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APPENDIX A

STUDY BRIEF

RESEARCH SPECIFICATION: ANALYSIS OF HEAVY VEHICLE FATAL AND SERIOUS INJURY CRASHES IN N.S.W.

INTRODUCTION

The Road Safety Bureau of the Roads and Traffic Authority, N.S.W. and the Federal Office of Road Safety and the Department of Transport and Communications, Australia are jointly undertaking a detailed study of heavy vehicle crashes in N.S.W.. To assist with this study tenders are being invited for the research work specified below.

The contract for the work will be let jointly by the Road Safety Bureau and the Federal Office of Road Safety.

BACKGROUND

In N.S.W. in 1988 there were 120 fatal crashes involving articulated vehicles, resulting in 151 fatalities. This compares with 59 crashes resulting in 75 fatalities the previous year, and has occurred against background of a decline in both casualty and all reported crashes over the preceding several years. The increase in fatal crashes took place in the year in which the heavy vehicle open road speed limit was increased from 90 to 100 km/h (1 July 1988).

The reason for the fatal crashes in 1988 have not been determined. On preliminary information based on mass data there does not appear to have been any disproportionate increase in the number of crashes in which the articulated vehicle was at fault, or in which excessive speed was involved. Wet weather may have had some influence. There are indications of an increase in economic activity in 1988, leading to more road activity, and more travel generally as a result of the activities of the Bicentennial Year.

Because of the costs and consequences of crashes involving heavy vehicles, there is a need to determine as definitely as possible what were the causes and circumstances of these crashes, with a view to developing effective countermeasures.

OBJECTIVES

1. To ascertain the circumstances and, as far as possible, the causes of fatal and serious injury crashes involving heavy vehicles occurring in N.S.W. in 1988 and 1989.

2. To provide a basis for the development of countermeasures to improve heavy vehicle safety.

METHOD

The study will comprise 3 strands

The first strand involves a detailed examination of all available crash data on fatal and serious injury crashes involving heavy vehicles (heavy rigid trucks, articulated vehicles and long distance coaches) in N.S.W. in 1988 and 1989, incorporating at least the data items and elements listed in Attachment A. It is anticipated that the study will concentrate initially on crashes occurring on the Pacific and Hume Highways in N.S.W., moving on to other routes carrying heavy volumes of freight traffic if resources permit.

Data for this strand of the study shall include, initially, the police accident report form (P4 form). (At this stage, this will only cover 1988 crashes). Additional data on these crashes shall be obtained from Police Accident Investigation Squads, local police and local R.T.A. divisional offices, incorporating at least the data elements listed on Attachment A. The forms at Attachment B shall be the basis for the data collection. The additional data shall be collected by the consultant, local R.T.A. divisional staff or R.S.B. staff as resources or protocol allow. Where site and/or interviews shall be conducted, or arranged to be conducted to obtain the missing data.

For crashes occurring before the appointment of the consultant, the crash data shall be collected retrospectively.

For crashes occurring after the appointment of the consultant, the crash data shall be collected as "on-site" as possible. The consultant shall liaise closely with Police, R.T.A. divisional office staff and Road Safety Bureau staff to ensure that the crash data is collected. At this stage it is expected that Police will collect vehicle and driver data on-site and that the consultant will collect site data with possible assistance from R.T.A. divisional offices as their resources allow.

The second strand of the study comprises a detailed analysis of the N.S.W. mass data on crashes from 1982 to 1988, to determine in what ways (if any) 1988 was different from previous years with regard to heavy vehicle crashes.

The third strand comprises a detailed study of exposure and economic data for the period 1982 to 1988. This strand will address factors such as a change in the number of vehicles in register for the years concerned, or a change in task performance in terms of annual tonne-kilometres or other suitable measure, or a change in weather, in order to ascertain whether there were any particular circumstances occurring in 1988 compared to other years. Where possible and available, economic data should be examined to test the hypothesis that there was greater economic activity in 1988 than in 1987.

The three strands of the study shall be conducted concurrently.

The specific research questions that are to be addressed by this study are:

. Given that N.S.W. in 1988 had a large problem with fatal articulated truck crashes, was the problem significantly different from other years?

. Why are the Pacific and Hume Highways apparently a problem?

. Given that the fatal articulated truck crashes were higher in 1988 than 1987, why was the total number of articulated truck crashes lower in 1988 than 1987? (In other words, why was there a sharp increase in the severity of articulated truck crashes in 1988?).

. How does the heavy vehicle crash situation in 1989 compare to previous years?

. What were the causes and circumstances of heavy vehicle fatal crashes occurring in 1988 and 1989?

. Were heavy vehicles more involved as cause or "key vehicle" in crashes in 1988 than in 1987 or 1989?

. Did the economic travel activity in 1988 differ from that in 1987? If so, how?

. What specific countermeasures are indicated by the outcomes of this study?

CONSULTANT

Intending consultants will be required to demonstrate that they have the expertise and resources to carry out the task.

With regard to the first strand of the study, the consultant will be required to obtain detailed information on crashes on the Pacific and Hume Highways for 1988 and 1989. The Police accident report form (P4 form) and the forms in Attachment B are the basis for the minimum amount of data required.

Where data are missing, the consultant shall be required to collect that data by interviews or site inspections.(R.T.A. divisional office staff will assist in collecting this data as their resources allow).

With regard to the second strand of the study, the consultant will be required to analyse the mass crash data in detail. (Road Safety Bureau staff will assist with the data extraction). This analysis will occur in close co-operation with Road Safety Bureau staff.

With regard to the third strand of the study, the consultant will be required to obtain, analyse and report on relevant economic, travel and weather data, which it is expected will in the main be data available from the Australian Bureau of Statistics, Bureau of Meteorology and similar publicly accessible information.

OUTPUT

The output of the study will be a comprehensive report covering an analysis of the mass crash statistics, detailed examination of the 1988 and 1989 heavy vehicle crashes, and an analysis of exposure/economic data, to place the analysis of the mass crash data into perspective against an economic and travel activity background.

TIMING

The study is expected to take approximately 9 months in total. Mass data up to and including 1988 is already available. 1989 crash data up to June is expected to be available by approximately December 1989. It is expected that collection and analysis of exposure and economic data will proceed in parallel with the collection and analysis of the crash data, and will be commenced by the consultant upon commissioning.

The consultant shall provide interim reports on the detailed examination of the 1988 and 1989 heavy vehicle crashes by 30 November, 1989 (to include at the very least all of the 1988 crashes) and by 26 February, 1990. The consultant shall also provide an interim report on

the analysis of the mass crash data (up to December 1988), the economic data and the exposure data by 18 December, 1989.

Ten copies of a draft report of the complete study shall be provided by 30 April, 1990. After consultation with the Road Safety Bureau and completion of any amendments ought by them, 500 copies of the final report in a format acceptable to the Road Safety Bureau shall be provided by 30 May, 1990.

FURTHER INFORMATION

Further information on this project may be obtained by contacting Mr F. Schnerring on (02) 662 5289

APPENDIX B

STRAND 1 DATABASE CODING DEFINITIONS

WHICH YEAR?		RUM CODE		ROAD FACTOR
1=1988	2=1989	from mass data		1=friction
				2=roughness
WHICH HIGHWAY?		SINGLE VEHICLE?		3=road side objects
1=Hume		1=yes	2=no	4=delineation
2=Pacific				5=alignment
		ARTIC INVOLVED?		6=sight distance
UNDIVIDED ROAD?		1=yes	2=no	7=standard
1=yes	2=no			8=roadworks
		COACH INVOLVED?		9=shoulder
NO KILLED		1=yes	2=no	
input number				ENV FACTOR
		TYPE OF LOCATION		1=rain
VEH CATCH FIRE?		from mass data		2=light
1=yes	2=no			3=object on road
		WET ROAD?		
TRUCK RESPONSIBLE?		1=yes	2=no	
1=yes	2=no			
		AT NIGHT?		
CRASH DESCRIPTOR		1=yes	2=no	
1=truck ran off road				
2=truck head-on into truck		DRIVER OR PEDESTRIAN STATE		
3=truck head-on into coach		1=alcohol, drugs		
4=truck head-on into car		2=ill health		
5=truck (while overtaking) head-on into truck		3=inexperience		
6=truck (avoiding car) head-on into truck		4=attitude		
7=truck (avoiding car) head-on into car				
8=truck (hit cow) head-on into truck		DRIVER OR PEDESTRIAN BEHAVIOUR		
9=truck into cyclist		1=excess speed		
10=truck into pedestrian		2=slow speed		
11=truck rolled into path of truck		3=asleep		
12=truck rolled into path of car(s)		4=aggressive behaviour		
13=truck jacknifed into path of truck		5=inapprop. evasive action		
14=truck jacknifed into path of car(s)		6=overcompensation		
15=truck (avoiding oncoming trucks) into rear of car		7=no avoidance		
16=truck into rear of stationary car		8=inattention		
17=trailer head-on into truck		9=close proximity		
18=trailer head-on into car				
19=truck component into path of car		TRUCK FACTOR		
20=coach head-on into coach		1=load security		
21=car head-on into truck		2=brakes		
22=car head-on into coach		3=instability		
23=car (while overtaking) head-on into truck		4=other defects		
24=car U-turn in path of truck				
25=car into path of truck (at intersection)		CAR FACTOR		
26=car into rear of stationary truck		1=all factors		
27=car (forced by truck) head-on into car				
28=car (forced by truck) into path of truck				
29=cycle into path of truck				
30=pedestrian into path of truck				
31=truck into rear of motorcycle				
32=truck into rear of truck				

Strand 1 Database Coding Definitions

APPENDIX C

STRAND 2 DATA TABLES

NUMBER OF FATAL ARTICULATED VEHICLE CRASHES (Figure 3.1)

YEAR	J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
1982	9	14	11	7	13	9	6	11	9	9	7	9	114
1983	7	9	9	10	10	9	10	9	8	5	10	9	105
1984	2	10	8	5	8	12	11	10	13	8	13	13	113
1985	7	5	8	9	20	5	6	7	7	11	6	7	98
1986	10	4	11	2	8	5	9	5	7	4	9	3	77
1987	5	4	4	4	4	6	5	1	9	5	8	4	59
1988	7	5	13	6	5	10	14	16	13	8	8	15	120
1989	6	7	11	4	7	11	11	7	9	10	6	10	99

NUMBER OF SERIOUS INJURY ARTICULATED VEHICLE CRASHES (ADMITTED TO HOSPITAL) (Figure 3.1)

YEAR	J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
1982	12	25	24	22	25	22	28	26	23	13	25	16	261
1983	18	27	16	18	24	23	24	18	25	20	23	20	256
1984	21	27	26	16	20	22	26	14	16	24	19	18	249
1985	15	26	23	16	13	26	25	18	16	29	26	24	257
1986	16	21	25	14	28	20	22	19	14	20	25	19	243
1987	16	21	22	16	17	13	15	12	15	14	20	13	194
1988	12	11	17	15	19	13	12	13	9	15	25	11	172

NUMBER OF FATAL PLUS SERIOUS INJURY ARTICULATED VEHICLE CRASHES (Figure 3.1)

YEAR	J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
1982	21	39	35	29	38	31	34	37	32	22	32	25	375
1983	25	36	25	28	34	32	34	27	33	25	33	29	361
1984	23	37	34	21	28	34	37	24	29	32	32	31	362
1985	22	31	31	25	33	31	31	25	23	40	32	31	355
1986	26	25	36	16	36	25	31	24	21	24	34	22	320
1987	21	25	26	20	21	19	20	13	24	19	28	17	253
1988	19	16	30	21	24	23	26	29	22	23	33	26	292

YEARLY MOVING TOTALS OF FATAL ARTICULATED VEHICLE CRASHES (Figure 3.2)

	JAN	APR	JUL	OCT
1982				114
1983	105	105	106	105
1984	100	96	103	113
1985	113	122	108	98
1986	103	84	85	77
1987	65	64	58	59
1988	71	78	106	120
1989	119	120	104	99

ACTUAL AND PREDICTED VALUES OF NUMBER OF ARTICULATED VEHICLE CRASHES (Figure 3.3)

	1982	1983	1984	1985	1986	1987	1988
FATAL CRASHES	114	105	113	98	77	59	120
PREDICTED FATAL CRASHES	121	110	100	89	78	68	57
LOWER 95%	92.8	82.2	71.5	60.8	50.1	39.4	28.7
UPPER 95%	149.3	138.6	127.9	117.2	106.5	95.8	85.1
SERIOUS INJURY CRASHES	261	256	249	257	243	194	172
FATAL PLUS SERIOUS	375	361	362	355	320	253	292
PREDICTED FATAL PLUS SERIOUS	390.5	369.4	348.2	327.1	306	284.8	264
LOWER 95%	321.2	300.1	279.0	257.9	236.7	215.6	194.4
UPPER 95%	459.8	438.6	417.5	396.3	375.2	354.0	332.9

NUMBER OF FATAL CRASHES BY ROUTE AND YEAR (Figure 3.4)

ROUTE YEAR

	82	83	84	85	86	87	88
Pacific Hy North	22	19	17	14	14	13	24
Pacific Hy South	**13**	**6**	**7**	**7**	**6**	**5**	**10**
Newell Hy	**6**	**12**	**12**	**7**	**3**	**3**	**10**
Hume Hy	**20**	**17**	**14**	**13**	**15**	**12**	**20**
New England Hy	13	6	8	6	2	5	8
Rest of NSW	**106**	**98**	**119**	**98**	**102**	**101**	**129**
All NSW	**180**	**158**	**177**	**145**	**142**	**139**	**201**
Total highways	74	60	58	47	40	38	72

NUMBER KILLED BY ROUTE AND YEAR (Figure 3.4)

	82	83	84	85	86	87	88
Pacific Hy North	27	24	24	16	19	17	26
Pacific Hy South	16	7	9	8	8	6	11
Newell Hy	6	12	20	8	5	6	15
Hume Hy	22	18	18	18	16	13	31
New England Hy	15	8	12	7	3	7	11
Rest of NSW	123	117	137	108	121	113	152
All of NSW	209	186	220	165	172	162	246
Total of highways	86	69	83	57	51	49	94

NUMBER OF HOSPITAL ADMISSION CRASHES BY ROUTE AND YEAR (Figure 3.5)

ROUTE / YEAR	82	83	84	85	86	87	88
Pacific Hy North	56	48	47	35	57	42	39
Pacific Hy South	26	29	18	20	17	16	7
Newell Hy	15	15	30	17	20	12	15
Hume Hy	33	44	41	29	43	38	28
New England Hy	21	24	16	17	28	16	18
Rest of NSW	456	467	477	468	297	302	287
All of NSW	607	627	629	586	462	426	394
Total	151	160	152	118	165	124	107

NUMBER OF FATAL CRASHES AS A PROPORTION OF ALL NSW (Figure 3.6)

	82	83	84	85	86	87	88
Pacific Hy North	0.122222	0.120253	0.096045	0.096552	0.098592	0.093525	0.119403
Pacific Hy South	0.072222	0.037975	0.039548	0.048276	0.042254	0.035971	0.049751
Newell Hy	0.033333	0.075949	0.067797	0.048276	0.021127	0.021583	0.049751
Hume Hy	0.111111	0.107595	0.079096	0.089655	0.105634	0.086331	0.099502
New England Hy	0.072222	0.037975	0.045198	0.041379	0.014085	0.035971	0.039801

NUMBER KILLED AS A PROPORTION OF ALL NSW (Figure 3.6)

	82	83	84	85	86	87	88
Pacific Hy North	0.129187	0.129032	0.109091	0.09697	0.110465	0.104938	0.105691
Pacific Hy South	0.076555	0.037634	0.040909	0.048485	0.046512	0.037037	0.044715
Newell Hy	0.028708	0.064516	0.090909	0.048485	0.02907	0.037037	0.060976
Hume Hy	0.105263	0.096774	0.081818	0.109091	0.093023	0.080247	0.126016
New England Hy	0.071777	0.043011	0.054545	0.042424	0.017442	0.04321	0.044715

PROPORTION OF NSW HOSPITAL ADMISSION CRASHES (Figure 3.7)

	82	83	84	85	86	87	88
Pacific Hy North	0.092257	0.076555	0.074722	0.059727	0.123377	0.098592	0.098985
Pacific Hy South	0.042834	0.046252	0.028617	0.03413	0.036797	0.037559	0.017766
Newell Hy	0.024712	0.023923	0.047695	0.02901	0.04329	0.028169	0.038071
Hume Hy	0.054366	0.070175	0.065183	0.049488	0.093074	0.089202	0.071066
New England Hy	0.034596	0.038278	0.025437	0.02901	0.060606	0.037559	0.045685

NUMBER HOSPITALISED IN DEG=2 CRASHES BY ROUTE AND YEAR

	82	83	84	85	86	87	88
Pacific Hy North	97	94	125	56	175	66	64
Pacific Hy South	44	63	28	27	36	29	30
Newell Hy	25	57	55	57	61	23	20
Hume Hy	58	73	66	42	63	54	53
New England Hy	33	38	25	20	38	24	26
Rest of NSW	672	736	719	762	447	470	399
All NSW	929	1061	1018	964	820	666	592
Total	257	325	299	202	373	196	193

PROPORTION OF PERSONS HOSPITALISED IN HOSPITAL-ADMISSION CRASHES (Figure 3.7)

	82	83	84	85	86	87	88
Pacific Hy North	0.104413	0.088596	0.12279	0.058091	0.213415	0.099099	0.108108
Pacific Hy South	0.047363	0.059378	0.027505	0.028008	0.043902	0.043544	0.050676
Newell Hy	0.026911	0.053723	0.054028	0.059129	0.07439	0.034535	0.033784
Hume Hy	0.062433	0.068803	0.064833	0.043568	0.076829	0.081081	0.089527
New England Hy	0.035522	0.035815	0.024558	0.020747	0.046341	0.036036	0.043919

A COMPARISON OF CLASSIFYING CRASHES BY SPEED ZONE OR BY ROAD CROSS-SECTION

Relationship of speed zones and road cross-section categories

One might expect that speed zones and road cross-section would be related. Intuitively, there might be more intersections in low speed zones and more divided road in high speed zones. The degree of overlap is outlined in Tables 1 and 2.

The relationship of speed zone and road cross-section was similar for fatal and hospital admission crashes. In low speed zones most crashes occurred at intersections or on undivided sections of road. In high speed zones more than 85% of crashes occurred on undivided sections of road. A surprising result was that more divided road crashes occurred in low speed zones than high speed zones.

Table 1. Classification of fatal articulated vehicle crashes by speed zone and road cross-section (1982-1988).

SPEED	ROAD CROSS-SECTION				
Frequency Percent Row Pct Col Pct	int	undiv	div	unknown	Total
<100	98 14.29 39.36 72.59	118 17.20 47.39 24.03	30 4.37 12.05 56.60	3 0.44 1.20 42.86	249 36.30
>=100	37 5.39 8.62 27.41	366 53.35 85.31 74.54	23 3.35 5.36 43.40	3 0.44 0.70 42.86	429 62.54
999	0 0.00 0.00 0.00	7 1.02 87.50 1.43	0 0.00 0.00 0.00	1 0.15 12.50 14.29	8 1.17
Total	135 19.68	491 71.57	53 7.73	7 1.02	686 100.00

Table 2. Classification of hospital admission articulated vehicle crashes by speed zone and road cross-section (1982-1988).

SPEED ROAD CROSS-SECTION

Frequency / Percent / Row Pct / Col Pct	int	undiv	div	unknown	Total
<100	312	280	79	3	674
	19.13	17.17	4.84	0.18	41.32
	46.29	41.54	11.72	0.45	
	80.41	25.45	58.52	37.50	
>=100	66	803	52	4	925
	4.05	49.23	3.19	0.25	56.71
	7.14	86.81	5.62	0.43	
	17.01	73.00	38.52	50.00	
999	10	17	4	1	32
	0.61	1.04	0.25	0.06	1.96
	31.25	53.13	12.50	3.12	
	2.58	1.55	2.96	12.50	
Total	388	1100	135	8	1631
	23.79	67.44	8.28	0.49	100.00

FREQUENCY OF FATAL CRASHES BY SPEED LIMIT

	60	80	100	110	999
Pacific Hy North	12	9	101	0	1
Pacific Hy South	12	25	12	5	0
Newell Hy	0	2	51	0	0
Hume Hy	12	5	83	10	1
New England Hy	11	4	33	0	0
Rest of NSW	344	86	308	3	12

PROPORTION OF FATAL CRASHES BY SPEED LIMIT (Figure 3.8)

	60	80	100	110
Pacific Hy North	0.098361	0.07377	0.827869	0.008197
Pacific Hy South	0.222222	0.462963	0.222222	0.092593
Newell Hy	0	0.037736	0.962264	0
Hume Hy	0.109091	0.045455	0.754545	0.090909
New England Hy	0.229167	0.083333	0.6875	0
Rest of NSW	0.464238	0.116059	0.415654	0.004049

FREQUENCY OF HOSPITAL ADMISSION CRASHES BY SPEED LIMIT

	20	40	60	80	100	110	UNK
Pacific Hy North	0	0	54	23	241	0	5
Pacific Hy South	0	0	42	50	23	14	4
Newell Hy	1	0	16	4	100	0	3
Hume Hy	0	0	44	17	164	23	7
New England Hy	0	1	39	7	91	0	2
Rest of NSW	1	4	1518	263	907	6	57

PROPORTION OF HOSPITAL ADMISSION CRASHES BY SPEED LIMIT (Figure 3.9)

	20	40	60	80	100	110
Pacific Hy North	0.0000	0.0000	0.1698	0.0723	0.7579	0.0000
Pacific Hy South	0.0000	0.0000	0.3256	0.3876	0.1783	0.1085
Newell Hy	0.0082	0.0000	0.1322	0.0331	0.8264	0.0000
Hume Hy	0.0000	0.0000	0.1774	0.0685	0.6613	0.0927
New England Hy	0.0000	0.0072	0.2826	0.0507	0.6594	0.0000
Rest of NSW	0.0004	0.0015	0.5624	0.0974	0.3361	0.0022

PROPORTION OF FATAL CRASHES BY COLLAPSED SPEED LIMIT (Figure 3.10)

	< 100	>= 100
Pacific Hy North	0.172131	0.827869
Pacific Hy South	0.685185	0.314815
Newell Hy	0.037736	0.962264
Hume Hy	0.154545	0.845455
New England Hy	0.3125	0.6875
Rest of NSW	0.580297	0.419703

PROPORTION OF HOSPITAL ADMISSION CRASHES BY COLLAPSED SPEED LIMIT (Figure 3.10)

	< 100	>= 100
Pacific Hy North	0.242138	0.757862
Pacific Hy South	0.713178	0.286822
Newell Hy	0.173554	0.826446
Hume Hy	0.245968	0.754032
New England Hy	0.34058	0.65942
Rest of NSW	0.661727	0.338273

FREQUENCY OF FATAL CRASHES SPEED LIMIT < 100 km/h BY YEAR

	1982	1983	1984	1985	1986	1987	1988
Pacific Hy North	2	2	2	4	6	1	4
Pacific Hy South	12	3	5	3	4	4	6
Newell Hy	0	0	1	1	0	0	0
Hume Hy	4	2	2	2	2	2	3
New England Hy	4	0	2	3	1	0	4
Rest of NSW	57	53	63	56	64	63	75

FREQUENCY OF FATAL CRASHES SPEED LIMIT >= 100 km/h BY YEAR

	1982	1983	1984	1985	1986	1987	1988
Pacific Hy North	20	17	14	10	8	12	20
Pacific Hy South	1	3	2	4	2	1	4
Newell Hy	6	12	11	6	3	3	10
Hume Hy	16	15	12	11	13	9	17
New England Hy	9	6	6	3	1	4	4
Rest of NSW	47	45	54	41	37	34	53

PROPORTION OF FATAL CRASHES SPEED LIMIT >= 100 km/h BY YEAR (Figure 3.11)

	1982	1983	1984	1985	1986	1987	1988
Pacific Hy North	0.909091	0.894737	0.875	0.714286	0.541429	0.923077	0.833333
Pacific Hy South	0.076923	0.5	0.285714	0.541429	0.333333	0.2	0.4
Newell Hy	1	1	0.916667	0.857143	1	1	1
Hume Hy	0.8	0.882353	0.857143	0.846154	0.866667	0.818182	0.85
New England Hy	0.692308	1	0.75	0.5	0.5	1	0.5
Rest of NSW	0.451923	0.459184	0.461538	0.42268	0.366337	0.350515	0.414063

FREQUENCY OF HOSPITAL ADMISSION CRASHES SPEED LIMIT < 100 km/h BY YEAR

	1982	1983	1984	1985	1986	1987	1988
Pacific Hy North	18	9	13	9	9	9	10
Pacific Hy South	20	21	16	13	8	10	4
Newell Hy	3	3	6	2	3	3	1
Hume Hy	12	9	8	8	9	8	7
New England Hy	6	11	6	6	8	6	4
Rest of NSW	294	303	321	304	191	185	188

FREQUENCY OF HOSPITAL ADMISSION CRASHES SPEED LIMIT >= 100 km/h BY YEAR

	1982	1983	1984	1985	1986	1987	1988
Pacific Hy North	38	39	33	26	44	32	29
Pacific Hy South	6	6	2	7	7	6	3
Newell Hy	12	12	24	14	15	9	14
Hume Hy	21	34	30	20	33	29	20
New England Hy	15	13	10	11	20	10	12
Rest of NSW	156	163	147	152	103	103	89

PROPORTION OF HOSPITAL ADMISSION CRASHES SPEED LIMIT >= 100 km/h BY YEAR (Figure 3.11)

	1982	1983	1984	1985	1986	1987	1988
Pacific Hy North	0.678571	0.8125	0.717391	0.742857	0.830189	0.780488	0.74359
Pacific Hy South	0.230769	0.222222	0.111111	0.35	0.466667	0.375	0.428571
Newell Hy	0.8	0.8	0.8	0.875	0.833333	0.75	0.933333
Hume Hy	0.636364	0.790698	0.789474	0.714286	0.785714	0.783784	0.740741
New England Hy	0.714286	0.541667	0.625	0.647059	0.714286	0.625	0.75
Rest of NSW	0.346667	0.349785	0.314103	0.333333	0.35034	0.357639	0.3213

ROAD CROSS-SECTION (Figure 3.12)

PACIFIC HIGHWAY NORTH

	82	83	84	85	86	87	88
Intersection	3	2	2	1	4	1	1
Undivided	18	17	15	13	9	11	22
Divided	1	0	0	0	1	1	1

NEWELL HIGHWAY

	82	83	84	85	86	87	88
Intersection	2	1	0	1	1	0	2
Undivided	4	10	11	5	2	3	8
Divided	0	0	0	1	0	0	0

PACIFIC HIGHWAY SOUTH

	82	83	84	85	86	87	88
Intersection	1	3	0	1	3	1	3
Undivided	9	3	7	3	2	1	3
Divided	3	0	0	2	1	3	3

HUME HIGHWAY

	82	83	84	85	86	87	88
Intersection	2	1	1	0	1	0	1
Undivided	17	15	12	11	12	8	14
Divided	1	1	1	2	2	4	5

NEW ENGLAND HIGHWAY

	82	83	84	85	86	87	88
Intersection	4	0	0	1	1	1	1
Undivided	8	6	8	5	1	4	6
Divided	1	0	0	0	0	0	1

Tables for Figure 3.13.

PACIFIC HIGHWAY NORTH

	82	83	84	85	86	87	88
Intersection	10	4	7	4	8	5	3
Undivided	46	43	39	31	47	37	35
Divided	0	1	1	0	2	0	1

PACIFIC HIGHWAY SOUTH

	82	83	84	85	86	87	88
Intersection	6	8	7	5	5	5	0
Undivided	16	9	10	5	8	6	1
Divided	4	12	1	10	4	5	6

NEWELL HIGHWAY

	82	83	84	85	86	87	88
Intersection	1	4	5	5	5	2	2
Undivided	14	11	23	12	15	9	12
Divided	0	0	2	0	0	1	1

HUME HIGHWAY

	82	83	84	85	86	87	88
Intersection	6	9	2	3	7	5	3
Undivided	23	27	31	23	26	22	13
Divided	4	8	8	3	10	11	12

NEW ENGLAND HIGHWAY

	82	83	84	85	86	87	88
Intersection	6	7	8	4	8	5	6
Undivided	15	17	8	13	17	11	12
Divided	0	0	0	0	3	0	0

FATAL CRASHES 1982-1988 (Figure 3.14)

PACIFIC HIGHWAY NORTH

	82	83	84	85	86	87	88	
Artic	17	16	13	14	9	8	16	93
Rigid	5	3	4	2	4	5	9	32
LD Coach	0	1	0	0	2	1	0	4
	22	20	17	16	15	14	25	129

PACIFIC HIGHWAY SOUTH

	82	83	84	85	86	87	88	
Artic	8	4	2	4	3	2	6	29
Rigid	4	2	5	2	2	3	5	23
LD Coach	1	0	0	1	1	0	0	3
	13	6	7	7	6	5	11	55

NEWELL HIGHWAY

	82	83	84	85	86	87	88	
Artic	6	12	11	6	3	3	10	51
Rigid	1	1	1	1	0	0	1	5
LD Coach	0	0	0	2	0	0	2	4
	7	13	12	9	3	3	13	60

HUME HIGHWAY

	82	83	84	85	86	87	88	
Artic	17	13	12	13	11	7	16	89
Rigid	5	4	3	1	5	5	3	26
LD Coach	0	0	0	0	0	2	2	4
	22	17	15	14	16	14	21	119

NEW ENGLAND HIGHWAY

	82	83	84	85	86	87	88	
Artic	9	6	6	6	0	2	8	37
Rigid	3	0	2	0	2	3	0	10
LD Coach	1	0	0	0	0	0	1	2
	13	6	8	6	2	5	9	49

HOSPITAL ADMISSION CRASHES (Figure 3.15)

PACIFIC HIGHWAY NORTH

	82	83	84	85	86	87	88
Artic	31	34	29	30	37	26	23
Rigid	23	14	15	5	16	17	16
LD Coach	1	2	4	1	4	0	2
	55	50	48	36	57	43	41

PACIFIC HIGHWAY SOUTH

	82	83	84	85	86	87	88
Artic	12	11	9	10	7	8	3
Rigid	15	18	8	12	11	7	4
LD Coach	0	0	1	0	0	1	1
	27	29	18	22	18	16	8

NEWELL HIGHWAY

	82	83	84	85	86	87	88
Artic	14	12	26	12	17	7	12
Rigid	2	4	5	5	2	5	3
LD Coach	0	1	0	0	2	1	0
	16	17	31	17	21	13	15

HUME HIGHWAY

	82	83	84	85	86	87	88
Artic	21	34	29	19	32	23	24
Rigid	13	12	13	11	12	15	4
LD Coach	0	0	1	0	0	1	1
	34	46	43	30	44	39	29

NEW ENGLAND HIGHWAY

	82	83	84	85	86	87	88
Artic	12	17	11	11	18	8	12
Rigid	9	7	5	6	11	8	6
LD Coach	0	0	0	0	0	0	0
	21	24	16	17	29	16	18

NUMBER OF FATAL AND HOSPITAL ADMISSION CRASHES (1982-1988) BY TIME OF DAY (FIGURE 3.16)

ALL NSW

	6am-12pm	12pm-6pm	6pm-12am	12am-6am
artic	577	634	578	525
rigid	883	948	420	306
LD coach	24	28	10	20

PACIFIC SOUTH

	6am-12pm	12pm-6pm	6pm-12am	12am-6am
artic	18	31	20	20
rigid	36	38	12	12
LD coach	0	4	2	2

PACIFIC NORTH

	6am-12pm	12pm-6pm	6pm-12am	12am-6am
artic	57	61	104	81
rigid	40	38	35	25
LD coach	4	3	1	10

NEWELL

	6am-12pm	12pm-6pm	6pm-12am	12am-6am
artic	32	46	28	45
rigid	11	13	6	1
LD coach	1	0	0	5

HUME

	6am-12pm	12pm-6pm	6pm-12am	12am-6am
artic	33	48	80	110
rigid	30	16	25	35
LD coach	0	2	1	2

NEW ENGLAND

	6am-12pm	12pm-6pm	6pm-12am	12am-6am
artic	31	25	31	38
rigid	18	18	14	10
LD coach	1	0	0	0

Numbers of fatal articulated vehicle crashes in low and high speed zones classified by the number of vehicles involved in each crash. (Figure 3.17)

No. of vehicles	Year						
	1982	1983	1984	1985	1986	1987	1988
Speed limit < 100 km/hr							
1	3	4	1	7	5	3	5
2	35	19	30	29	23	15	29
>2	5	5	9	5	7	4	6
Speed limit >= 100 km/hr							
1	21	18	15	20	12	6	15
2	39	53	48	30	23	23	49
>2	11	6	7	7	6	4	16

Numbers of hospital admission articulated vehicle crashes in low and high speed zones classified by the number of vehicles involved in each crash. (Figure 3.18)

No. of vehicles	Year						
	1982	1983	1984	1985	1986	1987	1988
Speed limit < 100 km/hr							
1	21	18	16	18	12	18	12
2	82	76	74	74	70	42	44
>2	14	14	15	20	14	11	9
Speed limit >= 100 km/hr							
1	77	64	51	59	66	54	52
2	58	71	77	64	68	51	41
>2	9	14	15	13	11	6	4

RUM CODES

Tables for Figure 3.21.
Note: **some categories** were further collapsed before Figure 3.21 was created.

INTERSECTION

	86	87	88	Total
pedestrian	4	0	2	6
vehicle adjacent	6	4	10	20
vehicle opposing	9	1	2	12
vehicle same dir	2	1	3	6
manoevring	0	0	1	1
overtaking	0	1	0	1
on path	0	0	0	0
"off path,on straight"	0	0	1	1
"off path,on curve"	0	1	1	2
passenger & misc	0	0	0	0
Total	21	8	20	49

UNDIVIDED

	86	87	88	Total
pedestrian	1	1	1	3
vehicle adjacent	0	0	0	0
vehicle opposing	17	26	48	91
vehicle same dir	1	3	7	11
manoevring	4	1	0	5
overtaking	2	1	4	7
on path	3	2	5	10
"off path,on straight"	4	2	1	7
"off path,on curve"	13	7	15	35
passenger & misc	1	0	5	6
Total	46	43	86	175

DIVIDED

	86	87	88	Total
pedestrian	1	0	2	3
vehicle adjacent	0	0	0	0
vehicle opposing	3	2	1	6
vehicle same dir	4	5	6	15
manoevring	0	0	0	0
overtaking	0	0	0	0
on path	0	0	3	3
"off path,on straight"	2	1	1	4
"off path,on curve"	0	0	0	0
passenger & misc	0	0	0	0
Total	10	8	13	31

Tables for Figure 3.22.

INTERSECTION

	86	87	88	Total
pedestrian	7	3	2	12
vehicle adjacent	26	15	11	52
vehicle opposing	6	7	6	19
vehicle same dir	10	10	9	29
manoevring	1	1	1	3
overtaking	3	2	0	5
on path	0	0	1	1
"off path,on straight"	4	1	0	5
"off path,on curve"	1	3	5	9
passenger & misc	0	0	0	0
Total	58	42	35	135

UNDIVIDED

	86	87	88	Total
pedestrian	3	2	3	8
vehicle adjacent	0	0	0	0
vehicle opposing	46	24	28	98
vehicle same dir	19	24	7	50
manoevring	3	4	2	9
overtaking	3	5	6	14
on path	4	0	4	8
"off path,on straight"	20	22	12	54
"off path,on curve"	56	45	46	147
passenger & misc	8	5	1	14
Total	162	131	109	402

DIVIDED

	86	87	88	Total
pedestrian	2	1	0	3
vehicle adjacent	0	0	0	0
vehicle opposing	4	2	5	11
vehicle same dir	10	5	8	23
manoevring	0	0	0	0
overtaking	0	0	0	0
on path	4	0	2	6
"off path,on straight"	4	4	4	12
"off path,on curve"	3	3	3	9
passenger & misc	0	0	0	0
Total	27	15	22	64

Tables for Figure 3.23.

SPEED <= 100

	86	87	88	Total
pedestrian	5	0	3	8
vehicle adjacent	4	2	6	12
vehicle opposing	10	9	13	32
vehicle same dir	5	5	7	17
manoevring	1	1	2	4
overtaking	1	0	0	1
on path	3	1	3	7
"off path,on straight"	1	1	1	3
"off path,on curve"	5	3	4	12
passenger & misc	0	0	1	1
Total	35	22	40	97

SPEED > 100

	86	87	88	Total
pedestrian	1	1	2	4
vehicle adjacent	2	2	4	8
vehicle opposing	19	16	38	73
vehicle same dir	2	4	9	15
manoevring	3	0	0	3
overtaking	1	2	4	7
on path	0	1	5	6
"off path,on straight"	5	2	2	9
"off path,on curve"	7	5	12	24
passenger & misc	1	0	4	5
Total	41	33	80	154

Tables for Figure 3.24.

SPEED <= 100

	86	87	88	Total
pedestrian	10	3	5	18
vehicle adjacent	22	12	8	42
vehicle opposing	21	13	17	51
vehicle same dir	23	18	13	54
manoevring	1	0	1	2
overtaking	1	1	0	2
on path	3	0	6	9
"off path,on straight"	7	5	5	17
"off path,on curve"	7	16	10	33
passenger & misc	1	3	0	4
Total	96	71	65	232

SPEED > 100

	86	87	88	Total
pedestrian	1	3	0	4
vehicle adjacent	4	3	2	9
vehicle opposing	34	19	22	75
vehicle same dir	15	18	11	44
manoevring	3	5	2	10
overtaking	5	6	6	17
on path	5	0	1	6
"off path,on straight"	20	22	10	52
"off path,on curve"	51	33	42	126
passenger & misc	7	2	1	10
Total	145	111	97	353

CHARACTERISTICS OF VEHICLE OPPOSING AND OFF PATH CRASHES

Road alignment=curved

	Fatal		Hospital admission	
	1987	1988	1987	1988
opposing	15/29	28/51	20/33	24/39
offpath	8/11	16/19	49/78	54/71
all crashes	28/59	60/120	79/188	90/165
opposing	0.52	0.55	0.61	0.62
offpath	0.73	0.84	0.63	0.76
all crashes	0.47	0.50	0.42	0.55

Weather=raining

	Fatal		Hospital admission	
	1987	1988	1987	1988
opposing	6/29	17/51	3/33	9/39
offpath	1/11	5/19	15/78	14/71
all crashes	7/59	29/120	22/188	30/166
opposing	0.21	0.33	0.09	0.23
offpath	0.09	0.26	0.19	0.20
all crashes	0.12	0.24	0.12	0.18

Natural lighting=dark

	Fatal		Hospital admission	
	1987	1988	1987	1988
opposing	13/29	24/51	13/33	9/39
offpath	7/11	12/19	44/78	33/71
all crashes	26/59	52/120	83/187	65/167
opposing	0.45	0.47	0.39	0.23
offpath	0.64	0.63	0.56	0.46
all crashes	0.44	0.43	0.44	0.39

RECODING OF MANOEUVRES

Category	Codes
Proceeding along lane	10
Incorrect side of road	16
Other moving along roadway	11-15, 17
Turning right out of own lane	20
Turning left out of own lane	21
Other turning	22-29
Other reversing	30, 31, 39

RECODING OF FACTORS/ERRORS

Category	Codes
Driver disadvantaged	1-7
Unusual manoeuvre	10-24
Driver/passenger/pedestrian	30-32
Stationary vehicle	40, 41
Equipment	50-60
Loss of control	70
Did not stop after accident	*88*
No relevant factors	98

ALCOHOL IN DRIVERS OF CARS WHICH WERE KEY VEHICLES IN FATAL HEAVY VEHICLE CRASHES

	<.05	>.05	Unknown
1987	32	16	13
1988	57	13	16

APPENDIX D

OPERATION CO-OPERATION

OPERATION CO-OPERATION

Operation Cooperation was an experiment mounted in the Port Macquarie Police District, which runs from Karuah to Halfway Creek (north of Coffs Harbour). It arose from a concern that traditional enforcement practices were not only of diminishing effectiveness, but that relationships between police and heavy vehicle drivers had deteriorated to the extent that their mutual interest in reducing road trauma had been subsumed by hostility and suspicion. Moreover, over the years, any new police tactics had merely elicited a response from truck drivers which led to the diminution of that tactic - use of CB radios, radar detectors, radio scanners, etc.

Operation Cooperation emerged from negotiations between the Police Traffic Commander at Port Macquarie (Inspector Geoff Luland) and the Long Distance Road Transport Association. (It should be noted that other industry associations also gave the experiment their backing once the proposal developed). In essence, it was an agreement that during the period of the experiment, the following would take place:

Police :

- would not use covert operations or actions,

- would not hide or camouflage themselves in order to detect breaches,

- would not use spotter vehicles,

- would issue cautions or breaches where appropriate (see sample attached)

- would treat serious breaches committed by heavy vehicle drivers as such, and consider arresting the driver, particularly where danger was considered to exist,

- a very high police profile would be given to the Pacific Highway, with an upgrading of random breath testing and radar enforcement,

- an extensive media campaign would be launched,

- police would have meetings with large fleet operators, and make personal approaches to heavy vehicle drivers.

Heavy Vehicle Drivers :

- would not use CB radios to advise other vehicles of the presence of police vehicles,

- would not use CB radios to call other vehicles around on a blind bend or crest.

The benefits to the police were seen as being the ability to work unrestricted on the highway, more productive use of enforcement personnel; a higher public profile; encouragement of voluntary compliance with traffic laws; and improved knowledge of the difficulties faced by heavy vehicle drivers leading to a more thoughtful approach to enforcement and perhaps therefore to fewer complaints about police attitude and practices.

The benefits to the industry were a safer road environment, and a better public image.
The Operation was to run for a 3 month period, 1 August 1989 to 31 October 1989. However, it was curtailed on 9 October 1989. The official reason was that there was a conflict between this operation and the use of camouflage vehicles in other parts of the State, and Operation Cooperation was suspended in order to gauge the full effect of the use of camouflage vehicles.

The Operation received extensive publicity in both the regional media, and the metropolitan (and national) media. Distinctive adhesive stickers were issued by the LDRTA, and roadside signs were erected.

The effects of the Operation were significant. First, it appeared that crashes involving heavy vehicles were greatly reduced. Initial statistics showed that for the period 1 August - 9 October, 1989, sixteen crashes involving heavy vehicles occurred on the relevant section of the Pacific Highway. This compares with 35 for the period 1 August - 31 October 1988. For fatal crashes involving heavy vehicles over the same periods, the comparison was one in 1989 and six in 1988.

We have not been able to analyse statistically the overall effectiveness of Operation Cooperation, because at the time of writing, data on crashes other than fatal crashes for the second half of 1989 were not available. Considering fatal crashes only, the numbers in the Port Macquarie Police District for successive 10-week periods (counting back from the 10-week period of Operation Cooperation) were as follows:

Period beginning	Number of fatal crashes involving a heavy vehicle
8/9/87	5
17/11/87	1
26/1/88	4
5/4/88	2
14/6/88	4
23/8/88	4
1/11/88	2
10/1/89	5
14/3/89	0
23/5/89	4
1/8/89*	1

* period corresponding to Operation Cooperation

The total number of fatal crashes over the 110-week period was 32, and the mean per period was 2.91, with a standard deviation of 1.75. Only one period had no fatal crashes, while two (including the period corresponding to Operation Cooperation) had one fatal crash.

Statistical tests indicated that the frequency of 1 in the interval corresponding to Operation Cooperation was highly significant, i.e. had a probability of less than 0.1 of occurring by chance1.

When data on non-fatal crashes in the second half of 1989 are available, a more detailed statistical analysis using a larger sample will be possible. However, the data would certainly suggest that Operation Cooperation was associated with a significantly smaller number of fatal crashes than might have expected based upon historical trends. Seasonality is also a factor; the roughly corresponding periods of the previous two years had seen quite high numbers of fatal crashes (5 in 1987 and 4 in 1988), and this would tend to suggest that fatal crashes in the period corresponding to Operation Cooperation were, if anything, even lower than might have been expected.
The number of infringement notices issued to drivers of heavy vehicles was similar to that for the previous year (about 160), but in addition, about 70 cautions were issued; this illustrates the extra level of enforcement, as well as its changed form.

The use of CB radios by heavy vehicle drivers reportedly fell considerably during the period of the operation. It appears that the "local" drivers were not only aware of the Operation, but highly supportive of it and acted accordingly. However, drivers who were not based in the area, and who may have been unaware of the Operation, reportedly continued to use CB to advise the location of police vehicles. Also, car drivers with CB radios continued to inform other drivers of police presence.

Apart from the reduction in crashes, perhaps the most significant effect of Operation Cooperation was the change in attitude amongst heavy vehicle drivers. Attitudes changed from suspicion and scepticism at the outset, to strong, even enthusiastic, support as the Operation progressed. This evidenced itself in a number of ways. For example,

- Transport Radio Network base stations (nine of which were located in the relevant part of the State) had previously notified the presence of police vehicles, but ceased to do so, and in fact gave extensive publicity to the Operation;

- a reported much greater incidence of heavy vehicle drivers contacting police at their own initiative to discuss problems;

-a number of unsolicited letters of support from truck and coach companies;

- peer pressure from truck drivers to encourage their colleagues to support the scheme (e.g. using CB radio to admonish them for careless driving and to urge them to drive more responsibly);

- a number of occasions where heavy vehicle drivers called up police on the CB to inform them of the actions of other road users (both truck and car drivers); in several cases this led to drivers being charged;

- a very supportive article in the truckers magazine "Truckin' Life".

As noted, the Operation featured a change in the type of enforcement, and this no doubt contributed to the change in driver attitude. For example,

- police officers were more likely to listen to a driver's reasons for certain driving behaviours, rather than to adopt a more aggressive, authoritarian attitude;

- more cautions (rather than infringement notices) were issued for minor offences;

- police gave lectures to groups of truck drivers to explain what the law requires and to update them on amendments to regulations;

- owners of heavy vehicles who were contacted by police after the issue of a caution were most appreciative of the approach.

Following the announcement of the end of the experiment, a number of industry and community groups expressed their disappointment at the decision, both publicly and directly to police and politicians.

This support was still evident over six months later, when we conducted our driver interviews as part of the present study. Drivers spoke favourably of Operation Cooperation, not because they were less likely to be issued with an infringement notice (they weren't), but because the attitude and actions of police were seen as being positive contributions towards a safer road environment. This perhaps implies that conventional police enforcement programs are not seen by truck drivers as being related to road safety, but to revenue collection, and relationships between truck drivers and police are part of a "game" (or even worse, a "war"). To the extent that this is true, Operation Cooperation must be seen as a significant event, because of the turnaround in the attitude of a very substantial part of the truck driver population. Moreover, we received anecdotal evidence that the effects of Operation Cooperation were still being felt months after the cessation of the exercise, in that we were told that there were now fewer instances of trucks drivers calling other through around bends or over crests than used to be the case.

In summary, Operation Cooperation:

- apparently led to a reduction in heavy vehicle crashes, and

- apparently produced a significant change in the attitude of many heavy vehicle drivers towards safety in general, and police enforcement in particular.