

A REVIEW OF RURAL SPEED LIMITS
IN AUSTRALIA

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Report prepared under contract
to the Office of Road Safety
Commonwealth Department of Transport

January 1980

DEPARTMENT OF TRANSPORT
OFFICE OF ROAD SAFETY
DOCUMENT RETRIEVAL INFORMATION

Report No.	Date	ISBN	Pages
CR 20	1980	0 642 51194 2	(viii) + 31

Title and Subtitle

A REVIEW OF RURAL SPEED LIMITS IN AUSTRALIA

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Keywords

Traffic speed; accident statistics/accident rates; rural;
speed limit; traffic safety.

Abstract

The National Road Traffic Code is being reviewed by the Advisory Committee on Road User Performance and Traffic Codes (ACRUPTC), and during 1978/79 an assessment of speed limit provisions in the Code was undertaken. The present study was originally performed to contribute to the ACRUPTC review, but it has been subsequently updated to include the changes which were made in late 1979 to the Code provisions and to State and Territory practice. The study has concentrated upon rural speed limits, as the main differences between Code provisions and Australian practice are in this area. The study therefore examines local and overseas information on rural free speeds and speed limits in relation to road-traffic safety; this includes recent Australian speed data obtained from the national survey carried out in 1978/79 under the co-ordination of ACRUPTC. The report recommends options for absolute and differential speed limits for Australian rural roads.

NOTE:

This report is disseminated in the interest of information exchange. The views expressed are those of the author(s) and do not necessarily represent those of the Commonwealth Government.

The Office of Road Safety publishes two series of reports resulting from internal research and external research, that is, research conducted on behalf of the Office. Internal research reports are identified by OR while external reports are identified by CR.

ACKNOWLEDGEMENTS

The project required information on vehicle speeds, speed limits and accidents from all States and Territories; the cooperation and assistance of officers from these Traffic Authorities, the Australian Bureau of Statistics and the Office of Road Safety is gratefully acknowledged.

Special acknowledgements are due to Messrs. W. Callaghan and G.M.L. Quayle of the Office of Road Safety, for their advice and assistance throughout the course of the project.

ABBREVIATIONS

ABS	-	Australian Bureau of Statistics.
ACRUPTC	-	Advisory Committee on Road User Performance and Traffic Codes.
ACT	-	Australian Capital Territory.
ADR	-	Australian Design Rules for Motor Vehicle Safety.
ARRB	-	Australian Road Research Board.
ATAC	-	Australian Transport Advisory Council.
DoT	-	Department of Transport.
ECE	-	Economic Commission for Europe (vehicle safety standards).
FMVSS	-	Federal Motor Vehicle Safety Standards (USA).
HCV	-	Heavy Commercial Vehicle.
HS, LS	-	High Speed, Low Speed (regions of a State). HS region is the region to which a rural speed limit applies; LS is the complement of the HS region.
MV	-	Motor Vehicle (occupants) - used only in Appendix.
NHTSA	-	National Highway Traffic Safety Administration (USA).
NSW	-	New South Wales.
NT	-	Northern Territory.
ORS	-	Office of Road Safety (Dept. of Transport).
PF	-	Prima facie (speed limit).
QLD	-	Queensland.
RoSTA	-	Road Safety and Traffic Authority (Victoria).
SA	-	South Australia.
SAA	-	Standards Association of Australia.
SV, MV	-	Single Vehicle, Multi-Vehicle (accidents).
TARU	-	Traffic Accident Research Unit (NSW).

TAS	-	Tasmania
USA	-	United States of America
VIC	-	Victoria
WA	-	Western Australia

CONVERSION FACTORSIMPERIAL AND METRIC SPEEDSMPH TO KM/H (1.61)

MPH	35	40	45	50	55	60	65	70
KM/H	56	64	72	80	89	97	105	113

KM/H TO MPH (0.621)

KM/H	50	60	70	80	90	100	110	120
MPH	31	37	43	50	56	62	68	75

NORMAL DISTRIBUTION PARAMETERSDISPERSION TO PERCENTILES

SD ABOVE MEAN	0.5	1.0	1.5	2.0
PERCENTILE	69	84	93	98

PERCENTILES TO DISPERSION

PERCENTILE	80	85	90	95
SD ABOVE MEAN	0.84	1.04	1.28	1.64

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INTRODUCTION

Australia is a large continent divided into six States and two Territories, with separate Parliaments, Judiciaries and State and Local Government administrations and procedures. As a result, road traffic laws and regulations have tended to differ throughout the country. In particular, Australian rural speed limits - the subject of this report - are not uniform between various States and Territories.

Guidance on uniform road traffic laws for Australia is provided by the National Road Traffic Code. The Code was endorsed in 1962 by the Australian Transport Advisory Council (ATAC), which is a Council of Ministers with responsibility for transport and is the forum for discussing transport policies at the national level. The Code's provisions are under constant review by the Advisory Committee on Road User Performance and Traffic Codes (ACRUPTC), which is responsible to ATAC.

ACRUPTC has recently undertaken a comprehensive review of the Code and during 1977-79 an important aspect of this review concerned speed limit provisions. The present study was originally performed for the Office of Road Safety (ORS) to contribute to the ACRUPTC review, and a draft report was tabled at the 23rd ACRUPTC meeting in April 1979; it has now been updated to January 1980, to take account of changes made in late 1979 to the Code provisions and to State and Territory practice.

The study has concentrated upon rural speed limits, as the main differences between Code provisions and Australian practice

are in this area. Emphasis has been placed upon the safety aspects of rural speed limits, so that transportation cost aspects have not been considered in any detail.

This report therefore examines past and present rural speed limit provisions in the Code, in relation to the different speed limits in force on Australian rural roads and to the findings from local and overseas studies of the safety benefits of rural speed limits. The report finally recommends options for new absolute and differential speed limits for Australian rural roads.

STUDY AIMS, METHODS AND INFORMATION SOURCES

AIMS AND METHODS

The overall objective of the study was to review and assess existing Australian rural speed limits and the National Road Traffic Code's recommended limits, in relation to local and overseas information on accidents, speeds and speed limits, to assist the ACRUPTC review of the Code.

The specific aims of the Study were:-

- (1) To summarise and review present Code requirements on absolute and differential speed limits in rural areas and their underlying rationale. (This required examination of ACRUPTC documents, and correspondence and discussion with ACRUPTC representatives.)
- (2) To summarise and review existing State and Territory legislation and practice on absolute and differential speed limits in rural areas and their underlying rationale. (This required examination of existing legislation and practice using questionnaire and interview methods.)
- (3) To evaluate Australian literature and data on vehicle speeds and speed limits in rural areas in relation to road-traffic safety. (This required evaluation of published literature and accident and speed data made available by Australian Traffic Authorities.)
- (4) To evaluate overseas literature on vehicle speeds and speed limits in rural areas in relation to road-traffic safety.

INFORMATION SOURCES

The major sources of information for this study, required for the four specific aims given above, can be summarised as follows:-

- (1) ACRUPTC meeting records.
- (2) State/Territory legislation and practice,
(obtained in replies to questionnaires).
- (3) (a) Australian (mainly Victorian) literature on
road safety benefits and effectiveness of
rural speed limits.
(b) Free speed data from a Rural Speed Survey
in late 1978 organised by ACRUPTC through
the ORS.
(c) Special fatality data tables supplied by
Authorities in New South Wales, Victoria,
Queensland and South Australia.
- (4) Overseas literature on road safety benefits and
effectiveness of speed limits in rural areas.

SPEED LIMIT PROVISIONS IN THE CODE

Part 10 of the current Code (as revised in 1979) covers
Speed Restrictions as follows:-

'1001. Speed Limits.

- (1) No person shall drive a vehicle -
 - (a) in a built-up area at a speed exceeding 60 kilometres per hour, except within a speed zone in which a higher speed is permitted under paragraph (b) of this sub-regulation;
 - (b) in a speed zone, whether within a built-up area or not, at a speed exceeding the speed in kilometres per hour indicated by numerals on the restriction sign at the beginning of the speed zone; or
 - (c) elsewhere at a speed exceeding 110 kilometres per hour.
- (2) Notwithstanding the foregoing provisions, no person shall -
 - (a) drive a goods vehicle the weight of which together with any trailer attached including the total load carried (if any) exceeds four and one half tonnes at a speed exceeding 80 kilometres per hour;
 - (b) drive at a speed exceeding 80 kilometres per hour any vehicle to which a trailer or other vehicle is attached if the weight of the trailer or other vehicle including any load exceeds 750 kilograms; or
 - (c) drive any vehicle licensed for the carriage of nine or more passengers at a speed exceeding 90 kilometres per hour.
- (3) The foregoing provisions of this Regulation shall not apply to the driver of an emergency vehicle.
- (4) Nothing in this Regulation shall be construed to justify the driver of a vehicle driving at a speed which -
 - (a) may constitute driving carelessly, recklessly or at a speed or in a manner which is dangerous to the public having regard to all the circumstances; or
 - (b) exceeds any maximum speed applicable to the vehicle and fixed by or under any Act or Regulation.
- (5) In this Regulation 'goods vehicle' means any vehicle other than a vehicle designed and ordinarily used primarily for the carriage of passengers.'

The Code does not contain recommended speed limits for probationary/provisional licensed drivers/riders, learner drivers/riders, night-time driving, weekend/recreational traffic or adverse environmental conditions.

Two detailed reviews of the speed limit provisions in the Code were carried out in the 1970's. The first review took place during 1972-74 and took account of the Australian change from imperial to metric units, which was implemented in mid-1974. The second review took place during 1977-79, as mentioned in the Introduction. The two reviews are discussed in more detail below, but Code speed limit provisions during the 1970's for general traffic can be summarised as follows:-

<u>Region</u>	<u>Pre 1972-74 Review</u>	<u>Pre 1977-79 Review</u>	<u>Current</u>
(1) Built-up area	35 mph (56 km/h)	60 km/h	60 km/h
(2) Speed Zone	Signed speed	Signed speed	Signed speed
(3) Elsewhere	60 mph (97 km/h)	110 km/h	110 km/h

Similarly, differential limits for certain vehicle classes can be summarised as follows:

<u>Vehicle</u>	<u>Pre 1972-74 Review</u>	<u>Pre 1977-79 Review</u>	<u>Current</u>
(4) Heavy Trucks	40 mph (64 km/h)	80 km/h	80 km/h
(An additional limit of 30 mph in built-up areas was abolished in 1969)			
(5) Omnibuses	50 mph (80 km/h)	90 km/h	90 km/h
(6) Heavy Trailers	45 mph (72 km/h)	80 km/h	80 km/h
(7) Motor Cycles with Pillion/Other Passengers	40 mph (64 km/h)	70 km/h	110 km/h (i.e. general speed limit)

1972-74 REVIEW

The ACRUPTC sub-committee which undertook the 1972-74 review was formed at the 5th ACRUPTC meeting (May 1972) and first reported to the 8th ACRUPTC meeting, (December 1972). At that meeting ACRUPTC endorsed the sub-committee recommendation for a 100 km/h general traffic limit outside built-up areas, which was the agreed conversion of the pre-metric limit of 60 mph. However, the 9th ACRUPTC meeting (June 1973) recommended this be changed to 110 or 120 km/h, (mainly on the basis of Victorian information), and the former value was selected by ATAC at its July 1973 meeting. It is apparent, therefore, that there was some variation of opinion on the most suitable rural speed limit for general traffic.

A variation of opinion also existed regarding differential speed limits for heavy trucks and for vehicles towing heavy trailers; ACRUPTC recommended limits of 90 km/h for both vehicle classes, but ATAC in October 1973 altered these to 80 km/h.

The ACRUPTC recommended speed limit of 90 km/h for omnibuses was endorsed by ATAC.

With regard to speed limits for motorcyclists, ACRUPTC recommended 70 km/h for motorcycles carrying pillion passengers and for learner riders, and the former recommendation was endorsed by ATAC in October 1973. It should be noted that at two subsequent meetings of ACRUPTC - the 15th in May 1975 and 20th in October 1977 - the Committee recommended removal of the 70 km/h differential limit on motor cycles carrying pillion passengers, but these recommendations were not endorsed by ATAC.

At its 8th meeting in December 1972, ACRUPTC expressed support for absolute speed limits rather than prima facie speed limits. The 8th ACRUPTC meeting also expressed support for speed zoning both above and below the general traffic speed limits. This can be compared with, for example, the United States Uniform Vehicle Code, National Committee on Uniform Traffic Laws and Ordinance (1968), which proposed urban and rural general limits (for daytime) of 30 and 60 mph respectively and supported speed zoning within, but not outside, these limits.

1977-79 REVIEW

The second major review of speed limit provisions in the Code began at the 19th ACRUPTC meeting in 1977, when Committee members drew attention to the lack of Australian data on vehicle speeds and effectiveness of speed limits. At the 20th ACRUPTC meeting (October 1977), it was agreed that vehicle free speeds on rural roads should be measured by all Traffic Authorities and the ORS undertook to coordinate such a survey. This free speed survey was carried out in late 1978/early 1979, drawing on the experience gained in the 1978 Victorian Heavy Commercial Vehicle Operational Safety Study, Thompson T.W. (1978), and the results are documented in Office of Road Safety (1979). This ORS report, together with an earlier version of the present (consultant) report, formed the main inputs to the ACRUPTC review and were discussed at the 23rd meeting in April 1979.

At the 23rd ACRUPTC meeting, the Committee recommended two changes to the then existing Code provisions:-

- (a) a decrease in the rural general traffic limit from 110 to 100 km/h, and

- (b) removal of the 70 km/h differential limit for motorcycles carrying passengers.

At its meeting in July 1979, ATAC endorsed only the latter recommendation, so that current Code speed limits (as summarised earlier in this Section) are little different from those existing prior to the 1977-79 review.

At the 23rd ACRUPTC meeting, the Committee again supported the principle of speed zoning, above and below the proposed general limits, as in the earlier ACRUPTC review of speed limits.

SPEED LIMIT PRACTICE IN AUSTRALIA

Information relating to current speed limit practice in the six States and two Territories was obtained from questionnaires sent out to Traffic Authorities in late 1978 and completed at subsequent discussions with officers of these Authorities in early 1979.

The main points covered by these questionnaires were as follows:-

- (a) existing speed limits - absolute and differential limits, speed zoning, signing standards, major changes in speed limits and their application during the last ten years,
- (b) rationale behind these speed limits - methods and warrants used to set speed zones, specific studies carried out to support current limits or analyse effectiveness of limits, current and future policy and strategy on speed limits,
- (c) free speed information, for effectiveness studies of speed limits,
- (d) accident/casualty information, for effectiveness studies of speed limits,
- (e) general issues - opinion and information on:-
 - (i) special limits for night-time, etc.,
 - (ii) effectiveness of enforcement, education and publicity, and
 - (iii) accident exposure, vehicle occupancy, etc.

The main findings from this questionnaire - interview survey are

given below under these five main headings, and have been updated, wherever possible, to January 1980.

EXISTING SPEED LIMITS

Current speed limits in Australia are summarised in Tables I and II, for rural and urban conditions respectively. The tables show general limits, differential limits and speed zoning employed in the States and Territories; equivalent figures from the current Code are given for comparison.

General rural limits in the six States are absolute limits of either 100 km/h, in New South Wales, Victoria and Queensland, or 110 km/h in South Australia, Western Australia and Tasmania, compared with the Code figure of 110 km/h. The current 100 km/h limit in New South Wales (NSW) was introduced in July 1979; at the time of the review in early 1979, NSW had an 80 km/h prima facie limit, although many NSW highways (mainly east of the Dividing Range) were speed zoned at 100 km/h.

The Northern Territory (NT) and the Australian Capital Territory (ACT) do not have general rural limits. However it should be noted that the ACT employs 100 km/h speed zoning on all major rural roads, which is compatible with the speed limit on adjacent NSW roads.

Table I also summarises rural speed signing and it can be seen that many States employ the derestriction sign. However, Queensland employs numerical signing of 100 km/h, and Western Australia (WA) and South Australia (SA) employ both derestriction and numerical signs (where the sign on exit from a built-up area

is governed by highway alignment and standard). NSW now has both types of sign following the July 1979 changeover to an absolute limit.

Differential speed limits vary amongst the States and Territories, ranging from seven types in Victoria to none in Queensland. The Code contains three recommended differential limits, for heavy trucks, omnibuses and heavy trailers.

Speed zoning is not employed to any great extent at present on rural roads.

RATIONALE BEHIND EXISTING SPEED LIMITS

In the discussions with Traffic Authorities during early 1979 very little documented information was obtained relating specifically to optimisation or effectiveness of the current general speed limits employed throughout Australia. The only report available on effectiveness of rural general limits is a Victorian study of the current 100 km/h limit, Cowley (1977). This was done for the Road Safety and Traffic Authority (RoSTA) to examine the effectiveness of the speed limit change from 70 mph to 60 mph/100 km/h, implemented in late 1973. The findings from this study are referred to in the next Section on general speed limits. A considerable amount of Australian information is, however, available relating to rural differential limits for trucks and for vehicles towing caravans/trailers, as outlined below.

The important subject of differential limits for trucks has been examined recently in the 1978 RoSTA Heavy Commercial Vehicle (HCV) Operational Safety Study, where emphasis was placed upon

rural speed limits in Victoria. This study is documented in two main reports, RoSTA (1978) and Thompson J.E. (1978), supplemented by three reports on accidents, braking and speeds, Cowley (1978), MacKay (1978) and Thompson T.W. (1978), and three other task reports, Bishop (1978), Pearson (1978) and Wood (1978). Truck speed limits have also been examined in two Traffic Accident Research Unit (TARU) reports from NSW, Croft (1972) and Messiter (1971). These findings are referred to in the next two Sections on general and differential speed limits.

Rural differential limits for vehicles towing caravans and trailers have been examined for Queensland and NSW, Boughton (1979) and Vaughan (1974). These findings are referred to in the later Section on differential speed limits.

Road and Traffic Authorities in Australia employ very similar methods and warrants for selection of speed zones on given roads or highways, which are based upon:-

- (a) a high percentile (generally the 85th percentile) of the free speed distribution on the road,
- (b) land use and development alongside the road, and
- (c) accident history for the road,

and it is understood that most decisions employ a balanced engineering judgement using mainly (a) and (b).

During the 1970's the main changes in policy and application of rural speed limits in Australia have been the replacement of prima facie limits by absolute limits in Victoria in 1971, SA in 1974 and NSW in 1979.

RURAL FREE SPEED INFORMATION

Most States have carried out recent (late 1978/early 1979) rural free speed surveys - originated by ACRUPTC through the ORS - and the results are presented in the report to ACRUPTC, Office of Road Safety (1979). Results from the survey are summarised for the three main vehicle classes - cars and car derivatives, rigid trucks and articulated trucks - in Table IV; other vehicle classes are included in the ORS report. The NSW data are shown separately for the prima facie (PF) and zoned limits which were in force at the time of the survey.

This free speed information is valuable, as it permits a direct comparison to be made across the States of rural free speeds in the presence of different rural speed limits. From Table IV it can be seen that rigid and articulated truck speeds are similar, so they have been aggregated in Fig. 1, which compares car and truck mean and 85th percentile free speeds, including the within-State ranges of these parameters, across Australia.

A broad interpretation of Fig. 1 is that speed limits in rural regions of mainland Australia have little effect on actual free speeds. Free speeds in Tasmania are substantially lower than those on the mainland.

At present three States measure rural free speeds on an annual basis - South Australia (SA) has been gathering such information since the mid 1960's, Victoria since 1972 and Tasmania since 1976. The SA and Victorian data are discussed below.

The SA data (which refer to cars and car derivatives, measured at the same 33 rural highway sites every year) are summarised for 1967-79 in Fig.2. It should be noted that the ACRUPTC speed data for late 1978, given in Table IV and Fig.1, are not included in the speed trend data graphed in Fig.2, as the ACRUPTC survey sites were different from those used in the SA annual surveys.

The Victorian data (which refer to cars and car derivatives, measured at the same 11 rural highway sites every year) are summarised for 1972-79 in Fig.3 and show the effect of the introduction of the 60 mph (97 km/h) speed limit in December 1973, converted to 100 km/h in mid 1974. Again, it should be noted that the ACRUPTC speed data for early 1978, given in Table IV and Fig.1, are not included in the speed trend data graphed in Fig.3, as the ACRUPTC survey sites were different.

ACCIDENT/CASUALTY INFORMATION

As discussed with the Traffic Authorities, it is important to attempt a comparative analysis of accident/casualty rates between States, to see whether different rural speed limits are associated with different accident rates. Road traffic accident fatality rates have therefore been examined in this study; injury rates have not been included because of the differing reporting criteria in use across Australia.

Fig.4 shows overall fatality rates for the six Australian States, computed from fatality and motor vehicle registration data published by the Australian Bureau of Statistics (ABS), for the period 1965-79. It can be seen that Fig.4 only allows a broad

comparison to be made between States, as no consistent urban/rural breakdown in fatalities is published. For this reason four States - NSW, Victoria, Queensland and SA - have provided special fatality tables, divided into speed limit zones, and this permits a comparative evaluation to be made between these States, by consistent 'urban' and 'rural' regions. The results of this analysis are given in the Appendix and discussed in the next Section on general speed limits.

GENERAL ISSUES

In the discussion with Traffic Authorities, little or no support was received for a differential limit for night-time driving, although a later Section shows that there is some evidence for considering such a limit. Arguments against a lower night-time limit included improvements in rural road design, vehicle lighting and the greater use of delineators and pavement linemarking in recent years.

No State or Territory has been able to measure the effectiveness of enforcement or publicity on speed limits. However, it is of interest to note that some Police Departments are working in conjunction with Traffic Authorities to concentrate enforcement of speed limits at locations, or on routes, with high accident rates.

TABLE I AUSTRALIAN SPEED LIMITS (KM/H)
OUTSIDE BUILT-UP AREAS - JANUARY 1980

	NAT. R.T. CODE	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
1. <u>GENERAL LIMIT</u> - Derestriction or Numerical Signing									
General Traffic	110	100	100	100	110	110	110	-	-
Main type of Sign	-	D,N	D	N	D,N	D,N	D	-	N
2. <u>DIFFERENTIAL LIMIT</u> - Not signed									
Light Trucks	-	-	-	-	-	-	-	-	-
Heavy Trucks	80	80	80	-	80	80	80	-	50-80
Omnibuses	90	90	80	-	90	90	90	-	-
Light Trailers	-	-	-	-	-	100	80	-	-
Heavy Trailers	80	80	80	-	-	80	80	-	-
Prov.Licence Holders	-	80	80	-	-	80	80	-	-
Learner Drivers/Riders	-	70	80	-	-	-	-	-	-
M/C & Pillion Pass.	-	-	-	-	-	-	-	-	70†
Buses & L. Trailers	-	-	70	-	-	-	-	-	-
Buses & H. Trailers	-	-	65	-	-	-	-	-	-
3. <u>SPEED ZONING</u> - Signed									
70	NOT SPECIFIED	-	-	(70)	-	-	-	-	-
75		-	-	-	-	-	-	-	-
80		-	-	80	-	-	-	-	(80)
90		-	-	(90)	-	-	-	-	-
100		-	-	-	-	(100)	-	-	100
110		110*	-	-	-	-	-	-	-

() = Occasional use only.

* = Freeways only.

† = Legislation to remove this limit has been proposed.

NSW & QLD also have some 60 speed zoning on some rural roads.

See Table III for vehicle definitions.

TABLE II **AUSTRALIAN SPEED LIMITS (KM/H)**
IN BUILT-UP AREAS - JANUARY 1980

	NAT. R.T. CODE	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
1. GENERAL LIMIT - Signed at entry to B.U. Area									
General Traffic	60	60	60	60	60	60	60	60	60
2. DIFFERENTIAL LIMIT - Not signed									
Light Trucks	-	-	-	-	-	-	-	-	-
Heavy Trucks	-	-	50	-	-	-	-	-	40,50
Omnibuses	-	-	50	-	-	-	-	-	-
Light Trailers	-	-	-	-	-	-	-	-	-
Heavy Trailers	-	-	-	-	-	-	-	-	-
Prov.Licence Holders	-	-	-	-	-	-	-	-	-
Learner Drivers/Riders	-	-	-	-	-	-	-	-	-
M/C & Pillion Pass.	-	-	-	-	-	-	-	-	-
Buses & L. Trailers	-	-	-	-	-	-	-	-	-
Buses & H. Trailers	-	-	-	-	-	-	-	-	-
3. SPEED ZONING - Signed									
70	NOT SPECIFIED	-	-	-	-	70	70	-	-
75		-	75	-	-	-	-	-	-
80		80	(80)	80	(80)	80	80	80	80
90		-	(90)	-	-	90	-	-	-
100		-	100*	-	(100)	-	-	-	-
110		110*	-	-	-	-	-	-	-

() = Occasional use only

* = Freeways only

QLD also has occasional 40 speed zoning on some urban roads.

See Table III for vehicle definitions.

TABLE III VEHICLE DEFINITIONS IN TABLES I-II

Three categories of "heavy vehicle" are given in Tables I-II, namely, Heavy Trucks, Omnibuses and Heavy Trailers. Current (January 1980) definitions of these categories are given below. Light Trucks and Trailers are complementary to Heavy Trucks and Trailers.

HEAVY TRUCKS

Code - exceeding 4.5 tonnes (all-up weight).

NSW, WA, Tasmania - agree with Code.

Victoria - exceeding 3.0 tonnes.

SA - exceeding 4.0 tonnes.

ACT - (1) exceeding 3.0 tonnes but not 7.0 tonnes,
 (2) exceeding 7.0 tonnes but not 13.0 tonnes,
 (3) exceeding 13.0 tonnes.

Urban and Rural speed limits for the ACT ranges are respectively:-

(1) 50 and 80, (2) 40 and 60 and (3) 40 and 50 km/h.

OMNIBUSES

Code - 9 or more passengers.

All States agree with the Code, (provided "passengers" includes the driver). In Victoria the differential limit applies to all licensed passenger carrying vehicles; a separate Victorian Omnibus definition is unrelated to speed limits.

HEAVY TRAILERS

Code - exceeding 0.75 tonne.

NSW, WA - agree with Code.

Victoria - exceeding 1.0 tonne.

In Tasmania, legislation to differentiate between light and heavy trailers has been proposed.

TABLE IV

SUMMARY OF CAR AND TRUCK
RURAL FREE SPEEDS IN AUSTRALIA
(ACRUPTC 1978 SURVEY)

STATE OR TERR.	RURAL LIMIT	VEHICLE TYPE		
		CARS	RIGID TRUCKS	ARTIC. TRUCKS
		MEAN SPEEDS (KM/H)		
NSW	80 prima facie	103.0	80.9	87.1
NSW	100 zoned	97.9	82.2	83.3
VIC	100	97.7	78.5	79.9
QLD	100	94.1	80.5	84.4
SA	110	96.1	80.2	83.6
WA	110	93.1	-	-
TAS	110	83.2	71.1	73.3
NT	None	-	-	-
ACT	100 zoned	95.5	83.0	89.0
		85TH PERCENTILES (KM/H)		
NSW	80 prima facie	119.5	-	98.1
NSW	100 zoned	113.1	91.2	94.3
VIC	100	109.0	87.5	89.0
QLD	100	104.7	90.3	93.0
SA	110	107.9	89.6	92.9
WA	110	102.2	-	-
TAS	110	97.1	77.7	78.6
NT	None	-	-	-
ACT	100 zoned	108	93	100

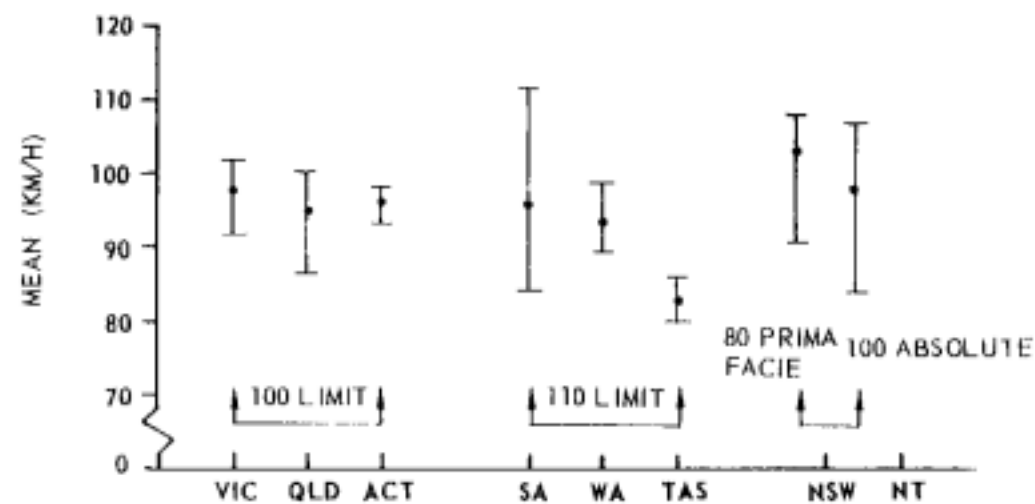
All data refer to late 1978 except for:-

Victoria - HCV Oper. Safety Study - early 1978.
 WA - 1975 to 1977.
 ACT - Early 1979.

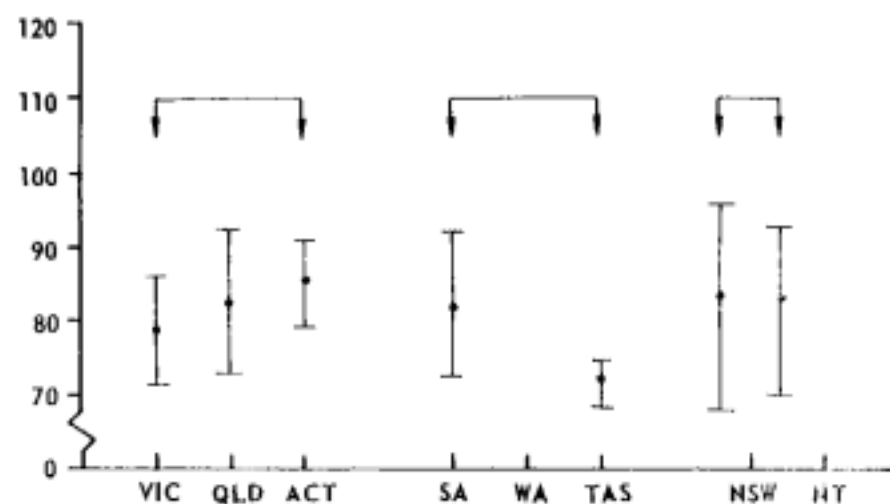
All data measured during daytime.

All data are simple (not weighted) averages over sites and traffic directions.

Cars include car-derivatives.



CARS (INCLUDING DERIVATIVES)



TRUCKS (RIGID AND ARTICULATED)

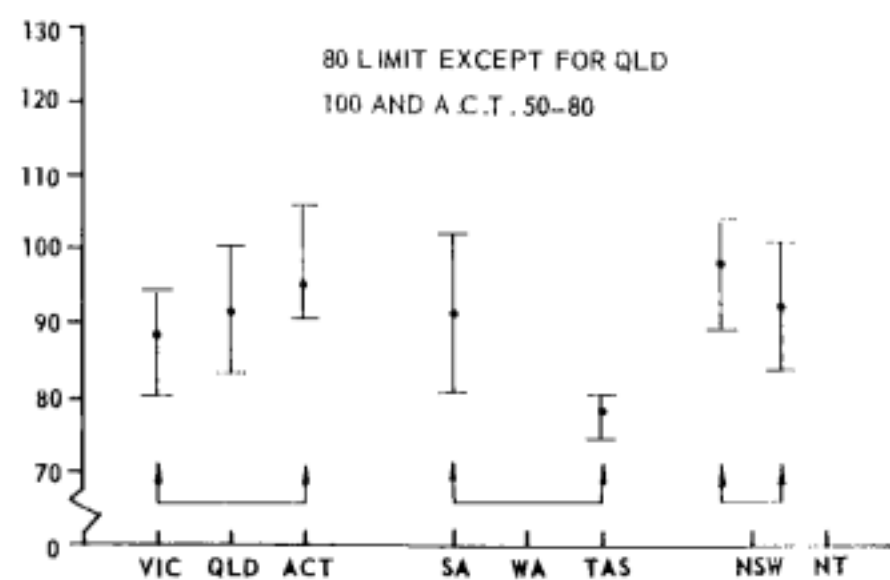
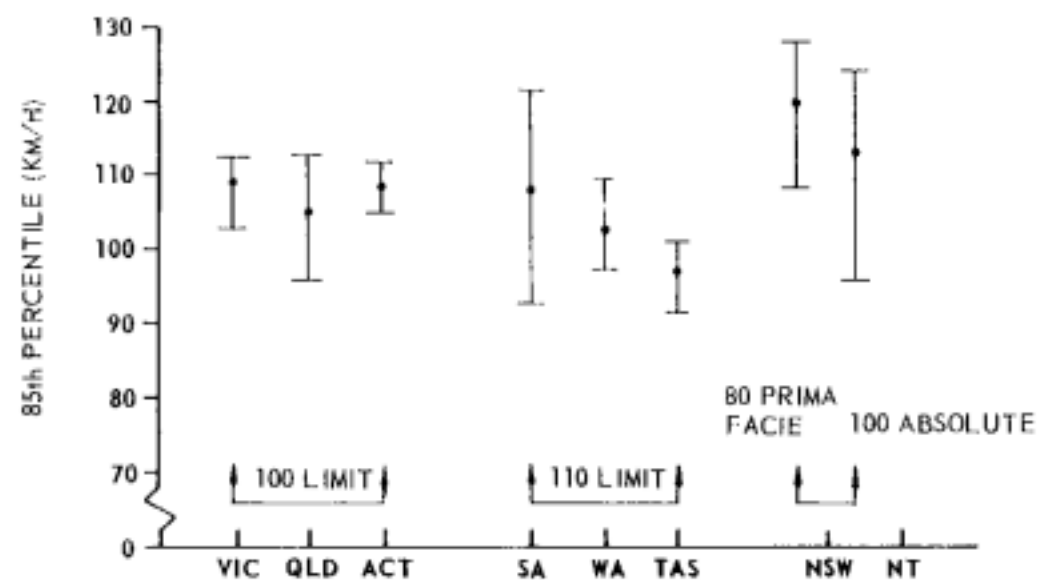


FIG. 1 - RURAL FREE SPEEDS OF CARS & TRUCKS (ACRUPTC 78/79 SURVEY)

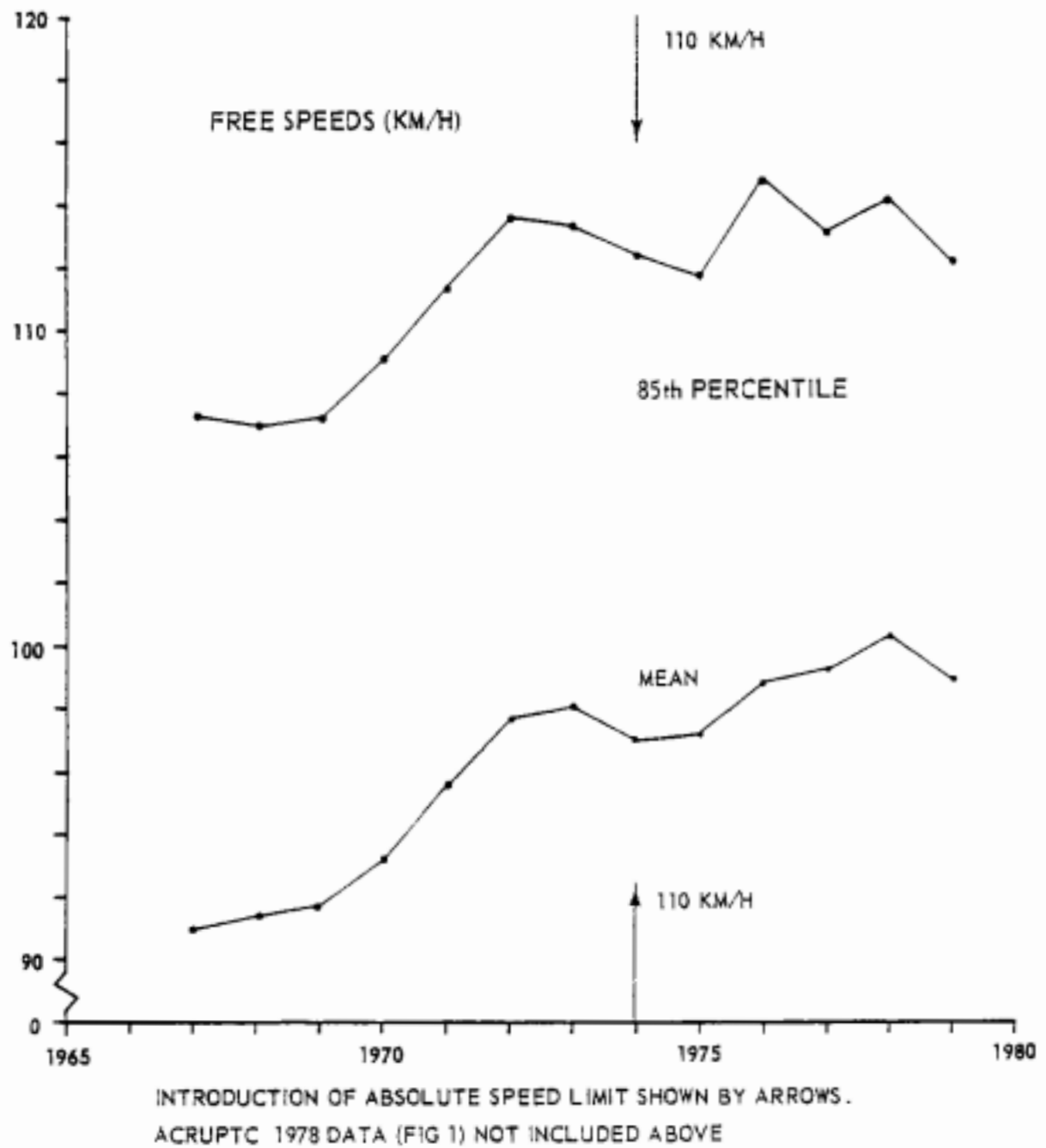


FIG. 2 - RURAL FREE SPEED TRENDS OF CARS IN SOUTH AUSTRALIA, 1967 - 79

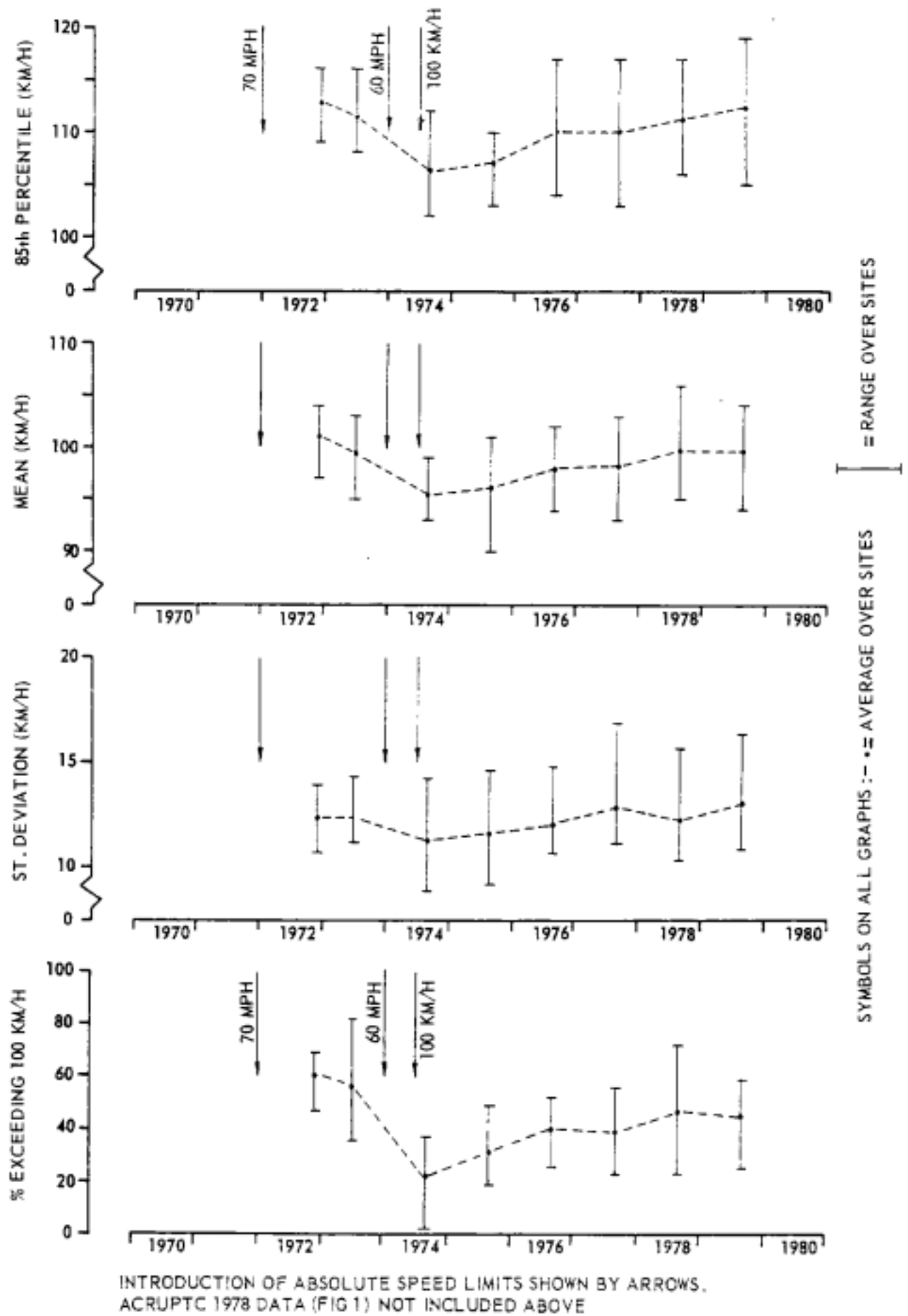


FIG. 3 - RURAL FREE SPEED TRENDS OF CARS IN VICTORIA, 1972-79

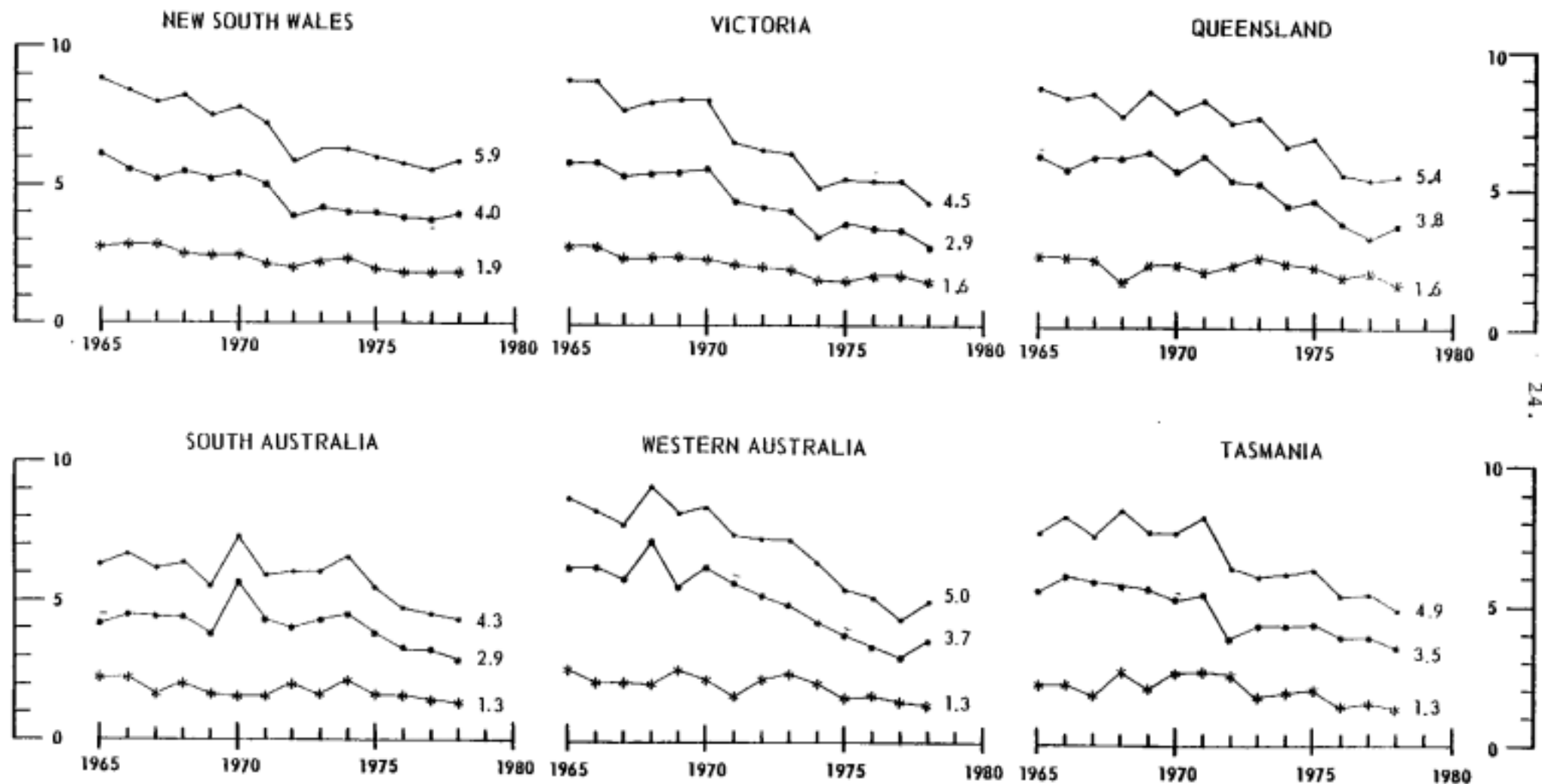


FIG.4 - ROAD TRAFFIC FATALITY RATES PER 10 000

MOTOR VEHICLES REGISTERED

PRELIMINARY 1978
VALUES IN ()
D SOURCE: O.R.S.

—●— ALL ROAD USERS
—●— VEH. OCCUPANTS
—●— NON-OCCUPANTS

GENERAL TRAFFIC SPEED LIMITS IN RURAL AREAS

As indicated in the previous Section, speed limits for general traffic on Australian rural roads are now 100 or 110 km/h absolute, but no Australian studies have been done to substantiate either of these levels, apart from a Victorian study, Cowley (1977). In this Section an attempt is made to determine a suitable general traffic limit for Australian conditions. Differential limits are considered separately in the following Section.

No consideration is given to minimum speed limits, as in general these would only apply to specific highways or freeways; for example, the 60 km/h limit on the Kwinana Freeway in Perth.

A substantial volume of literature, mainly from overseas, is available on the subject of speed limits. This study has concentrated upon major reports which have appeared during the last ten years and the main findings are given below under two headings:-

- (1) Objectives and Criteria for Speed Limits, and
- (2) Speed Limits and Road-Traffic Safety.

This information is supplemented by a summary of the favourable experiences in Victoria and the USA, (where new, lower rural speed limits were introduced in 1973/74), in:-

- (3) The Victorian 60 mph/100 km/h Speed Limit, and
- (4) The USA 55 mph Speed Limit.

This is followed by:-

- (5) Australian Free Speeds, and
- (6) Australian Fatality Rates,

which amplify the previous comments on these subjects, and

discuss whether rural speed limits have an appreciable effect on rural safety. Finally, in:-

(7) A General Traffic Speed Limit for Australia, the advantages and disadvantages of various possible speed limits are discussed.

OBJECTIVES AND CRITERIA FOR SPEED LIMITS

The literature shows that in the past the main objective of speed limits has been to increase safety, by reducing the number of excessively fast vehicles in the traffic stream and thereby reducing the variance of speeds within the traffic stream. This change in traffic speed distribution improves:-

- (a) primary safety, as the risk of accident involvement increases at speeds above the mean traffic speed, and
- (b) secondary safety, as the severity of accidents increases steadily with speed,

as shown in Solomon (1964) and some other reports, discussed later.

During the 1970's energy conservation became important, so that a current objective of speed limits is to reduce highway fuel consumption; indeed, the USA and New Zealand introduced new absolute speed limits, of 55 and 50 mph respectively, in 1973/74 mainly for this reason.

In conflict with these objectives is the reduction in mobility which results from reduced traffic speeds. This leads to:-

- (a) increased journey times and, perhaps, costs, (particularly for commercial traffic), and

- (b) a lack of respect by motorists for speed limits which are perceived to be unreasonably low, for the prevailing road conditions.

For these reasons, there is now increasing emphasis on economic studies in which the objective is to minimise overall transportation cost - i.e. the sum of accident/casualty costs, vehicle operating costs and driver/occupant costs, Castle (1976), European Conference of Ministers of Transport (1978) and Nilsson and Roosmark (1977).

There is little consensus of opinion on criteria for setting speed limits. Before energy considerations became important, speed limits were generally recommended to be set at or slightly below the 85th percentile of vehicle free speeds, Joscelyn et al (1970) and Ministry of Transport (1968). The extensive study by Joscelyn et al concluded that such a limit is:-

- (a) fundamentally fair in the context of the Traffic Law System,
- (b) related to risk of dysfunction in the Surface Road Transportation System,
- (c) accepted as reasonable by drivers,
- (d) applicable to a wide range of highways, and
- (e) capable of implementation with existing resources.

However, energy considerations and moves to reduce accident severity have led to consideration of speed limits equivalent to lower percentiles of the free speed distribution.

The optimal criterion for a rural speed limit is probably that which results in traffic speeds which minimise overall transportation cost. However, such a criterion would be difficult to apply, due to

problems in calculating:-

- (a) compliance with the speed limit, particularly in the long term.
- (b) fuel savings from lower speeds, and
- (c) costs associated with time lost.

SPEED LIMITS AND ROAD-TRAFFIC SAFETY

The Department of Transport's 1973 national review of speed control in relation to road safety examines this subject, Cumming and Croft (1973). Major findings from this review in relation to rural speed limits are:-

- (1) prima facie limits are unsuitable in comparison with absolute limits, because they are not restrictive and are virtually impossible to enforce,
- (2) the imposition of an absolute limit, or the lowering of an existing absolute limit, generally results in a decrease in accident/casualty rate,
- (3) the raising of an absolute limit generally results in an increase in accident/casualty rate,
- (4) there is a wide variation in the reported effectiveness of (2) and (3), (particularly regarding rural limits), and a lack of data on long term benefits,
- (5) the purpose of a maximum speed limit is to reduce the number of vehicles travelling at excessively high speeds,
- (6) accident/casualty rates increase rapidly above 100 to 110 km/h, particularly at night-time,
- (7) accident severity increases monotonically with speed, and

- (8) control/reduction of the variance of speeds in the traffic stream is very important.

The importance of the relationship between speeds of the traffic stream and rural accident/casualty involvement rates was demonstrated in Solomon (1964), which analysed a large amount of USA travel-speed and accident-speed data for the late 1950's. The main results of Solomon's work are summarised in Figs.5 and 6. Some caution must be used in applying his findings to Australian conditions, not only because they refer to data which is 20 years old, but also because the USA accident patterns differ in having a large proportion of rear-end collisions and a small proportion of single-vehicle accidents. (Note that accident-involvement rates can be obtained from the vehicle-involvement rates in Fig.6 by approximately halving the rates shown).

Solomon's findings are supported in Research Triangle Institute (1970) which analysed a smaller sample of travel-speed and accident-speed data from Indiana in the late 1960's. Even after accidents involving vehicle-turning manoeuvres were excluded, the authors obtained a U-shaped curve of vehicle involvement rate, although the relationship was weaker than Solomon's.

These U-shaped accident involvement rate curves are also supported by some theoretical work in Hauer (1971), which relates accident involvement rate to overtaking rate and concludes that on highways with both lower as well as upper speed limits, the lower limit could be more effective.

Solomon's results are also confirmed to some degree in Newby (1970) which quotes figures for USA toll roads:-

Speed limit (mph)	60	65	70	80
Accident rate	95	117	118	162
Fatality rate	1.7	2.2	2.7	7.1

where rates refer to 100 million vehicle miles. The sharp increase in rates for speed limits above 70 mph is noticeable.

Joks and Wuerdemann (1973) states that there is strong evidence from a number of studies that the relative speed of a vehicle to the average speed of traffic, rather than its absolute speed, is related to accident involvement. Thus Solomon's findings of the late 1950's could still be applicable today. If this is correct, then Figs.5 and 6 show that involvement rates of vehicles and persons injured during daylight hours remain fairly constant between 90 and 110 km/h (56 and 68 mph); however night-time rates rise sharply above 90 to 100 km/h (56 to 62 mph). These points are important to the consideration of an absolute speed limit, and a differential speed limit for night-time.

As mentioned earlier, Joscelyn et al (1970) recommends setting a speed limit at the 85th percentile of the free speed distribution. Unfortunately, there appears to be no logical method for choosing between, say, 75th, 85th and 95th percentiles, although Joscelyn et al argue against choosing percentiles higher than the 85th because of the rapid increase in vehicle/casualty involvement rate above this level, and the problem of enforcement when allowance is made for enforcement tolerances.

It is not clear from the literature whether enforcement of speed limits is effective or not, nor whether this factor can be separated from the publicity factor associated with the introduction

of a new speed limit. For example, Council (1970) showed that static (or moving) police cars in a traffic stream affect vehicle speeds; Reinfurt et al (1973) found a similar effect with police operated radar. Both studies cast doubt on long term effects and the latter report emphasised the importance of media publicity.

A novel method for choosing a speed limit was put forward by Vaughan (1970) which proposed, inter alia, that 'the chances of booking a safe driver for speeding must be the same as the chances of an unsafe driver travelling slower than the speed limit'. A brief check of this hypothesis using data from Solomon (1964) yields a speed limit value close to or below the mean free speed.

Rural free speed distributions tend to be Normal or have slight positive skewness. A number of authors have examined the shapes of speed distributions, and this work is summarised in an internal TARU report, Croft (1972). There is evidence that the accident rate on a given road is related to the skewness of the speed distribution. Further, the imposition of an absolute speed limit is usually associated with a reduction in the number of excessively fast vehicles, thereby reducing the degree of skewness.

THE VICTORIAN 60 MPH/100 KM/H SPEED LIMIT

Until 1971, Victoria had a prima facie rural speed limit of 50 mph (80 km/h) and this was changed in December 1971 to a 70 mph (113 km/h) absolute speed limit on a trial basis. In December 1973 the limit was reduced to 60 mph (97 km/h) and converted in mid 1974 to 100 km/h.

The first change - from prima facie to absolute - was made

after an extensive study reported in Victorian Parliamentary Joint Select Committee on Road Safety (1971). The report recommended an absolute daytime speed limit of 70 mph (113 km/h) and a differential night-time limit of 65 mph (105 km/h), but the latter was not introduced in December 1971. Reasons for the second change - from 70 mph (113 km/h) to 60 mph (97 km/h) - have not been published.

The former change in limits had no noticeable effect on Victorian casualties, but the second appeared to, as Victorian casualties in 1974 fell sharply by comparison with 1973, fatalities by 14% and persons injured by 12%. These falls were comparable with those obtained three years earlier as a result of seat-belt wearing legislation.

An investigation of the 1973/74 reduction in fatalities (fatality trends up to 1977 are shown in Fig.7), using 1969-75 data, in Cowley (1977) showed that:-

- (a) it occurred mainly in the 'high speed' (HS) region - defined as the region to which the maximum speed limit applies - compared with the 'low speed' (LS) region (the complement of the HS region), and
- (b) it involved mainly motor vehicle occupants, passengers particularly,

and the same factors were associated with the subsequent upturn in fatalities in 1975, to the pre-1974 level. Further, a substantial part of the HS region downturn occurred on the more heavily trafficked roads close to Melbourne. Rural free speeds (Figs.3, 7) showed a similar pattern, but with a slower return towards the pre-speed limit levels. It was concluded that the new 100 km/h

speed limit was an important causal factor in the 1973/74 downturn in fatalities, but that it had short term effectiveness.

Examination of the high speed region fatality data, Cowley (1977), showed that:-

- (a) the data had a high variance - compared with the low speed region data - so that the 1973/74 downturn was not significant, and
- (b) the 1970 seat-belt wearing legislation probably had little effect in this region - compared with the low speed region - but firm conclusions would have required additional pre-legislation data, with a high speed/low speed regional split.

Subsequent work in the RoSTA HCV Operational Safety Study, Cowley (1978), showed that car-truck collisions accounted for a substantial proportion of the 1973/74 fatality downturn, as shown in Fig.8. It might be inferred that the reduction in car speeds, in association with (probably) no reduction in truck speeds, led to a reduction in the speed variance of the traffic stream and therefore a lower accident/casualty rate; however, there is insufficient truck speed information to check this supposition.

In summary, the Victorian experience from an analysis of 1969-75 data indicates that an absolute speed limit of 100 km/h, imposed upon a rural vehicle population travelling at about 100 km/h mean, 110-115 km/h 85th percentile, resulted in free speeds reducing by 4 to 8 km/h (Fig.3), and returning towards previous levels in 2 to 4 years, and in fatalities reducing by 14%, and returning to previous levels in one year, Figs.3,7. Changes in

car-truck collisions contributed to this fatality pattern.

In comparison with the fatality data, analysis of data on persons-injured was inconclusive; indeed, Cowley (1977) stated that there is some evidence to indicate that the steady reduction in Victorian injury statistics during the 1970's might be partly due to changes in accident reporting procedures.

THE USA 55 MPH SPEED LIMIT

Beginning in late 1973 the USA experienced an 'energy crisis' which led to restrictions in petrol sales, increases in petrol prices and the introduction of a nationwide maximum speed limit on all roads and freeways of 55 mph (89 km/h). Many reports have been written examining the manner in which these measures affected fuel consumption and road-traffic safety, the latest available being National Highway Traffic Safety Administration (1978). Many of the findings given below are taken from this source. Prior to the energy crisis, speed limits in the USA varied considerably from one State to another; for example, an earlier report, National Highway Safety Bureau (1969), quoted absolute limits between 45 and 80 mph, although the majority lay between 60 and 70 mph, (97 and 113 km/h).

It would be of interest to compare USA findings with those of New Zealand where a 50 mph (80 km/h) speed limit was introduced at the same time for the same reason; however, a literature search did not reveal any published work on evaluation of the effectiveness of the lower New Zealand limit.

The main results from the USA can be summarised by the

following changes between 1973 and 1974:-

- (a) a 16% drop in fatalities;
- (b) an 8% drop in average rural free speeds, i.e. about 5 mph (8 km/h),
- (c) about 10% drop in total vehicle-travel, in both rural and urban areas;
- (d) about 15% drop in fatality rate (per vehicle distance),
- (e) a drop in highway fuel consumption of between 1 and 3% approximately, due to the speed limit, per se.

The 8% speed drop (from 1973 to 1974) of 60 to 55 mph - item (b) above - refers to 'main rural roads', but the NHTSA report quotes an 11% decrease from 65 to 58 mph on 'rural and Interstate highways'.

NHTSA (1978) states that more than half of the 1974 fatality reduction could be attributed to the new speed limit, (with the remainder being attributed to a decrease in vehicle-travel, changes in travel patterns, etc.). However, a study by The Pennsylvania State University, Heckard et al (1976), was more cautious, concluding that '... fatalities per hundred million vehicle miles of travel have been reduced by the enactment of the speed limit, but injuries per hundred million vehicle miles of travel have not. The data do not, however, permit a precise numerical estimate of how much of the reduction in the fatality rate is due to the speed reduction'.

As a result of the introduction of the 55 mph limit, the previous car/truck and day/night differential limits have been abolished in practically all States.

The fuel consumption benefits resulting from the speed limit introduced in the 'energy crisis' appear to be small. The figure quoted earlier, of about 10% reduction in vehicle travel, would imply an overall transportation fuel reduction of at least 10%; however, the decrease in fuel consumption due to the speed limit itself is estimated to be 1 to 3%.

The cost effectiveness of the lower speed limit is difficult to establish, as it depends upon the costing of time lost on rural trips. It is not clear whether costing lost time (particularly for non-commercial traffic) is valid or not, Castle (1976) and European Conference of Ministers (1978).

With the easing of the 'energy crisis', the 55 mph speed limit has been questioned in the USA. The NHTSA data for 1976-77 shows that the limit was not being respected by the majority of drivers. In addition, a number of States (mainly in the West) were considering increasing the limit, (thus potentially foregoing considerable amounts of Federal aid monies), but the 1979 fall in Iranian fuel production was affecting these considerations, Institute of Transportation Engineers (1977a, 1977b).

In summary, the USA experience from the 'energy crisis' measures, including the introduction of the 55 mph limit, is:-

- (a) fairly large reductions in vehicle-travel,
- (b) small reductions in highway fuel consumption due to the speed limit itself, and
- (c) large reductions in fatalities and fatality rates.

AUSTRALIAN FREE SPEEDS

Free speeds of cars and car derivatives in Australian rural regions, measured in the ACRUPTC survey in late 1978, Office of Road Safety (1979), are summarised in Table IV and Fig.1. For mainland Australia, statewide means can be summarised by a range of 84 to 112, with an average of 97 km/h; corresponding figures for statewide 85th percentiles are:- range 93 to 128, average 109 km/h. In general, standard deviations are between 10 and 15 km/h. Tasmanian figures are as follows:- mean: range 80 to 86, average 83 km/h, and 85th percentile:- range 92 to 101, average 97 km/h, which are 12 to 15 km/h lower than those on the mainland. The lower values for Tasmania are most likely influenced by its more difficult terrain and, possibly, smaller trip distances, Commonwealth Bureau of Census and Statistics (1973) and Australian Bureau of Statistics (1978). This point is reinforced by observing that car/truck differential speeds in Tasmania are of the same order as those on the mainland.

A broad interpretation of Fig.1 is that free speeds of cars are independent of the rural speed limits in force; indeed, the correlation between speeds and speed limits appears to be negative, not positive.

The trends in car free speeds for SA given in Fig.2 are difficult to interpret; they might be showing a general upward trend and they might be consistent with a recent levelling-off of speeds. McLean (1978) concludes that for the period 1967 to 1976 the lower rate of increase in the 85th percentiles, 0.85 km/h per year, compared with 0.92 km/h per year for the means, implies that the coefficient of variation is decreasing with time and he

found this to be statistically significant. There is a slight indication in Fig.2 that the changeover at metrication in mid-1974 from a 60 mph (97 km/h) prima facie limit to a 110 km/h absolute limit led to a reduction in upward speed trends.

The Victorian speed data shown in Fig.3 were noticeably affected by the introduction of the new 60 mph/100 km/h absolute limit in 1973/74; the limit affected all the parameters shown. During 1975 and 1976 speeds returned towards the pre-1974 levels; this is analysed in Cowley (1977) on the effectiveness of the speed limit.

In summary, current free speeds of cars do not appear to be related to current speed limits, and it is impossible to draw firm conclusions regarding upward speed trends. In the mainland States, mean and 85th percentile speeds are approximately 100 and 110 km/h, but there is a wide variation about these figures.

AUSTRALIAN FATALITY RATES

In a study which aims to recommend rural speed limits for Australia, it is important to compare accident statistics across the States, particularly to see whether different speed limits are associated with different accident/casualty rates. Fatality rates are briefly examined below; injury rates are not examined because of the differing reporting criteria in use across Australia.

Fig.4 shows overall fatality rates for the six States, computed from fatality and motor vehicle registration data published regularly by the ABS. The period 1965-78 has been chosen to cover

similar time spans pre- and post-legislation on seat belt wearing, introduced in Victoria in December 1970 and in other States and Territories 9 to 12 months later. The fatality data have been divided into:-

- (a) motor vehicle occupants, defined as drivers of motor vehicles excluding motor cycles, plus passengers of motor vehicles including motor cycles, (in accordance with ABS publications), and
- (b) non-occupants, defined as the complement of occupants.

The fatality rates in Fig.4 have been computed for each State by dividing the three fatality curves, for all road users, occupants and non-occupants, by the number of motor vehicles registered at mid-year, (where motor vehicles include motor cycles). The peaks and troughs in the fatality rate curves generally reflect equivalent changes in the fatality curves, because the vehicle registration curves are reasonably smooth.

Some noticeable features of Fig.4 are:-

- (a) the generally high rates in Queensland and WA particularly in the 1960's,
- (b) the rapid decline in rates in Queensland and WA during the 1970's, and
- (c) the generally low rates in SA.

Seat belt wearing legislation appears to have been effective in all States - in terms of decreasing the gradients of occupant fatality rate curves - and particularly so in NSW,

Victoria and Tasmania, where step-function changes in seat-belt wearing rates apparently occurred.

The fatality rates in Fig.4 effectively assume equal average vehicle distances in all States; but some account can be taken of different vehicle distances by using data from the ABS vehicle-usage surveys carried out in 1971 and 1976, Commonwealth Bureau of Census and Statistics (1973) and Australian Bureau of Statistics (1978). Average vehicle distances for the six States, relative to Australia as a whole, can be summarised as follows:

	NSW	VIC	QLD	SA	WA	TAS
1971	+1%	+3%	-8%	0	+6%	-11%
1976	0	+3%	-6%	-3%	+3%	-10%

When these figures are used in conjunction with the occupant fatality rates (per vehicles registered) from Fig.4, for the period following seat-belt wearing legislation, it can be inferred that occupant fatality rates (per vehicle-distance) are 'low' in Victoria and SA, and 'high' in Queensland and Tasmania. It would be of interest to find reasons for these differences between States; a possible reason could be different relative magnitudes of urban and rural travel.

One way of examining this problem is to use data from the ABS vehicle-usage surveys, mentioned earlier. These surveys show that the proportion of urban travel varies from as low as 41% (Tasmania, 1971) to as high as 66% (NSW, 1971) compared with a figure of 61 to 62% for the whole of Australia. However, it should be noted that the ABS definition of urban travel is an over-estimate, as it includes the high-speed roads of the ABS-

defined capital city areas (Statistical Divisions), but also an under-estimate, as it does not include travel in towns with populations of under 40,000 persons. An alternative way of examining the problem is to use accident data broken down into consistent high-speed (HS) and low-speed (LS) regions. For this reason, four States - NSW, Victoria, Queensland and SA - have produced special tables of motor vehicle occupant and non-occupant fatalities, divided into speed limit zones, from which a HS/LS regional split can be obtained. This information is summarised in the Appendix.

The Appendix shows that the fatality data for the period following the introduction of seat belt wearing legislation can be summarised by the following breakdowns:-

<u>State</u>	<u>HS Region</u>		<u>LS Region</u>		<u>Total</u>
	<u>Occ</u>	<u>Non-Occ</u>	<u>Occ</u>	<u>Non-Occ</u>	
NSW	34%	5%	31%	30%	100%
Victoria	42%	7%	24%	28%	100%
Queensland	41%	9%	23%	27%	100%
SA	43%	6%	23%	27%	100%

This shows that NSW has the lowest proportion of motor vehicle occupant fatalities in the HS region of these four States, which can be compared with Fig.1 which indicates that the highest rural free speeds are in NSW. The Appendix concludes by questioning whether rural free speeds, and rural speed limits, have an appreciable effect on road-traffic fatality patterns.

A GENERAL TRAFFIC SPEED LIMIT FOR AUSTRALIA

It is considered that selection of an optimal speed limit for rural areas should be based upon minimising total transportation

costs - comprising the sum of accident/casualty costs, vehicle operating costs and driver/occupant costs - as stated earlier. However, there appear to be insufficient data available to calculate all of these factors. For this reason, the arguments given below only consider the likely safety benefits of various absolute speed limits.

All States now have rural speed limits of 100 or 110 km/h, but there is little documented evidence to support either of these levels. Consideration of a speed limit for the National Road Traffic Code should take account of these existing limits, and, possibly, limits as low as 90 km/h (close to the current USA level) and as high as 120 km/h. Four options are therefore presented below, assuming that general speed limits should be restricted to multiples of 10 km/h.

The selection of a suitable limit within this 90 to 120 km/h range is difficult, when all factors are taken into consideration. As a recent report, European Conference of Ministers of Transport (1978), says:-

"Choice of threshold - speed limits are undoubtedly subject to threshold effects. If the maximum permitted speed is set too high, there will be no truly significant effects. The limit must be set at a level which is fairly constraining and seen to be so. But speed limits must not be chosen without regard for the problem of compliance and the corresponding provisions for monitoring and enforcement. It is essential to have the support of drivers and of public opinion for, if not, the cost of enforcement could well become prohibitive."

A speed limit of 90 km/h in a country as large as Australia would be unlikely to be effective for the following reasons:-

- (a) it represents a current free speed percentile (for mainland States) in the range of 20 to 30% on average, Office of Road Safety (1979), and

- (b) USA experience and Victorian experience (Fig.3) indicate that it would only be respected by the majority of drivers for a short period,

even though the potential savings in accidents and casualties from reduced car speeds (and car-truck differential speeds) could be large.

A speed limit as high as 120 km/h, which represents a percentile value (for mainland States) greater than 90%, would be unsuitable, considering the high rate of increase in accident/casualty involvement rates above 110 km/h, from Solomon (1964), Fig.5, and other work described earlier. This applies to daytime as well as night-time operations.

Comparison between 100 and 110 km/h as possible absolute limits can be summarised as follows:-

- (1) Safety:- Based upon Solomon's data (Figs.5 and 6) the two speeds are comparable in terms of daytime accident/casualty rates, but differ by 25-75% in terms of night-time accident/casualty rates, so that 110 km/h would not be a suitable night-time limit.
- (2) Speed Limit Compliance:- Based upon recent Australian free speeds, Office of Road Safety (1979), 100 km/h is close to the 50th percentile and 110 km/h to the 85th percentile, in mainland States, so that the latter would be seen to be more realistic by the majority of drivers.
- (3) Enforcement:- A 110 km/h speed limit could be enforced with a low tolerance, whereas a 100 km/h speed limit would probably require the Police to add, say, a 10%

tolerance to keep enforcement effort to a reasonable level.

The only Australian data available to assist in the choice between 100 and 110 km/h comes from the Victorian experience of reducing the limit from 70 mph (113 km/h) to 60 mph (97 km/h) in late 1973, and subsequently converting it to 100 km/h in mid 1974, as summarised in Figs.3 and 7. On the basis of this experience, it could be predicted that the introduction of a 100 km/h limit in the mainland States of SA and WA would yield only short term safety benefits.

There is no Australian information available for predicting the outcome of introducing a 110 km/h limit in the Eastern States of NSW, Victoria and Queensland; however, in terms of road-traffic safety, it would be seen to be a retrograde step, and such a limit would probably need to be rigidly enforced, i.e. with minimal tolerance.

Thus there is insufficient information available to allow a choice to be made between 100 and 110 km/h in a wholly objective manner. The main points for and against either level can be summarised as given below; these points do not take into account the possible influence of differential limits for various vehicle classes - e.g. trucks - as discussed in the next Section.

100 km/h General Limit

- For:-
- (1) 'safe' and in line with worldwide trends.
 - (2) restrictive, as suggested in European Conference of Ministers of Transport (1978).

- (3) probably suitable for both day and night driving.

Against:- (4) safety benefits possibly short-term only,

- (5) probably requires an enforcement tolerance of, say, 10%,

- (6) high standard roads and freeways might require to be zoned (at, say, 110 km/h) above the general limit.

110 km/h General Limit

For:- (1) 'realistic' in terms of driver compliance,

- (2) realistic in terms of enforcement,

- (3) would not require speed zoning at higher levels, on high standard roads and freeways,

Against:- (4) not restrictive nor in line with worldwide trends,

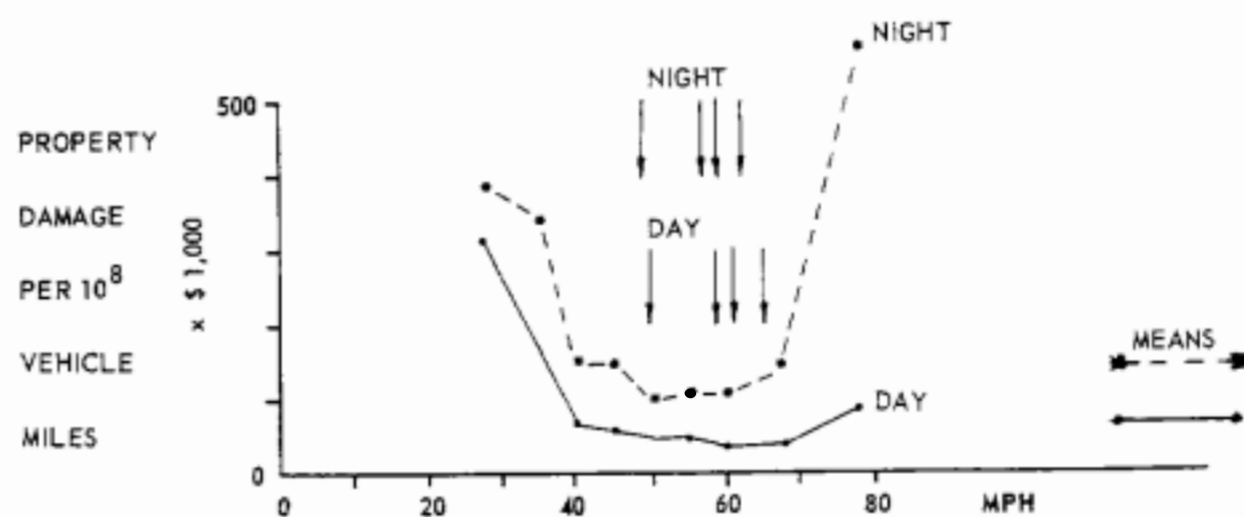
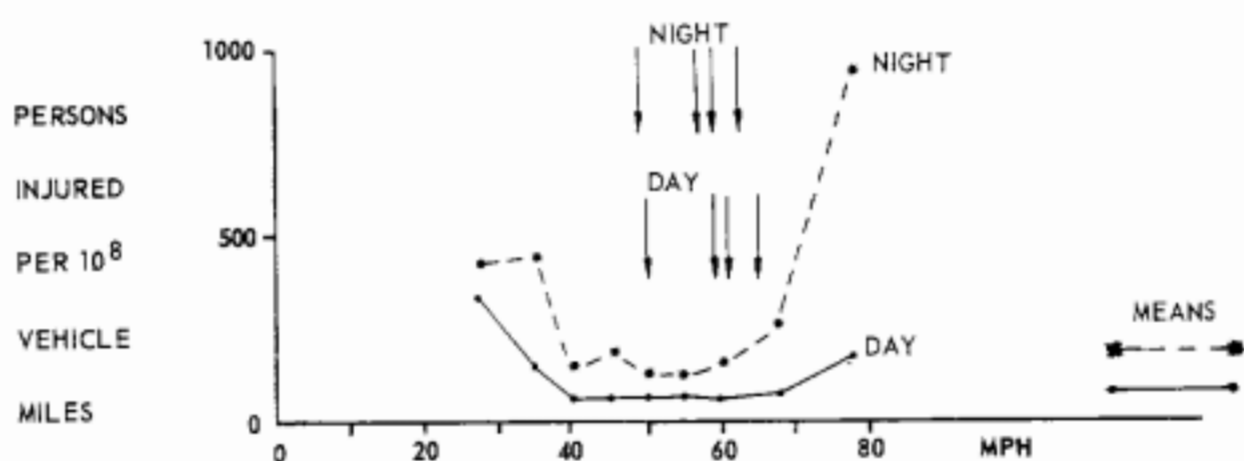
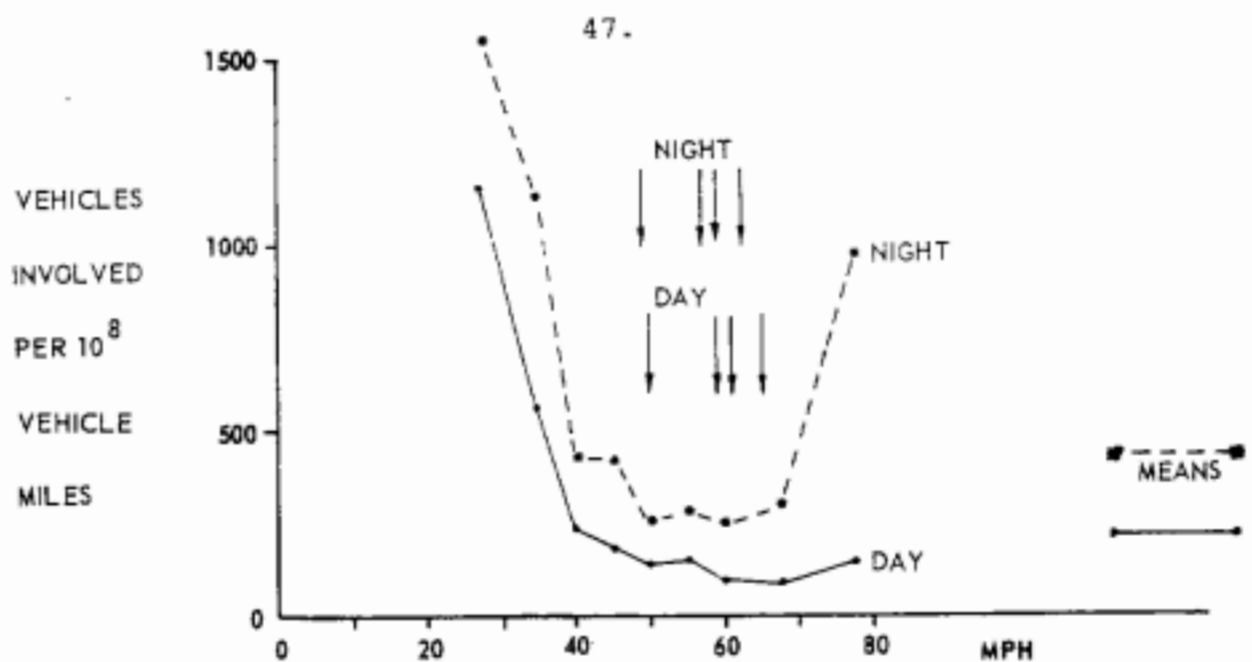
- (5) probably no safety benefits,

- (6) probably requires a (lower) differential limit for night-time driving.

Therefore, on safety grounds, neither level of general speed limit has a clear advantage over the other. It is the author's opinion that the more realistic limit of 110 km/h should be selected for Australian rural roads.

An additional consideration in support of a 110 km/h limit is that, in being closer to the 85th percentile of free speeds than the 50th percentile, selection of this general limit would be more consistent with current speed zoning practice. It could be argued that the ultimate speed limit structure for Australia

would be obtained by speed zoning all (through traffic) roads by a consistent set of criteria, such as those employed now. Adoption of a 110 km/h general limit - followed by progressive speed zoning of lower standard and heavily trafficked rural roads at, say, 90 km/h (assuming a basic structure or hierarchy of speed limits in steps of 20 km/h), could be seen as a first step towards a consistent speed limit strategy.



ARROWS DEPICT (LEFT TO RIGHT) PERCENTILES OF TRAVEL SPEEDS - 50th, 85th, 90th, 95th.

FIG. 5 - VEHICLES, PERSONS INJURED, PROPERTY DAMAGE INVOLVEMENT RATES - FROM SOLOMON (1964)

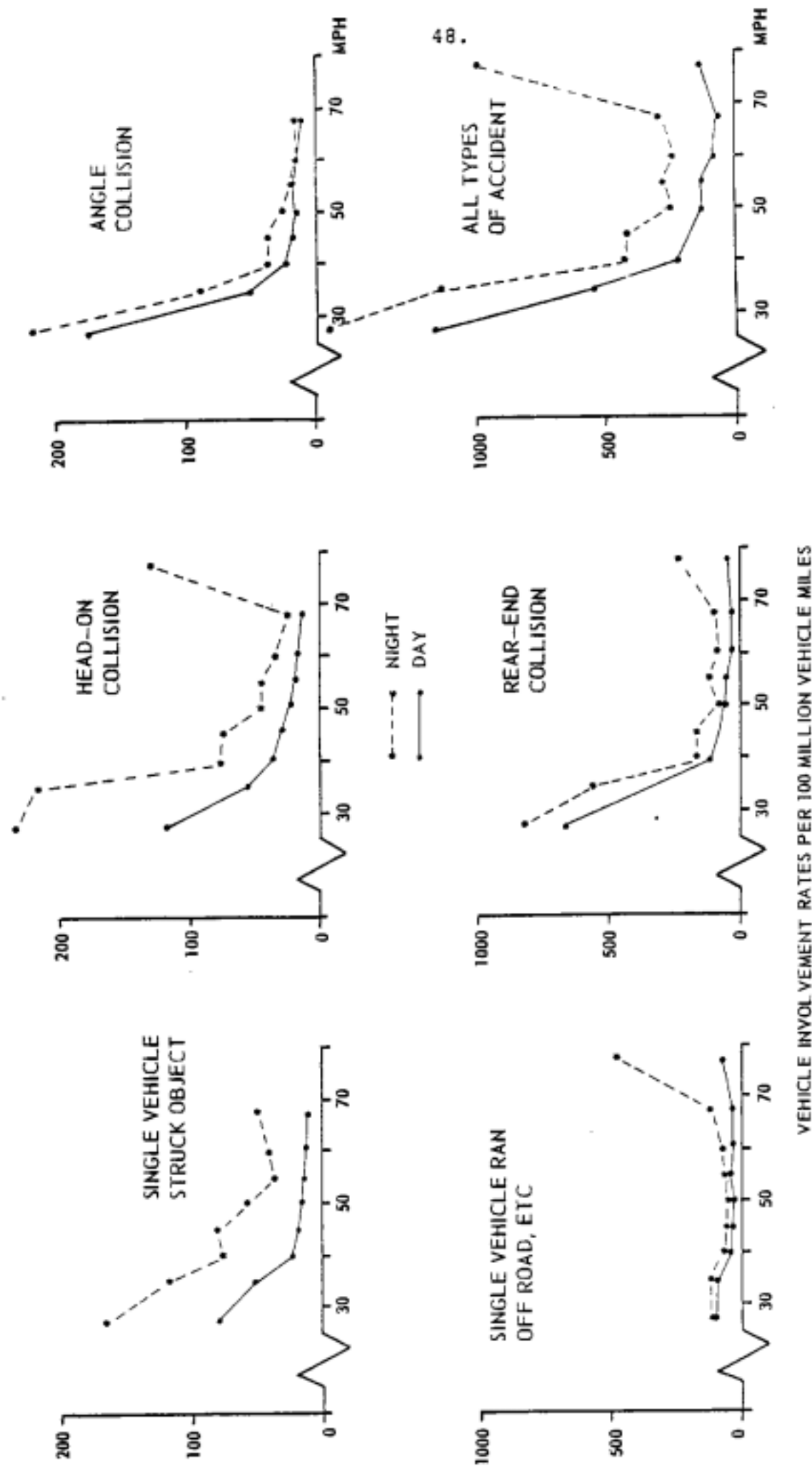


FIG. 6 - VEHICLE INVOLVEMENT RATES BY ACCIDENT TYPE FROM SOLOMON (1964)

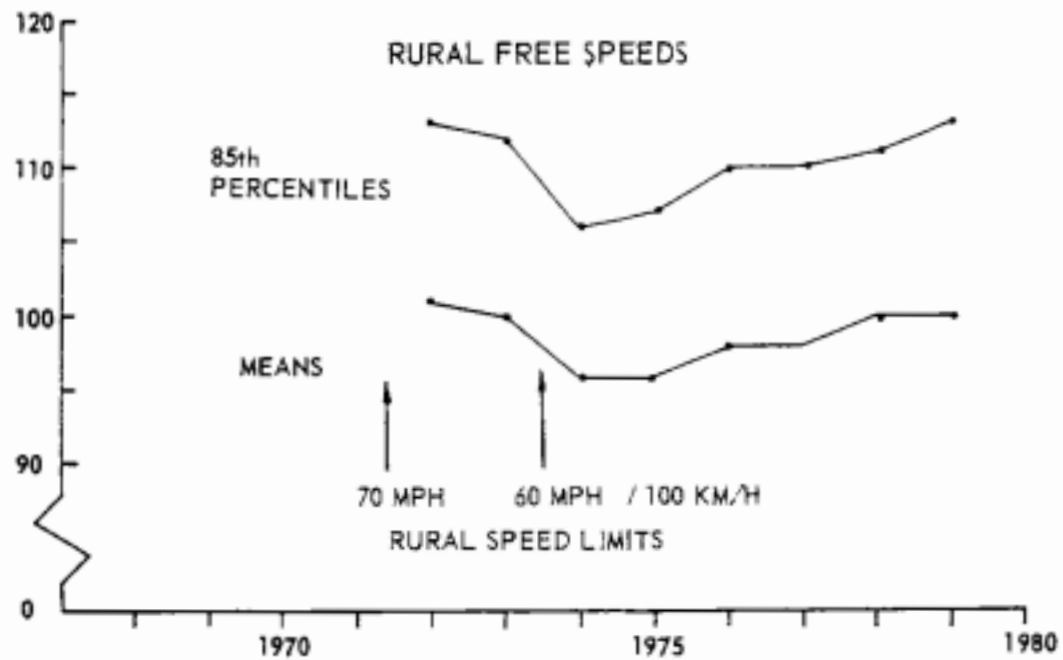
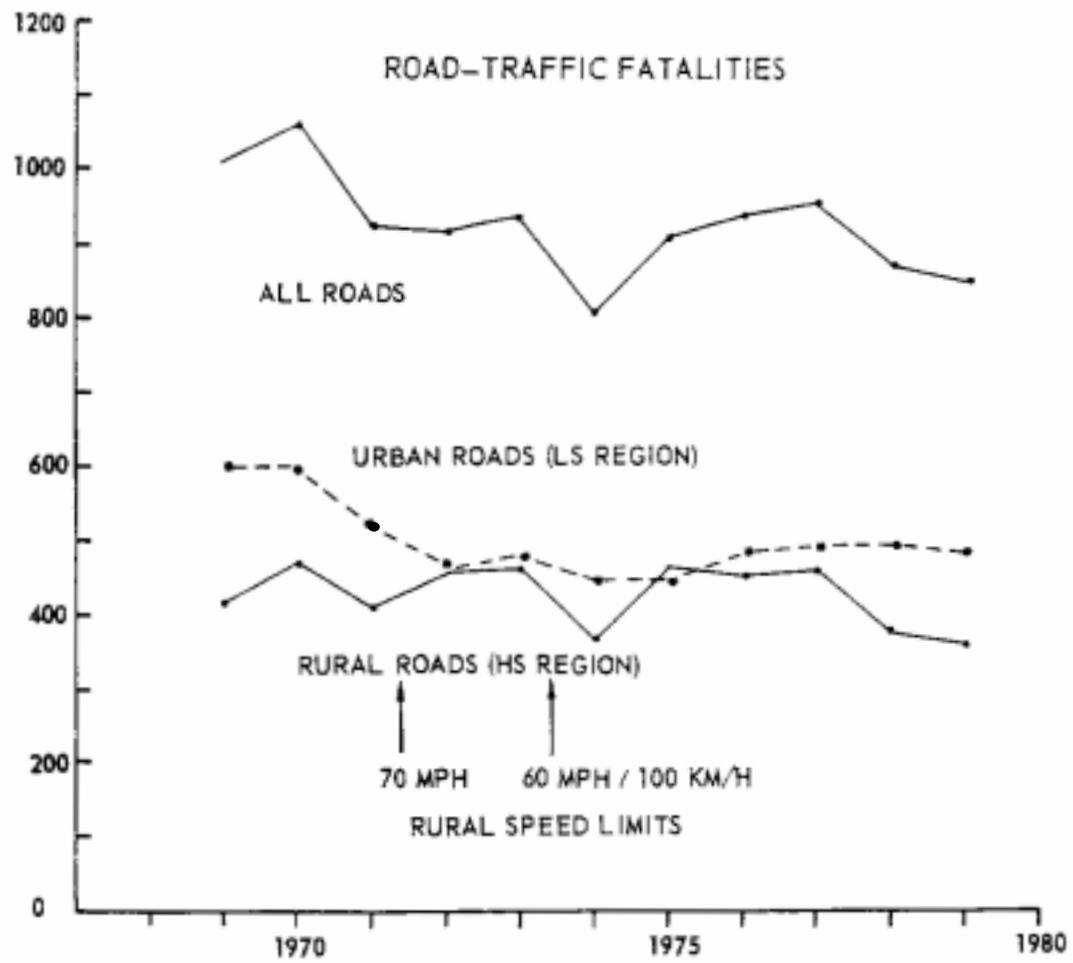


FIG. 7 - FATALITIES AND RURAL FREE SPEEDS IN VICTORIA, 1969-79

DIFFERENTIAL SPEED LIMITS IN RURAL AREAS

The previous Section examines absolute limits for general traffic in rural areas. Possible differential limits are considered in this Section, under the following subject headings:-

- (1) Heavy trucks.
- (2) Omnibuses.
- (3) Vehicles towing caravans/trailers.
- (4) Motorcycles with passengers.
- (5) Night-time.

Prior to the ACRUPTC review of the Code in 1977-79, the Code contained differential speed limit provisions of 80, 90, 80 and 70 km/h respectively for the four vehicle classes given above; however the motorcycle limit was removed from the Code in 1979, as described in an earlier Section.

A possible differential limit for night-time driving is examined because of two points arising from the previous Section, namely:-

- (a) the large differences between daytime and night-time accident and casualty rates in Solomon (1964), see Figs.5 and 6, and
- (b) the preference given to an absolute (daytime) limit of 110 km/h instead of 100 km/h.

HEAVY TRUCKS

All States except Queensland have a differential speed limit of 80 km/h on heavy trucks, as shown in Table I; ACT retains a more complex structure of limits between 50 and 80 km/h, based

upon different vehicle masses. Thus most States employ a differential limit for trucks which agrees with the current Code provision (Table I).

The recent study of free speeds, Office of Road Safety (1979), obtained good truck samples from five States and this information is summarised in Table IV and Fig.1, from which it can be stated that for four mainland States:-

- (a) mean and 85th percentile free speeds are approximately 80 and 90 km/h respectively, (although the 85th percentile for trucks is higher on some NSW roads),
- (b) truck speeds in Queensland (100 km/h truck limit) are not significantly higher than in NSW, Victoria or SA,
- (c) semi-trailers travel faster than rigid trucks by about 3 km/h on average, (but with considerable variation about this figure),
- (d) to the nearest 5 km/h, trucks on average are 15 to 20 km/h slower than cars,

and for Tasmania:-

- (e) truck speeds are about 10 km/h below those on the mainland, and
- (f) to the nearest 5 km/h, truck means and 85th percentiles are respectively 10 and 20 km/h below those for cars.

On the basis of an 85th percentile free speed criterion, a suitable Australian truck speed limit would therefore be 90 km/h.

The RoSTA HCV Operational Safety Study, carried out in early

1978, was a comprehensive investigation of truck safety, which originated mainly from a request to raise Victoria's 65 km/h rural limit for trucks, but which covered many aspects of truck safety. As a result of this study, this rural limit has now been raised to 80 km/h, although the Study Team's recommendation was for a truck speed limit of 90 km/h, RoSTA (1978).

The following seven findings on truck safety are taken from the Accident Analysis Task Report, Cowley (1978), and Vehicle Braking Task Report, MacKay (1978), prepared for the RoSTA study. The main findings of other truck safety studies - such as Messiter (1971), Croft (1972) and Pak-Poy (1971) - were confirmed in the RoSTA report on accident analysis. Car and truck free speeds measured in the RoSTA study are the Victorian data shown in Table IV and Fig.1.

- (1) Car and truck casualty accident trends in Victoria during 1969-76 (shown in Fig.8) can be summarised as 5 to 6% per year declines in car and rigid truck casualty accidents and 0 to 4% per year declines in semi-trailer casualty accidents. There is little doubt that car safety measures (such as seat-belt wearing legislation and Australian Design Rules (ADR)) contributed to these declining trends, because most casualties in car-truck collisions are car occupants; however, other safety measures (such as improvements in traffic management, road design, truck design, etc.) would be required to explain the fast decline in rigid truck single vehicle casualty accident data. (It should be noted that Victorian accident forms do not distinguish between light and heavy trucks).

- (2) Victorian casualty accident patterns - by vehicle type, accident type and by high-speed (HS) and low-speed (LS) regions - were also examined for the same 8-year period. This analysis showed that many of these trends were 'stable' or decreasing, but a noticeable exception was a rising trend in semi-trailer ran-off-road type accidents in the HS region. It is possible that this is mainly a night-time problem, but this was not examined in the Study. This trend might reflect increasing exposure, but without further information it would seem undesirable to allow semi-trailers to be driven above current speeds.
- (3) Estimated casualty accident rates (in terms of vehicle-distances travelled) for Victorian cars and trucks halved approximately during 1969-76. A comparison of single-vehicle (SV) and multi-vehicle (MV) accident rates showed that:-
- (a) SV rates are lower than MV rates,
 - (b) SV truck rates are lower than SV car rates,
 - (c) truck-car rates are higher than car-car rates, and
 - (d) rigid truck rates are lower than semi-trailer rates.

However, a preliminary analysis of accident rate models showed that the mechanism of car-truck collisions, in relation to car-car collisions, single vehicle accidents and exposure, is not fully understood. In particular, conclusion (c) above could be invalid, as car-truck rates could be consistent with car-car rates.

- (4) The main casualty accidents involving cars and trucks in Victoria, for 1975 and 1976 combined, total 19,738 and can be summarised for SV and MV accident types, and LS and HS regions, as follows:-

	C	S	R
LS	5273 (27%)	36 (0.2%)	148 (0.7%)
HS	2759 (14%)	95 (0.5%)	70 (0.4%)
	CC	CS	CR
LS	8429 (43%)	239 (1.2%)	711 (3.6%)
HS	1653 (8%)	132 (0.7%)	193 (1.0%)

where C, S and R denote SV accidents involving cars, semi-trailers and rigid trucks respectively, and CC, CS and CR denote equivalent two-vehicle accidents. Truck-truck accident numbers are small and not shown above. Thus trucks contribute to 8% of all casualty accidents shown above and to 12% of all HS region casualty accidents.

- (5) A comparison between car and truck SV and MV accident patterns in the HS region of Victoria showed no significant difference between patterns, and it was concluded that there is little or no indication of a truck 'speed problem' at current speeds.
- (6) Reported speeds of cars and trucks involved in Victorian casualty accidents were examined in detail, and the main conclusion was that reported truck speeds in HS region accidents were at least 20 km/h lower than reported car speeds, which is consistent with the 20 km/h difference obtained from measured free speeds.
- (7) The Vehicle Braking Task Report estimated that a high

proportion of trucks (certainly most modern trucks) would meet the requirements of ECE 13/ADR 35 Regulations - approximately 4 metres/sec² of deceleration - and that a high proportion of cars would meet the requirements of FMVSS 105 Regulations - approximately 5.6 metres/sec² deceleration. When the free speed distributions of cars and trucks are combined with these braking curves, it can be shown that the distributions of braking distances are comparable for cars and trucks.

In summary, the Victorian truck accident problem is fairly small, truck accident rates are comparable with or lower than car rates, and car and truck braking distances are comparable; however, a safety problem might arise if truck (particularly semi-trailer) speeds were allowed to rise on rural roads.

Table IV and Fig.1 show that Victorian car and truck rural free speeds can be summarised (to the nearest 10 km/h) by:-

	Mean	85th Percentile
Cars	100	110
Trucks	80	90

where all measurements were taken in daylight hours.

On the basis of this information, the RoSTA Study Team recommended that the rural speed limit for trucks be set at 90 km/h, RoSTA (1978).

A comparison between Victoria and Queensland would be of interest, because the latter State imposes no differential speed limit on trucks (Table I). Table IV and Fig.1 show that the

free speed difference between cars and trucks is some 7 km/h smaller in Queensland (than in Victoria) due to slower cars and faster trucks. There are indications from Fig.4 and Cowley (1978) that casualty/accident rates in Queensland are comparable with, or higher than, those in Victoria. However, a detailed study of Queensland car/truck accident patterns and rates would be necessary for accurate comparison with the Victorian findings; without such a study, it is impossible to form conclusions regarding the different rural speed limit systems employed in Victoria and Queensland.

On the basis of the information presented above, it is recommended that the rural speed limit for trucks in the Code be set at 90 km/h. This recommendation is conditional upon a general traffic (daytime) limit of 110 km/h being adopted, as recommended in the previous Section. If, however, a general traffic limit of 100 km/h was selected instead, it might be difficult to justify a truck differential limit which is only 10 km/h lower, although the evidence for a truck limit of 90 km/h is substantial.

OMNIBUSES

Table I shows that five States and Territories employ differential limits for omnibuses, four of which are set at 90 km/h, in agreement with the current Code provision.

From the recent study of rural free speeds, Office of Road Safety (1979), two mainland States, Queensland and SA, recorded reasonable overall sample sizes for rural free speeds for buses, namely 57 and 118 respectively. These States recorded mean speeds of 87 km/h, and the average 85th percentiles were 93 and 96 km/h respectively. Comparison with equivalent data (for these two

States) for cars and trucks shows that, to the nearest 5 km/h, buses are 10 km/h slower than cars and 5 km/h faster than trucks. On the basis of an 85th percentile free speed criterion, a suitable rural limit for buses would therefore be 90 km/h.

The small sample sizes obtained in Office of Road Safety (1979) are an indication of the low rural vehicle-distances covered by buses. It can therefore be expected that the rural bus accident problem is small; this is supported in Australian Road Research Board/Department of Transport (1976), which shows that accident and casualty rates per vehicle-distance or occupant-distance are, overall, generally lower for buses than for other road vehicles. This is also mentioned in Advisory Committee on Safety in Vehicle Design (1974), which emphasises that the bus accident situation is essentially an urban problem, with no association with high speeds. The latter point is also supported by a study of bus accidents in Victoria, Pak Poy (1971).

The Accident Analysis Task Report, Cowley (1978), in the RoSTA HCV Operational Safety Study showed that for Victoria, during 1969-1976, bus and car-bus casualty accidents totalled approximately 80 per annum, resulting in 140 casualties (including 5 fatalities). An analysis of 1975-76 data showed that bus and car-bus casualty accidents for this period were divided into urban and rural regions in the ratio of 135:11; thus the Victorian rural accident problem for buses is very small. The RoSTA Study Team subsequently recommended that HCV speed limits should be based upon a common philosophy, oriented to all HCV classes, including buses.

The limited evidence available therefore shows that buses operating in rural areas are relatively safe and appear to travel

about 10 km/h slower than cars and 5 km/h faster than trucks. It is not known whether bus accidents would increase or not if their speeds were allowed to rise. Therefore it is conservatively recommended that the rural speed limit for buses be set at 90 km/h, as for trucks, in line with the current Code provision. This recommendation is conditional upon a general traffic (daytime) limit of 110 km/h being selected; if 100 km/h were selected instead, there would appear to be little evidence to support a differential limit for buses.

VEHICLES TOWING CARAVANS/TRAILERS

Office of Road Safety (1979) includes free speed data from three States, NSW, SA and Queensland, on these vehicle combinations. The agreement between these free speeds is good, as shown by the following:-

	<u>Mean (km/h)</u>	<u>85th Percentile (km/h)</u>
NSW (80 PF limit)	88	-
NSW (100 zone limit)	85	97
SA	85	96
QLD	83	93

Table I shows that NSW, Victoria, WA and Tasmania all have differential limits of 80 km/h for vehicles-towing, in agreement with the Code. Thus of the three States given in the table above, only NSW has such a limit.

These figures indicate that a differential limit has little or no effect on free speeds; indeed, on the basis of an 85th percentile free speed criterion, a suitable rural limit would be 90 km/h.

Comparison with the equivalent data from NSW, SA and Queensland for cars-only and trucks shows that (to the nearest 5 km/h) the free speeds of cars-towing are:-

10 to 15 km/h below cars-only, and
0 to 5 km/h above trucks.

Thus it can be inferred that the speed characteristics of cars-towing are slightly above those of trucks, but considerably below those of cars-only.

Two Australian reports are available on accidents involving vehicles-towing, Vaughan (1974) on cars towing caravans and Boughton (1979) on vehicles towing caravans and trailers. The former is an analysis of one year's data (1972/73) in NSW, which at that time had a 45 mph vehicle-towing limit, and the latter covers three years' data (1974/75 to 1976/77) in Queensland, which has no differential limit. (Queensland abolished this limit some years ago as a result of rural traffic congestion.)

The NSW study found that accidents involving cars towing caravans constituted 0.35% of all reported accidents and 0.18% of all casualty accidents; no exposure data was available to compute accident rates. About three-quarters of the caravan accidents occurred on rural roads. The largest single characteristic (nearly one quarter) of the accidents was overturning on the road. In almost half of the accidents, stability of the combination appeared to have been a causal factor. As a result, Vaughan (1974) recommended that the then NSW speed limit for these combinations of 45 mph (72 km/h) be raised to 80 km/h, in accordance with the proposed metric conversion of this limit, and this was implemented at metrification in mid-1974.

The study of Queensland data found that accidents involving all vehicles-towing constituted 3.4% of all reported accidents and 2.8% of all casualty accidents; of these, about half were cars (including car derivatives) towing trailers and a quarter were cars towing caravans. Thus the accident involvement of car-caravan combinations in Queensland was 2 to 4 times higher than that in NSW; however, it was argued that differences in accident reporting criteria, and numbers of caravans registered, were sufficient to cast doubt on this apparent over-involvement. Rural roads accounted for about three-quarters of car-caravan accidents - in agreement with the NSW results - and about half of all towing accidents. Boughton (1979) concluded that implementation of a special vehicle-towing limit for Queensland, below the general traffic limit of 100 km/h, could not be justified on the available data.

The two studies differed regarding overturning accidents, as the Queensland proportions were 24% of all accidents and 18% of casualty accidents, compared with the corresponding NSW figures of 22% and only 6%. However, the overturning problem is large; for this reason and because of the general over-involvement of towing accidents on straight and level roads, there does appear to be a stability problem. The apparent stability problem would become worse if speeds were permitted to increase, so that a speed limit close to existing free speeds is warranted.

On the basis of this information, it is recommended that vehicles towing caravans and trailers be limited to 90 km/h, as recommended earlier for trucks. This assumes that the general traffic limit adopted is 110 km/h. If however a general limit

of 100 km/h were chosen, it might be difficult to support a lower limit for vehicles-towing.

MOTORCYCLES WITH PASSENGERS

No States or Territories impose rural differential speed limits on motorcycles, but prior to the recent ACRUPTC review both Victoria and ACT had limits for motorcycles carrying pillion passengers, of 80 and 70 km/h respectively, (the latter being in agreement with the Code provision at that time). Following the recent ACRUPTC review, the Code provision has been removed and only ACT now has a differential limit for motorcycles carrying pillion passengers (Table I); it is understood that legislation has been proposed to remove this limit in the ACT.

The recent free speed report, Office of Road Safety (1979), shows that Queensland and SA recorded reasonable overall sample sizes for motorcycles, of 58 and 83 respectively; these States recorded mean speeds of 96 and 92 km/h respectively, and 85th percentile speeds of 107 and 104 km/h respectively. Comparison with car free speed parameters in Table IV shows that motorcycle free speeds are comparable. Sample sizes for motorcycles carrying pillion passengers were too small for analysis purposes.

The literature on motor cycle safety is growing rapidly and much of this is recorded in Australian Road Research Board/ Department of Transport (1976) and House of Representatives Standing Committee on Road Safety (1978). This literature summarises the motorcycle accident situation as essentially an urban, high severity, high accident-rate, motorcycle-conspicuity problem, with a strong association with young, inexperienced riders and motorcycles

with large capacity engines. There appears to be no evidence of high speeds being a more serious factor in accident causation for motorcycles than for drivers of motor vehicles.

It is not clear why differential limits came into being for motorcyclists carrying pillion passengers. The House of Representatives report states that user groups argued that motorcycles are designed to carry pillion passengers safely. The double occupancy of such combinations approximately doubles the chance of a person being injured, given that an accident does occur; however a NSW study in 1975, quoted in the above reference, found that only 10% of motorcyclist casualties are pillion passengers, so that the rider plus passenger accident problem is small in comparison with the rider-only problem.

On the basis of the limited available evidence it appears that no differential limit is required for motorcycles carrying pillion passengers; this is in line with the current provisions in the Code.

NIGHT-TIME

As stated earlier in this report, the subject of a special limit for night-time was discussed with Traffic Authorities in early 1979 and little support was received for such a limit. The main arguments against a lower night-time limit included improvements in rural road design (involving greater use of delineators and pavement line marking) and vehicle lighting in recent years.

The majority of accident publications include the time of

day factor, but few contain a light/dark split to illustrate the magnitude of the night-time accident problem. In addition, very little information is available on vehicle-exposure to compute night-time rates, and few comparisons have been made of night versus day free speeds. The limited information available on Australian free speeds - unpublished data from NSW, Victoria, WA and Tasmania - shows that night and day speeds are comparable, with some evidence from Victoria (early 1970's) that trucks travel a little faster at night.

Figs.5 and 6 taken from Solomon (1964) show clearly that night-time rates were approximately twice daytime rates and that the night-time rate increases much faster than the daytime rate at high speeds. The approximate speed percentiles in Fig.5 show that night-time speeds were only 2 to 3 mph below daytime speeds. Of the 27 two-lane sites studied by Solomon, 10 had day/night differential limits of 10 mph, 3 had 5 mph and 9 had no differential; the remainder had various mixtures of subjective limits.

National Highway Safety Bureau (1969) quotes the following limits of visibility -

- (1) 530 ft (160 m) for high beam headlights with no glare,
- (2) 270 ft (80 m) for high beam versus high beam, i.e. with glare,
- (3) 200 ft (60 m) for low beam versus low beam, i.e. with glare.

It is not known whether the advent of quartz halogen lights has changed these figures significantly or not. The corresponding

speeds for stopping distances equal to these limits of visibility, on dry (new concrete) pavements assuming 1 or 2 second reaction times, are as follows (to the nearest 10 km/h):-

	<u>2 seconds</u>	<u>1 second</u>
(1)	130	150
(2)	80	100
(3)	60	80

Thus although headlight performance appears to be adequate in the high-beam, no glare situation, the 'with glare' situation would require safe speeds to be in the range of 60 to 100 km/h.

The Accident Analysis Task in the RoSTA HCV Operational Safety Study, Cowley (1978), examined day versus night casualty accidents in Victoria for car, semi-trailer and rigid truck single vehicle accidents (C, S and R respectively) and car-car, car-semi-trailer and car-rigid truck two-vehicle accidents (CC, CS and CR respectively). The following table covers 19,738 casualty accidents, for 1975 and 1976 combined, divided into light and dark (including dusk and dawn), and into high-speed (HS) and low-speed (LS) regions.

		C	S	R	Total
LS	Light	2723	24	120	2867
	Dark	2550 (48%)	12 (33%)	28 (19%)	2590 (47%)
HS	Light	1277	34	48	1359
	Dark	1482 (54%)	61 (64%)	22 (31%)	1565 (54%)
		CC	CS	CR	Total
LS	Light	4961	165	513	5639
	Dark	3468 (41%)	74 (31%)	198 (28%)	3740 (40%)
HS	Light	1118	86	136	1340
	Dark	535 (32%)	46 (35%)	57 (30%)	638 (32%)

Thus in the HS region one-half of single vehicle accidents and one-third of multi-vehicle accidents occur at night (including dusk and dawn). It is possible that the headlight limitations on 'safe' speeds discussed earlier would affect the (smaller) number of multi-vehicle accidents more than the single vehicle accidents - although our knowledge of night-time accidents is limited - but it could be argued that lowering speeds might be beneficial in the HS region.

It would appear that further work would be necessary to define more clearly the likely benefits of a night-time limit. However on the basis of the information above it is recommended that consideration be given to a night-time differential limit, particularly in view of the preference given in the previous Section for an absolute limit for general traffic of 110 km/h. On the basis of the 'with glare' speeds given earlier, an appropriate differential limit for night-time might be 90 km/h. If however, a general traffic limit of 100 km/h were selected, it might be difficult to justify a lower limit for night-time.

SUMMARY

This Section has examined rural differential speed limits for a number of vehicle classes and for night-time driving.

Recommended differential speed limits (km/h) are:-

Heavy Trucks	90	
Omnibuses	90	
Vehicles towing Caravans/Trailers	90	
Motorcycles (with/without Passengers)	None (i.e. general limit)	
Night-time Driving	90	(subject to further research)

The recommendations are conditional upon selection of a 110 km/h absolute limit for general traffic. The recommended speed limit for trucks is based upon substantial evidence, whereas those for the remaining categories are not. Further research would be necessary to reach firmer conclusions in some cases; in particular, it is considered that night-time accidents and speed behaviour should be investigated further, as Australian data in this area is very limited.

If an absolute limit of 100 km/h were selected instead of 110 km/h, it is considered that there would be little justification for imposing any differential limits, with the possible exception of heavy trucks, where the evidence in support of a limit of 90 km/h is substantial.

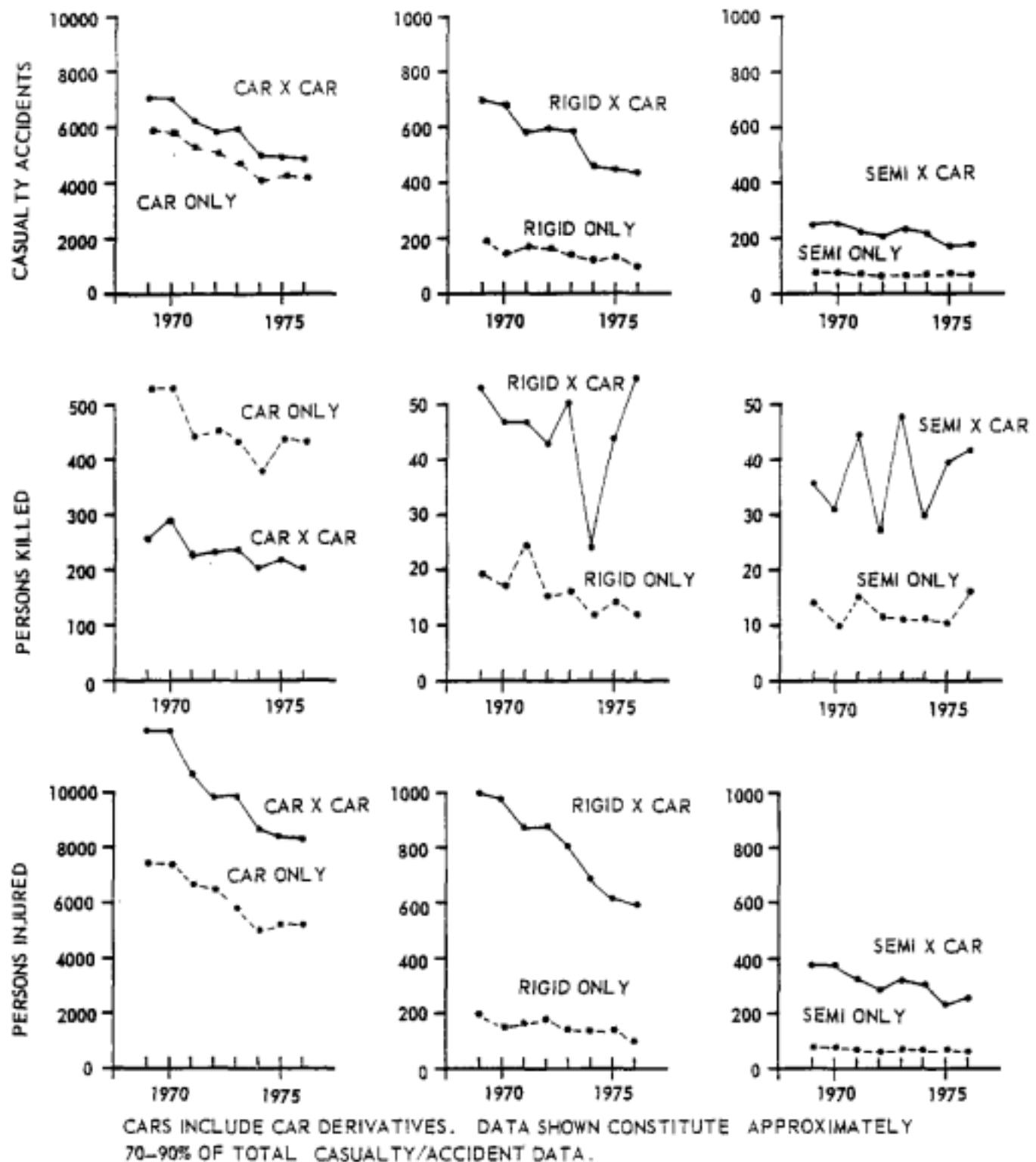


FIG. 8 . VICTORIAN CASUALTY ACCIDENT DATA FOR 1969-76
FOR CARS, RIGID TRUCKS & SEMI-TRAILERS

SUMMARY AND RECOMMENDATIONS

The National Road Traffic Code is being reviewed by the Advisory Committee on Road User Performance and Traffic Codes (ACRUPTC), and during 1978/79 an assessment of speed limit provisions in the Code was undertaken. The present study was originally performed to contribute to the ACRUPTC review, but it has been subsequently updated to include changes made in late 1979 to the Code provisions and to State and Territory practice.

The study has concentrated upon rural speed limits, as the main differences between Code provisions and Australian practice are in this area, (Tables I-III). The study therefore examines local and overseas information on rural speed limits in relation to road-traffic safety; this includes recent Australian free speed data obtained from the 1978/79 national survey carried out under the coordination of ACRUPTC, (Table IV, Fig.1).

Current Australian speed limits for general traffic on rural roads are either 100 or 110 km/h, (Table I). Speed zoning is not employed to any great extent on rural roads. Free speeds of cars and car derivatives from the 1978/79 survey can be broadly described by:-

Means:	90 to 100 km/h
85th Percentiles:	100 to 110 km/h

for mainland Australia (Table IV, Fig.1), although there is considerable variation in the data. There appears to be no meaningful relationship (correlation) between these free speed parameters and the speed limit values.

The study finds that a suitable absolute speed limit for Australia would be 100 or 110 km/h, and that there appears to be no clear advantage for either level, for daytime operation. Of the two, the preferred limit is 110 km/h, as it is representative of current free speeds of most cars in mainland States, would probably not adversely affect current rural safety, would command the respect of most car drivers for this speed limit (and other speed limits determined by current speed zoning practice) and could be realistically enforced, i.e. with minimal tolerances.

Differential limits for Australian rural roads vary from seven types in Victoria to none in Queensland; three differential limits are included in the Code provisions (Table I).

The study examines differential limits for four vehicle classes - heavy trucks, omnibuses, vehicles-towing and motorcycles with passengers - and recommends 90 km/h limits for the first three and no differential limit for motorcycles with passengers. In addition, a 90 km/h differential limit is suggested for night-time operation, although this requires further research. In all cases, these recommendations are conditional upon 110 km/h being selected as the (daytime) general traffic limit. Indeed, it is considered that if 100 km/h is selected as the general traffic limit instead, there would be little justification for imposing any differential limits - which is the situation in Queensland - although a possible exception concerns heavy trucks, where the evidence supporting a 90 km/h limit is substantial.

The recommended rural speed limits for the Code are summarised below as (1) preferred limits, based upon selection of a 110 km/h general limit, and (2) alternative limits, based upon 100 km/h

being selected instead. Current Code figures are shown for comparison. All units are km/h.

VEHICLE CLASS OR ENVIRONMENTAL CONDITION	PREFERRED LIMITS	ALTERNATIVE LIMITS	CODE LIMITS
General Traffic	110	100	110
Heavy Trucks	90	90 or 100	80
Omnibuses	90	100	90
Towed Caravans/Trailers	90	100	80
Night-Time Driving (subject to research)	90	100	—

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APPENDIX - FATALITIES BY SPEED REGIONS

Four States - New South Wales, Victoria, Queensland and South Australia - have provided special fatality tables, divided into MV* occupants and non-occupants, and into HS and LS regions of the States. This information is summarised in the following Tables A1 to A4, and the MV occupant fatality data are shown in Fig. A1.

MV occupants are defined as drivers and passengers in all motor vehicles, except motor cycles, and non-occupants are defined as the complement of MV occupants. Pillion passengers on motor cycles are thus placed in the non-occupant category, which is different from the practice followed in ABS publications.

The HS regions are defined as those in which upper speed limits apply, so that these regions mainly apply to roads outside built-up areas, (the main exceptions would be urban freeways with high speed limits). The LS regions are defined as the complement of the HS regions. It should be noted that in NSW the HS region covers roads which are speed-zoned at 60, 70 mph or 100, 110 km/h, as well as roads subject to the 50 mph or 80 km/h prima facie speed limit.

The fatality data for the years following seat belt wearing legislation can be summarised by the following totals:-

State	HS Region		LS Region		Total
	MV Occ	Non-Occ	MV Occ	Non-Occ	
NSW 72-77	2487 (34 %)	394 (5 %)	2256 (31 %)	2237 (30 %)	7374 (100 %)
VIC 71-77	2652 (42 %)	421 (7 %)	1556 (24 %)	1759 (28 %)	6388 (100 %)
QLD 72/3-77/8	1474 (41 %)	305 (9 %)	816 (23 %)	963 (27 %)	3558 (100 %)
SA 73-77	719 (43 %)	102 (6 %)	386 (23 %)	456 (27 %)	1663 (100 %)

* Throughout this Appendix, MV denotes motor-vehicle.

The fatality patterns for Victoria, Queensland and SA are reasonably consistent, whereas that for NSW differs by having similar numbers of MV occupant fatalities in both HS and LS regions.

Possible reasons for the similarities and differences between these States would include geographical and demographical factors, as well as road and traffic factors, and further research would be necessary to establish relationships between such factors and these fatality patterns.

It is of interest to note that NSW, which recorded the highest rural free speeds in the recent ACRUPTC Survey (Fig. 1), appears to have the lowest proportion of HS region fatalities amongst MV occupants. One therefore questions whether current rural free speeds (and rural speed limits) have an appreciable effect on road-traffic fatality patterns, compared with other safety measures.

TABLE A1 - FATALITY TABLES FOR NSW

YEAR	HS REGION		LS REGION		TOTAL
	MV Occ	Non-Occ	MV Occ	Non-Occ	
1968	436 (34)	48 (1)	362	350	1196 *
1969	455 (39)	43 (2)	327	351	1176 *
1970	440 (71)	47 (8)	422	381	1290 *
1971	451 (103)	31 (3)	397	358	1237 *
1972	383 (77)	52 (6)	310	339	1084 *
1973	377 (67)	65 (19)	384	381	1207 *
1974	346 (151)	62 (30)	442	416	1266 *
1975	464 (253)	73 (31)	376	372	1285 *
1976	452 (243)	75 (36)	373	364	1264
1977	465 (233)	67 (29)	371	365	1268

SOURCE: TARU SPECIAL TABLES

* Totals differ slightly from ABS Publications

Figures in parentheses refer to rural highways speed-zoned at 60, 70 mph or 100, 110 km/h (absolute limit), whereas HS Region figures also include those subject to the 50 mph or 80 km/h prima facie limit.

TABLE A2 - FATALITY TABLES FOR VICTORIA

YEAR	HS REGION		LS REGION		TOTAL
	MV Occ	Non-Occ	MV Occ	Non-Occ	
1969	383	35	312	281	1011
1970	427	45	316	273	1061
1971	362	47	254	260	923
1972	413	45	192	265	915
1973	401	62	215	257	935
1974	306	60	211	229	806
1975	395	67	224	224	910
1976	377	78	234	251	940 *
1977	398	62	226	273	959 *

SOURCE: ABS(VIC) AND RoSTA SPECIAL TABLES

* Totals differ slightly from ABS Publications

TABLE A3 - FATALITY TABLES FOR QUEENSLAND

YEAR	HS REGION		LS REGION		TOTAL
	MV Occ	Non-Occ	MV Occ	Non-Occ	
1972/3	268	55	139	163	625
1973/4	256	53	130	164	603
1974/5	249	42	131	161	583
1975/6	228	46	155	171	600
1976/7	251	55	128	153	587
1977/8	222	54	133	151	560

SOURCE: ABS (QLD) SPECIAL TABLES

TABLE A4 - FATALITY TABLES FOR SA

YEAR	HS REGION		LS REGION		TOTAL
	MV Occ	Non-Occ	MV Occ	Non-Occ	
1973	145	21	80	83	329
1974	169	23	86	104	382
1975	149	22	79	89	339
1976	122	18	78	89	307
1977	134	18	63	91	306

SOURCE: HIGHWAYS DEPT. (SA) SPECIAL TABLES

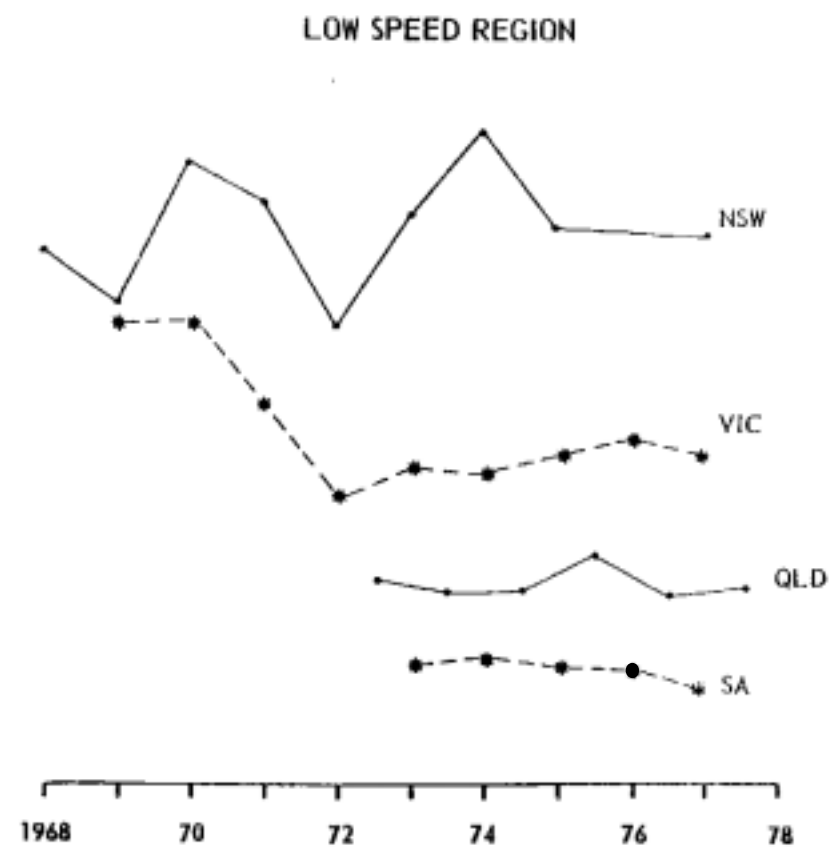
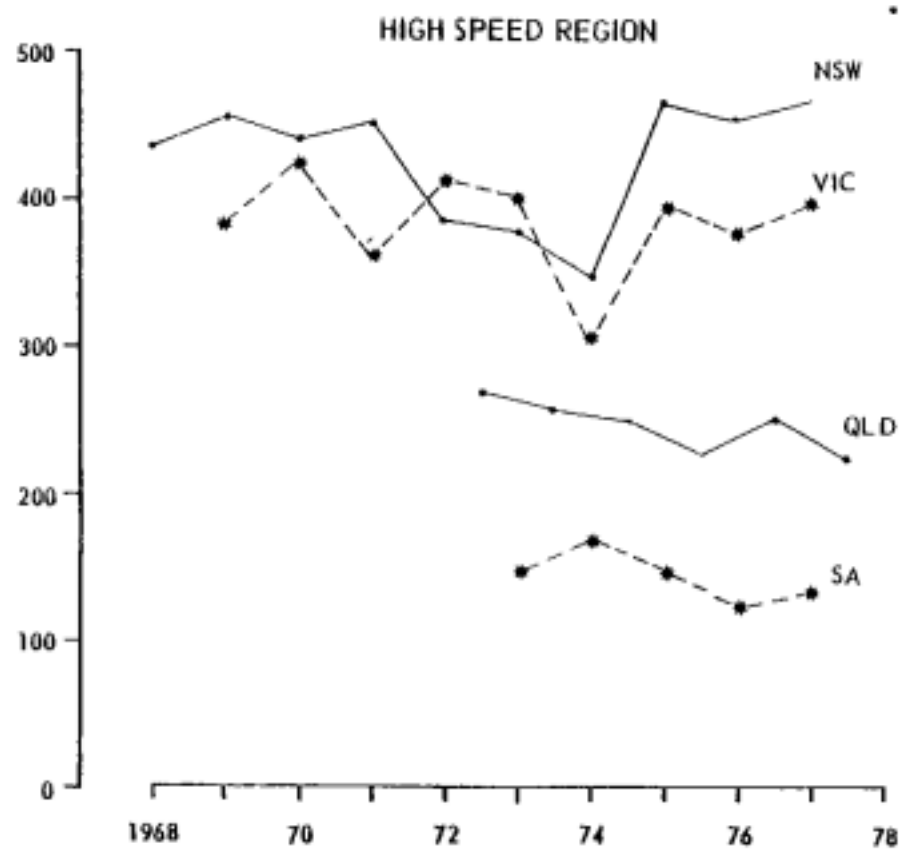


FIG. A1 - MV OCCUPANT FATALITIES BY SPEED REGIONS