates of these vehicles with a reasonably constant gap between expected theft rates and actual theft rates of Toyota Celicas.

Figure 11 Theft rates per 10,000 registrations of Toyota Celicas during 2000 in Australia by year of manufacture.



As there were only 11 vehicles with radio remote immobilisers stolen in South Australia it is difficult to make assertions about how these vehicles were being stolen. However, based on these 11 cases, three were definitely stolen with keys – all gained by a break-in. Only two were claimed to be secure with no key access and the rest were not able to say whether thieves had access to keys.

In summary, the radio remote immobilisers were a good deterrent of opportunistic thefts. However, they were frequently fitted in the more up market models and professional thieves still seem to be targeting these vehicles, particularly in New South Wales where an entrenched professional industry seems to continue regardless of advances in vehicle security.

Section 8: Encrypted – Radio Remote – Timed Override Immobilisers

- Theft rate – 63.0 per 10,000 registrations.
- The immobiliser is controlled by an encrypted radio remote signal, and there is a timed override.

The only vehicles fitted with these immobilisers as OEM are the Holden Berlina, Commodore, Calais and Statesman manufactured between 1992 and 1998 and the Toyota Lexcens of the same period. These systems are the same as the units examined in Section 4 except that they also have a timed override meaning that the immobiliser will deactivate a set time after an unsuccessful start attempt. The system does not meet Australian Standards (AS/NZS 4601:1999).

Table 21 reveals that over 50% of thefts of these vehicles were carried out in New South Wales during 2000. Theft rates in NSW were correspondingly high compared to the other states with almost 90 vehicles per 10,000 registered stolen in NSW during 2000 compared to 49.2 for the other states combined. Recovery rates were quite low in Victoria for these vehicles with only 46.8% of thefts being recovered. NSW also had a lower recovery rate (60.1%) although it was not as low as that seen in Victoria. It appears that both Victoria and NSW have problems with professional thefts of these vehicles.

Table 21 Vehicles with an Encrypted - Radio Remote - Timed Override immobiliser by state stolen.

State	Stolen		Recovered*	
	Number	Rate per 10,000 registered	Number	% Recovered
ACT	36	43.6	28	77.8
NSW	1,648	89.4	991	60.1
NT	9	22.8	6	66.7
QLD	334	33.8	254	76.0
SA	251	49.9	214	85.3
TAS	40	44.3	36	90.0
VIC	967	59.6	453	46.8
Total	3,285	63.6	1,982	60.3

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

There was a fairly even spread of thefts across years of manufacture for vehicles with these immobilisers. Table 22 shows this pattern (or lack of pattern) and also reveals a relatively consistent recovery rate across years.

The most striking point from Table 23 is the difference in theft rates between the Holden Commodores and the Toyota Lexcen. Essentially these vehicles are exactly the same except for the badges, and the fact that the Toyotas do not have any V8 versions. The higher theft rates among the Holden Commodores in spite of the vehicles having exactly the same security features shows the preference for Holdens among young joyriders. Clearly the problem is not one of vehicle security but of popularity. There is a price that Holden must pay for its commercial success and that is that it will probably continue to have extremely high theft rates regardless of the increases in security technology.

Table 22 Vehicles with an Encrypted - Radio Remote – Timed Override immobiliser by year of manufacture of the vehicle.

Year of manufacture	Stolen		Recovered*	
	Number	Percentage	Number	% recovered
1992	461	14.0	313	67.9
1993	411	12.5	242	58.9
1994	484	14.7	287	59.3
1995	509	15.5	289	56.8
1996	470	14.3	267	56.8
1997	407	12.4	233	57.2
1998	509	15.5	326	64.0
1999	3	0.1	0	0.0
<i>Subtotal 1990s</i>	<i>3,254</i>	<i>99.1</i>	<i>1,957</i>	<i>60.1</i>
2000	0	0.0	0	-
Unknown	31	0.9	25	80.6
Total	3,285	100.0	1,982	60.3

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

Table 23 Vehicles with an Encrypted - Radio Remote - Timed Override immobiliser by make, model and series of the vehicle (1992 models onwards).

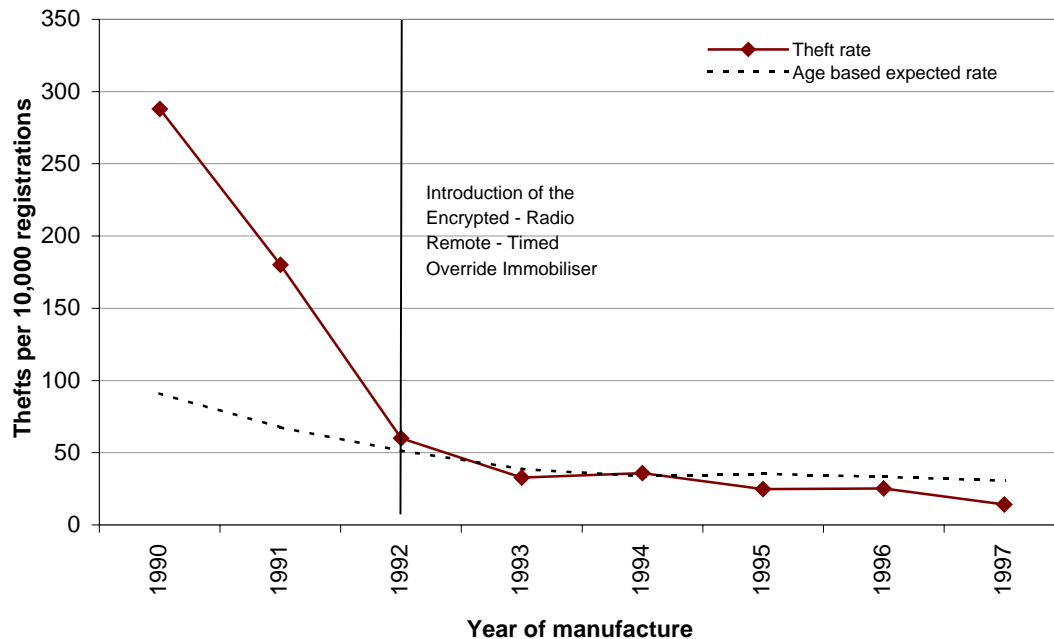
Make/Model/Series	Stolen		Recovered	
	Number	Rate per 10,000 registered	Number	% recovered
Holden Calais (series unknown)	1	-	1	100.0
Holden Calais VP	28	73.5	17	60.7
Holden Calais VR	50	90.6	25	50.0
Holden Calais VS	54	93.8	23	42.6
Holden Calais VT [#]	26	37.5	19	73.1
Holden Caprice VR	7	68.0	4	57.1
Holden Caprice VS	22	115.4	6	27.3
Holden Commodore VP	550	80.2	366	66.5
Holden Commodore VR	709	65.6	401	56.6
Holden Commodore VS	955	57.6	541	56.6
Holden Commodore VT [#]	634	60.9	408	64.4
Holden Statesman VQ II	34	124.4	20	58.8
Holden Statesman VR	31	70.7	21	67.7
Holden Statesman VS	69	50.4	37	54.4
Toyota Lexcen (series unknown)	3	-	3	100.0
Toyota Lexcen T5	2	11.2	1	50.0
Toyota Lexcen VP	39	51.2	30	76.9
Toyota Lexcen VR & T4	40	28.4	34	85.0

* Recovered is based the number of thefts that were recorded stolen during 2000 and recovered by 31st Dec. 2000.

Shaded figures were calculated on known registration numbers of less than 1,000. # Holden VT models manufactured from January 1999 onwards had the time override removed. This table only represents those VT models before the removal of the time override. Later model VTs are covered in Section 4, Table 11.

Figure 12 shows clearly the value of immobilisers in reducing the theft numbers of vehicles. While the system is relatively easy to defeat due to the timed override, thefts after its inclusion as OEM reduce significantly. The same pattern can be seen with the Holden Commodores (see Figure 7) after the introduction of the initial immobiliser system.

Figure 12 Theft rates per 10,000 registrations of Toyota Lexcens during 2000 in Australia by year of manufacture.



Examination of the 251 vehicles with these immobilisers reported to police during 2000 in South Australia revealed whether the system can be defeated by thieves. Fifty-four (21.5%) of the 251 vehicles stolen in South Australia were taken because the thief had access to keys. Compared to the immobiliser types covered in the previous sections this is an extremely low figure suggesting that the security systems on these vehicles can be defeated relatively easily. Of the 54 vehicles stolen by access to keys 6 involved an assault on the victim, 27 a break in to the victims home or business, 12 victims left keys unattended in the ignition or in their vehicles, 7 were stolen by a relative or friend of the victim, one was a rental theft and one was unknown.

Ninety-seven theft reports did not contain enough information to determine whether thieves had access to the keys, and the remaining 100 vehicles (39.8%) where the owner claimed to have secured the vehicle and the offender did not have access to keys.

While immobiliser systems such as the Encrypted – Radio remote – Timed override unit do act to reduce opportunistic theft to a certain extent they can be defeated relatively easily (given the time) and therefore reinforces the point that any system that allows timed overrides should be avoided wherever possible.

Section 9: The Western Australian Compulsory Immobiliser Scheme

This section analyses theft patterns of immobilised and non-immobilised vehicles in Western Australia, which were specifically excluded from previous analyses due to the introduction of legislation relating to the installation of immobilisers in this state. Before beginning the analyses, however, a brief history of the Western Australian situation is needed.

During the early to mid 1990's Western Australia was experiencing increasing vehicle thefts, and at a rate considerably higher than the national average. For example, in 1996, Western Australia led the nation with a theft rate of 803.91 thefts per 100,000 registrations compared to the Australian average of 671.44 (ABS, National Crime Statistics, 1997 Cat. 4510.0). The public concern at this high level of vehicle theft and the high number of deaths and injuries being sustained during high-speed police chases of offenders prompted the introduction of a voluntary immobiliser scheme in 1997. This voluntary scheme offered vehicle owners a \$30 subsidy off the price of an immobiliser and was successful in attracting a large number of owners to install such devices. However, in order to increase the speed at which the fleet was becoming protected, the government decided to extend the scheme. Thus as at 1st July 1999, legislative amendments became effective which made it compulsory to have an approved immobiliser fitted on any passenger new vehicle or when the registration of a secondhand vehicle less than 25 years old was transferred to a new owner. Light commercials were required to be immobilised upon a change of ownership. Public acceptance of the voluntary, and more recently, the compulsory scheme has been high, particularly as there has been an associated decrease in recorded vehicle thefts in recent years.

Figure 13 Vehicles stolen in Western Australia, July 1997 – June 2001.

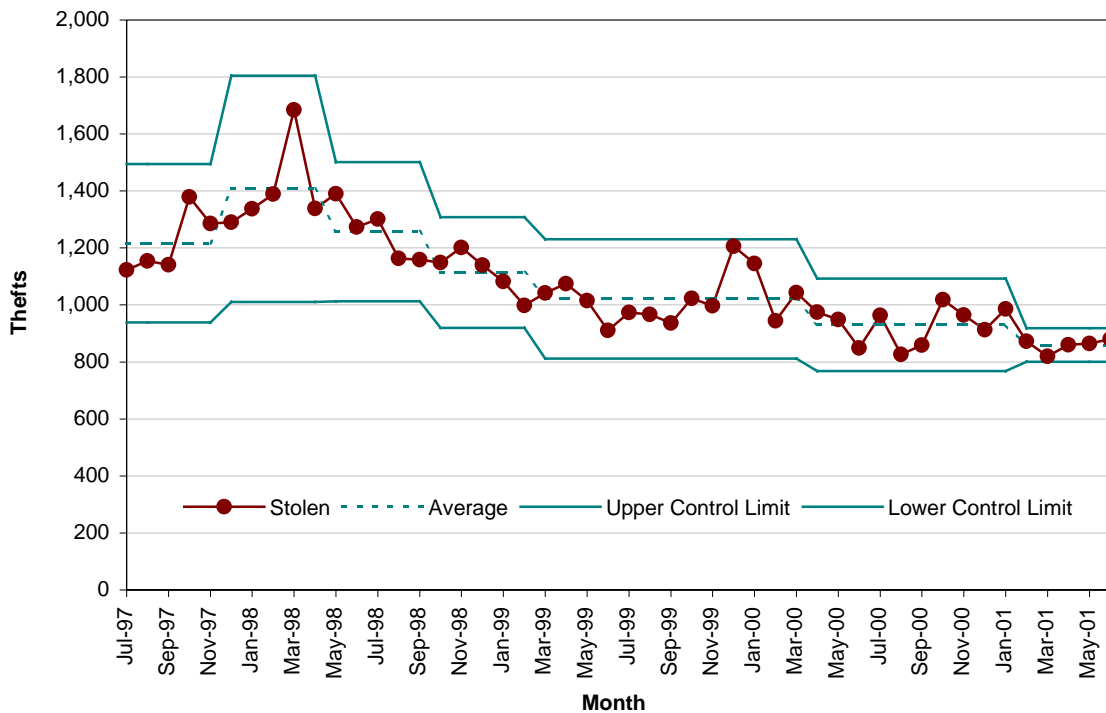
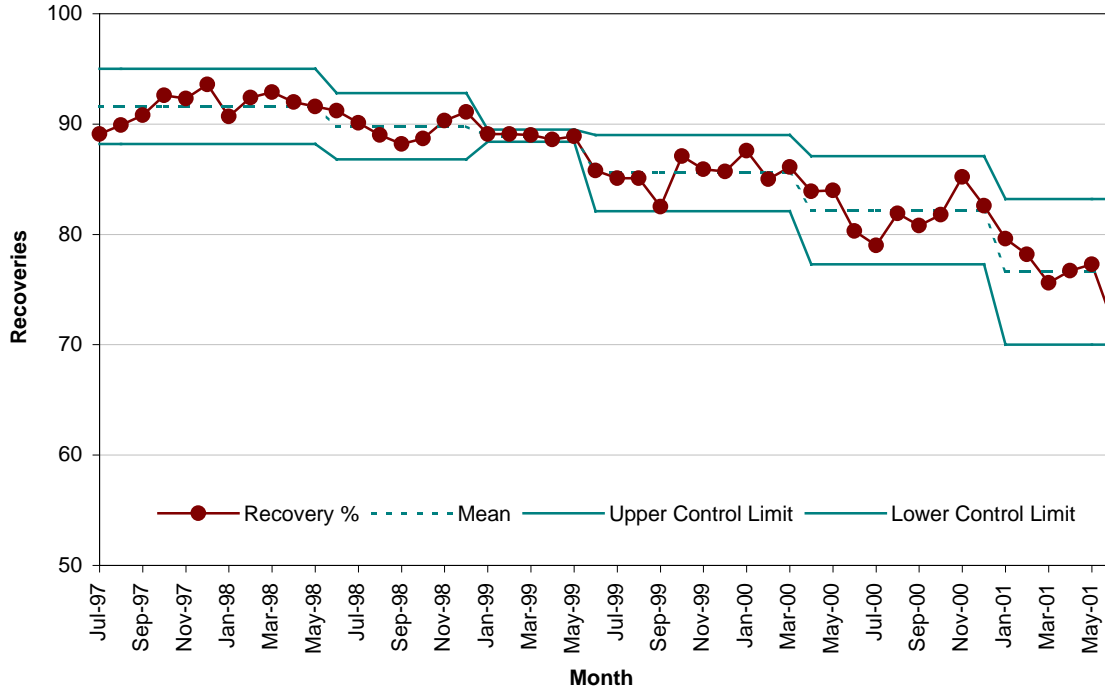


Figure 13 shows that theft numbers in Western Australia have been reducing since April 1998 with this downward trend continuing through to the present. Given the timing of this reduction and the fact that Western Australia was the only state to experience a prolonged reduction over this timeframe (all other states reported an increase), one may be tempted to conclude that the immobiliser scheme was a contributing factor in this declining theft trend.

Figure 14 Recovery rate of vehicles stolen in Western Australia, July 1997 – June 2001.



This result is perhaps the strongest evidence for the value of placing similar schemes in other Australian states. However, closer examination of the numbers reveals a more complex pattern of influence that the scheme was probably responsible for.

Figure 14 shows the recovery rate of vehicles stolen between July 1997 and June 2001. It demonstrated clearly that recovery rates have dropped from the average of 91.6% seen in the July 1997 – May 1998 period to 76.6% seen in the January 2001 – June 2001 period suggesting that professional thefts are becoming a more significant problem in Western Australia. What appears likely to have happened is that opportunistic thefts are being significantly reduced by the scheme making professional thefts a larger proportion of the total number of thefts and hence lowering the recovery rate. In other words, it is likely that the scheme has successfully reduced the level of opportunistic theft in the state but has had proportionately less impact on the level of professional theft.

In analyzing the Western Australian data further, the following points and assumptions are noted:

- Vehicles which already had an OEM immobiliser installed were derived in the same way as that for all other states.
- Vehicles which had a transfer of ownership recorded by the registration authorities after June 1999 were assumed to have had an AS immobiliser installed.

- If the vehicle already had a Non-Australian Standard immobiliser fitted, the legislation did not require the owner to change to an Australian Standard immobiliser.
- These changes were only made for passenger/light commercial vehicles manufactured after 1974 in order to account for the 25-year rule.

Furthermore, the present study was not able to account for :

- Vehicles fitted with immobilisers during the voluntary scheme, or
- Vehicles fitted with an after-market immobiliser without transfer of ownership are not accounted for.

The impact of these last two cases in this study is that they would be treated as having no immobiliser. Thus, if they occurred in large numbers, they would artificially lower the theft rate of the 'no-immobiliser' group in this report and diminish the apparent size of any difference in theft rate between immobilised and non-immobilised vehicles

Table 24 shows the change in the number of registered passenger/light commercial vehicles and their immobiliser status. Unfortunately, registration data just before the commencement of the immobiliser scheme (30/6/1999) was not available but the one for the end of 1999 shows just how much of an increase there was over a one-year period. The number of vehicles with no immobiliser has fallen significantly (21.3% or 178,585) and while some of these would have been written off vehicles or vehicles that were wrecked due to their age, the majority were probably vehicles that were sold and therefore had to have an immobiliser fitted.

Table 24 Passenger/light commercial vehicles registered in Western Australia by immobiliser presence for vehicles registered at 31/12/99 and 31/12/00.

	WESTERN AUSTRALIA		
	Registered at 31/12/99	Registered at 31/12/00	% change
No Immobiliser	840,173	662,365	-21.2
Immobilised – AS	216,256	407,592	88.5
Immobilised – Not AS	112,833	116,812	3.5
Total	1,169,262	1,186,769	1.5

Table 25 reveals that vehicles fitted with an Australian Standard Immobiliser that were manufactured after 1991 were stolen at a significantly lower rate (27.5 thefts per 10,000 registrations) in Western Australian than those with a Non-Australian Standard Immobiliser (44.1), and those with no immobiliser system fitted (34.9) ($z = 6.97$, $p = .001$).

When the same comparisons were done on vehicles manufactured in any year the results were different. Vehicles with AS Immobilisers were significantly less likely to be stolen than vehicles with no immobilisers (56.2 versus 109.9 respectively), but significantly more likely to be stolen than vehicles fitted with a non-AS Immobiliser (46.1). A possible explanation for this difference is that older vehicles that have immobilisers fitted may still be a reasonably soft target for thieves who know how to bypass the system. There have been some examples where incorrect installation of the immobiliser has resulted in reduced protection in some older vehicles. A search of Western Australian newspapers revealed two articles that suggested older vehicles were still

vulnerable even after an immobiliser was fitted (The Sunday Times, March 28 1999 and April 4 1999).

Table 25 Passenger/light commercial vehicles stolen and recovered in Western Australia by immobiliser presence for vehicles manufactured after 1991 and all vehicles, 2000.

	WESTERN AUSTRALIA					
	Vehicles manufactured after 1991			Vehicles manufactured in all years		
	Stolen passenger vehicles	Percentage recovered	Rate per 10,000 registered*	Stolen passenger vehicles	Percentage recovered	Rate per 10,000 registered
No Immobiliser	734	86.8	34.9	7,282	86.4	109.9
Immobilised – AS	692	91.3	27.5	2,291	93.2	56.2
Immobilised – Not AS	515	88.0	44.1	538	86.1	46.1
Total	1,941	88.2	33.5	10,111	87.9	85.2

* Registration snapshot as at 31/12/00.

In order to assess whether the above explanation was responsible for the different theft rates of vehicles immobilised under the scheme, rates were examined for vehicles that would not have had an immobiliser if the scheme were not in operation. Table 26 clearly illustrates the effectiveness of immobilisers in reducing theft, even if the vehicle is quite old. The cars least likely to be stolen were vehicles that were manufactured with an Australian Standard Immobiliser fitted as OEM (28.7 thefts per 10,000 registrations). Vehicles that were fitted with Immobilisers not meeting Australian Standards were the next least likely to be stolen (46.1), followed by those that had been fitted with an AS Immobiliser but would not have had one if there was no scheme (73.8). In fact, these were still significantly less likely to be stolen than vehicles with no immobiliser fitted (109.9) ($z=2.68$, $p<.01$) with the scheme in operation. Given that the mean age of these two groups are quite similar adds to the evidence suggesting that immobilisers are effective on older vehicles as well as their newer counterparts. There is no doubt that the older vehicles are still more vulnerable than newer vehicles with immobilisers but the presence of an immobiliser has still reduced the probability of it being stolen.

Table 26 Passenger/light commercial vehicles stolen in Western Australia by immobiliser presence with and without the scheme, 2000.

If No Compulsory Scheme in Place	With the Compulsory Scheme in Place	Stolen	Rate per 10,000 registered	Mean Age
No Immobiliser	No Immobiliser	7,282	109.9	15.61
No Immobiliser	AS Immobiliser	1,835	73.8	14.85
AS Immobiliser	AS Immobiliser	456	28.7	1.69
Not AS Immobiliser	Not AS Immobiliser	538	46.1	5.43

While it is difficult to imply the government's voluntary, and subsequent compulsory, immobiliser legislation was the cause of Western Australia's dramatic reduction in thefts, it must clearly be one of the major contributing factors. It is also clear that Western Australia's immobiliser laws have produced a disproportionately large impact on opportunistic theft resulting in a decline of recovery rates during this period. For Western Australia to have a comprehensive approach to the problem of vehicle theft the numbers suggest that a program that targets professional theft would be the component that is currently missing. While the Western Australian compulsory immobiliser

scheme puts Western Australia ahead of the rest of the country in the fight against opportunistic theft, they now need to also ensure they implement strategies designed to combat professional theft. The incorporation of a wrecks register would be a good first step in the war on professional theft. Together with a recent moves by many manufacturers (eg. BMW, HSV, Mitsubishi, Ford and Porsche) to begin using microdot based component identification systems and NMVTRC initiatives with the development of self voiding compliance labels, and nationally integrated information systems life for professional vehicle thieves across Australia will become considerably more difficult. In Western Australia, however, the current evidence suggests that life already becoming harder for the opportunistic car thief.

Another important fact that this study has supports is the idea that even older vehicles can have their security enhanced by the fitting of an immobiliser. While the Western Australian data suggests that there may exist some limited problems relating to the quality of the installation of immobilisers in older vehicles, the probability of theft amongst older vehicles is greatly reduced by the presence of an immobiliser.

Section 10: Conclusions

This study provides clear evidence that immobilisers are very effective mechanisms for reducing the risks of a vehicle being stolen within the Australian vehicle fleet. The data supports the theory that vehicles with immobilisers are much less likely to be stolen than their non-immobilised counterparts. The notion that immobilisers reduce opportunistic theft but have less impact on professional theft is, however, borne out by the fact that rates of theft for immobilised vehicles are lower in states that do not have a large level of professional theft. This finding should provide a stimulus for all stakeholders to work together to develop additional strategies targeting professional theft. In NSW, and sometimes Victoria, theft rates for immobilised vehicles were significantly higher than in other states where recovery rates were higher indicating less professional theft. This hypothesis was also supported by the recovery rates reported in Western Australia since the compulsory scheme came into effect.

The data also demonstrate that most of the systems that meet the Australian Standards (ie. Encrypted, Encrypted – Radio Remote and Read Only) are the best deterrents to theft with rates of theft for these vehicles being significantly lower than vehicles with other types of immobilisers. It appears that systems that have a Timed Override, Radio Remote or Ignition Dependent provide less protection. However, it is important to note that these systems still out-perform those with no immobiliser system but do not have an influence as big as those that meet Australian Standards.

Examination of the South Australian data relating to how immobilised vehicles were stolen revealed a similar pattern of results. Using a *rule of thumb* that states, 'if over 50% of recorded thefts were executed with keys then the system can be regarded as resistant to defeat', then the three systems (Encrypted, Encrypted – Radio Remote and Read Only) emerge as the most secure immobilisers. Similarly, the other four systems examined emerge as immobilisers had less than 50% of their thefts executed by access to keys meaning that defeating the system was probably possible.

Inspection of theft rates for particular models did not present a very clear picture. For some models the benefit was clear (eg. BMW 3 Series, Honda Civic, HSV and Toyota Lencen) with rates dropping below expected levels after the immobiliser was introduced. For others it was difficult to see any real effect of the immobiliser system (eg. Hyundai Sonata, Toyota Celica and Ford Falcon) and it is likely there were many other factors influencing their theft rates.

It is clear that immobilisers, and particularly those that meet the current Australian Standard are very effective theft deterrents for many opportunistic and some professional offenders. Furthermore, all jurisdictions should closely monitor Western Australia's example and consider adopting a compulsory immobiliser scheme in an attempt to reduce vehicle theft in a meaningful way.

Report Release Date: 18th October 2001

This report has been prepared using data from the National CARS Project. The NMVTRC and the CARS Project gratefully acknowledges the support of all police services, registration authorities and participating insurers for the supply of their data. We also thank the Federal Chamber of Automotive Industries for access to VFACTS data and both Polk Autospec and NRMA Insurance for their detailed vehicle specification data.

