The effects of police motor patrols on accident incidence and driver behaviour

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The effects of Police Motor Patrols on Accident Incidence and Driver Behaviour

by

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Thesis submitted to the University of Durham in application for the Degree of Master of Science. 1969.

PREFACE

In 1829, Sir Richard Mayne, Commissioner of the Metropolitan Police defined the function of a Police Force as follows:-

"The primary object of an efficient Police is the prevention of Crime: the next that of detection and punishment of offenders if crime is committed. To these ends all the efforts of Police must be directed. The protection of life and property, the preservation of public tranquillity, and the absence of crime, will alone prove whether those effects have been successful, and whether the objects for which the Police were appointed have been attained".

This definition is still valid 140 years later.

ABSTRACT

This work gives an account of an experiment conducted by Durham University on behalf of The Research and Development Branch of The Home Office. The object of the experiment was to establish the effect, if any, of various levels of Police Motor Patrol on the accident rate. The project was confined to Trunk Roads A1 and A19, within the Durham Constabulary area and lasted from August 1967, to September 1968.

The two roads were divided to provide four motor patrol routes each approximately twelve miles long. Two of the routes were kept as Controls throughout the project. The other two were subjected to varying Police patrol levels and different tactics.

The time element was divided into four phases, each approximately of three months duration. Phase 1 was used to obtain control data for all four routes. During Phase 2 the patrol level on route 2 was increased by two patrol cars. In Phase 3 an additional seven motor cycles were used on route 4. During Phase 4 four motor cycles were alternated in cycles of ten days between routes 2 and 4.

Throughout the experiment measurements were made of patrol hours reported, accidents and other incidents dealt with on route. The statistical analysis of the measurements is fully reported and the measurements are presented in tabular and graph form.

During the project surveys were made of the distribution of patrols crews time between various tasks and the function of single and double crewed patrol cars.

Studies were made of certain Police administrative procedures and completely new systems of accident and process reporting were introduced.

A series of pilot experiments were conducted establishing the effect of Police Patrols on driver behaviour. These pilot experiments were used as a basis for a further experiment.

ACKNOWLEDGEMENTS

The Author wishes to record his appreciation to the following:-

(1) The Chief Constables and Officers of Durham and Teesside Constabularies for their co-operation.

(2) The Road Research Laboratory, The Home Office Research and Development Branch, the Swedish Road Research Unit, the North Western University, and the North Riding Constabulary for supplying helpful and relevant information.

(3) Dr. Hawkes of the University of Durham, Department of Mathematics for his direction with statistical analysis.

(4) The staffs of Durham County Surveyor's Department, Sunderland Borough Surveyor's Department, and the Tyneside Conurbation Traffic Survey, for information relating to traffic flows.

(5) The Data Processing Manager, The Ministry of Social Security, Longbenton, Newcastle, for the use of his card sorting equipment.

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Map of Durham Constabulary area showing Divisional Boundaries between 1st April, to 30th September 1968. (Stockton Division transferred to Teesside Constabulary - Number of Divisions reduced to 8.)

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Document 1.

Durham Constabulary Accident Report Book. Withdrawn from use on 31st March 1968.

Document 2.

Durham Constabulary Road Accident Report. Withdrawn from use on 31st March 1968.

Document 3.

New Accident Report Form introduced on 1st April 1968.

Document 4.

Durham Constabulary Process Report Form. Withdrawn 31st December 1968.

Document 5.

Process Report Card introduced on 1st January 1969.

I N D E X

HISTORY OF PROJECT

The joint Durham Constabulary - Durham University Research projects began in 1967, when the Chief Constable Mr. A. A. Muir attended a dinner at Hatfield College. As a result of a conversation with Dr. M. R. C. McDowell, a reader in Mathematics at Durham University, the Chief Constable arranged that six Police Officers of the rank of Inspector - Chief Inspector would attend a series of Seminars at the University. For six weeks members of the University and the Police Force met each Monday afternoon. Subjects discussed ranged from communications, public relations, C.I.D., motor patrols and beat duties, accident prevention and recording, use of computers for Police purposes, and operational research.

At the conclusion of the series of Seminars it was generally agreed that there were many fields inside the Police Service which would bear investigation and which would benefit from experimentation. Because of the amount of historical accident data held by Durham Constabulary the University members of the Seminar decided that a Traffic project would be easier to mount than any other. Mr. McDowell and Dr. D. M. Grieg, Senior Lecturer in Mathematics agreed that they would draft a research proposal and submit it to the Home Office.

The Seminars had impressed the Police Officers attending to such a degree that on reporting back to the Chief Constable it was suggested that a Residential Course should be organised and held at one of the Colleges. This was agreed and a Course of a week duration was held in June 1967, at Van Mildert College, Durham City and was attended by Senior Police Officers from the North East Region. The Course was organised by the University Business School and members of the Mathematics and Computer Unit. Representatives of Home Office Research and Development Branch sat in on the Course.

DESIGN OF THE PROJECT

Mr. A. MacDonald, Chief Scientific Advisor to the Director of The Home Office Research and Planning Department visited the Course at Van Mildert College. He discussed the proposal submitted by Dr. McDowell and Dr. Grieg. (See Appendix 'A'). Mr. MacDonald said he was disappointed that a crime based project had not been formulated as he felt that it was in this area not traffic, that University assistance would be most useful. However, after a full discussion Mr. MacDonald accepted that the Traffic project would be useful, the recorded historical accident data would obviate the necessity of a large scale search for data and said he was prepared to support the project.

After further discussion between representatives of The Home Office, Durham Constabulary and Durham University, the University entered into a contract with The Home Office to study the effects of different Police patrol levels, tactics and strategy on the Accident Rate. The project was to last for one year and commence on the 9th August, 1967.

The major variables amenable to measurement in such a project are:-

(i) Police Patrol level: expressed as a number of vehicle - hours of patrolling on a given route as a function of time.

(ii) Traffic flow: in vehicles per day.

(iii) Accident rate: the number of accidents recorded which were,

a. Fatal

b. Injury

c. Damage

(See Appendix 'B' for legal definition of an Accident).

It was appreciated that other variables such as weather, road repairs and alterations could affect accident rates. It was expected that effects from weather would be eliminated by using data from Control Routes and by analysis of historical traffic flow and accident data. It was assumed that minor road repairs could be ignored.

In 1966, 12,500 accidents were recorded in the Durham Police Force area. Such a large number made a Force wide experiment impractical as such a project would also have required a daily return from every mobile unit.

Examination of current and historical accident data by road classification showed that Trunk Road A1 and Trunk Road A19, had an annual accident rate of some 640/660 accidents respectively. Trunk Road A1. was reported by the County Surveyor to have a daily traffic flow of 32,500 vehicles per day and Trunk Road A19 19,000. (These figures are later proved wrong). Both roads are approximately twenty-four miles long and traverse the Durham Police Force Area from North to South. Trunk Road A1. ran from Aycliffe interchange to what was then the Gateshead Borough Police Boundary and Trunk Road A19 ran from Yarm to Sunderland. Each road, for the purpose of the experiment, was divided into two twelve mile stretches. These four routes are denoted as:-

Trunk Road A1. Route 1 - Southern Section - A1 from Aycliffe interchange to Cock O' The North roundabout. The Southern part of this route, Rushyford roundabout to Aycliffe interchange was

redesignated A167 on the opening of a further section of A1(M) on 15th October, 1967.

Route 2 - Northern Section - Cock O' The North to Gateshead boundary. (Large scale engineering and extensive diversions occurred on this route after 14th August, 1968.) Phase 4 of the experiment was terminated on this route on 13th August, 1968.

Trunk Road A19

Route 3 - Southern Section - County Boundary at Yarm (on A19) to the intersection of the A19 with A179. The southern part of this route became the responsibility of the new Teesside Constabulary from 1st April, 1968, but the new Force continued to collaborate with the project and supplied reports on motor patrols, and accidents.

Route 4 - Northern Section - A179 junction with A19, north to Monkwearmouth Bridge, Sunderland. Accident rate was recorded for this route, excluding the section Sunderland Art College to Monkwearmouth Bridge, owing to the urban character of this section, and the introduction of one-way systems, thus preventing comparison with earlier accident data.

Throughout the entire project Route 1 and Route 3 were used as Controls. No alterations in patrol levels or tactics were made on these routes. (See Figure 1.)

Motor Patrols in Durham Constabulary operate under Headquarters and Divisional Command. Headquarters Traffic Patrols are commanded by Chief Superintendent Traffic and patrol Motorways, Trunk and Primary Routes. As a Traffic Unit their prime function is the enforcement of traffic legislation, the detection of traffic offences and Road Safety in all aspects. Divisional Motor patrols are under the Command of each Divisional Chief Superintendent. Briefly their function may be described as highly trained mobile Policemen whose bias changes by time of day. At peak traffic times they are Traffic patrols but during the early hours of the morning when traffic flow is minimal, their prime function is crime prevention.

The duties of both Traffic and Motor patrols are supplemented by Serious Incident Squads. The Serious Incident Squad personnel are commanded by Detective Chief Superintendent C.I.D. Headquarters. The vehicles used by the Squad are Shooting Brakes and carry a large amount of specialist equipment. The officers of the Squad are highly trained in Scientific and Mechanical examinations and attend the scenes of all fatal and serious accidents.

CHAIN OF COMMAND

The chain of command in August 1967, in Durham Constabulary for Motor Patrol was as follows:-

- Chief Constable
  - Assistant Chief Constable (Traffic and Communications)
    - Chief Superintendent (H.Q. Traffic and Communications)
      - Chief Inspector (Motor Patrols)
        - Inspector (Section A)
          - Motor Patrol Sergeants
            - Patrol Crews
      - Divisions A, B, C, D, E, F, G, H, I, J & K) (See Figures 2, 3 & 4)
        - Superintendent (For each Division)
          - Motor Patrol Inspector or Sergeant
            - Divisional Motor Patrol Crews
  - Assistant Chief Constable (CID)
    - Detective Chief Superintendent
      - Detective Superintendent (Technical Aids)
        - Chief Inspector (Serious Incident Squad)
          - Sergeants
            - Serious Incident Squad Crews

DURHAM CONSTABULARY

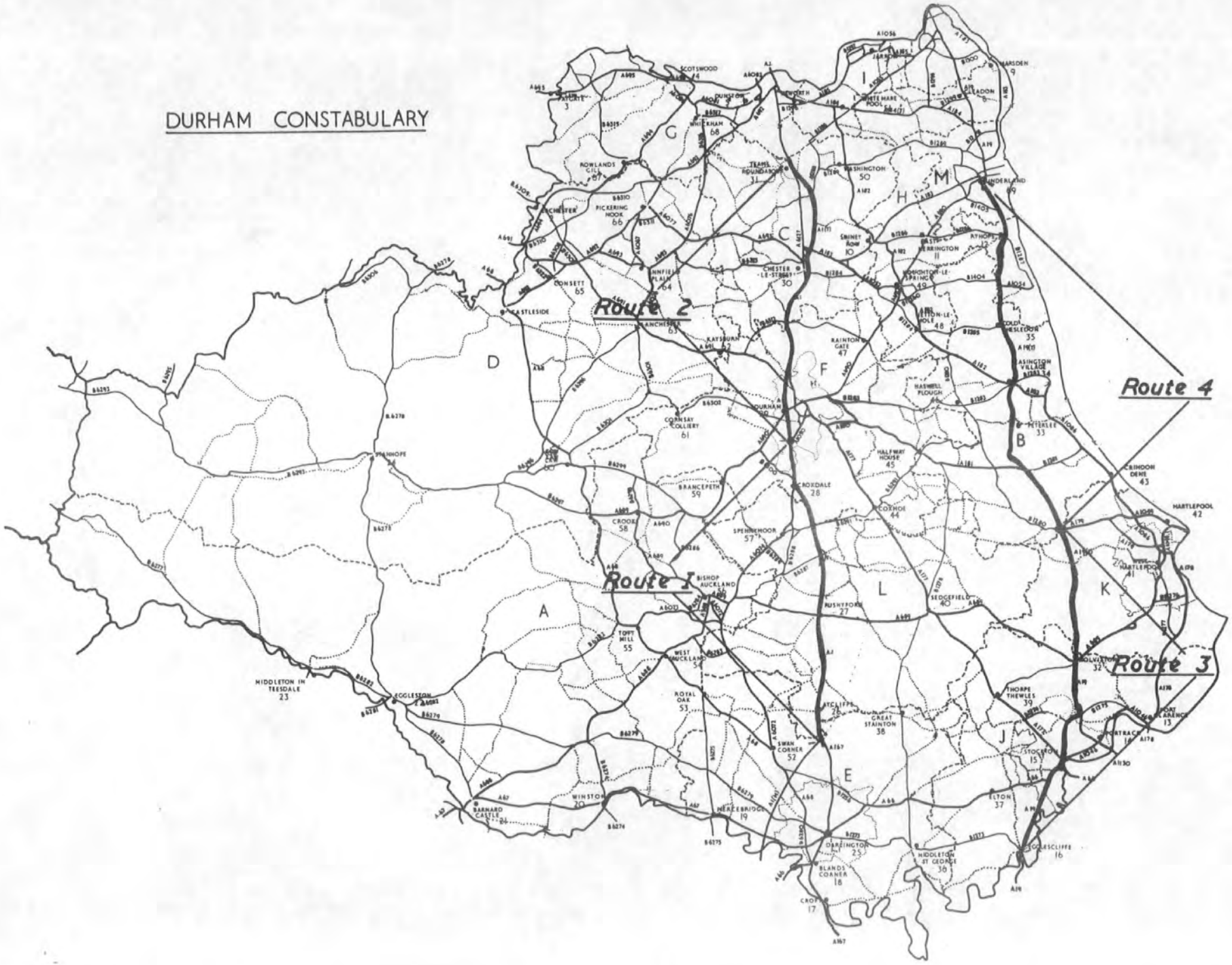
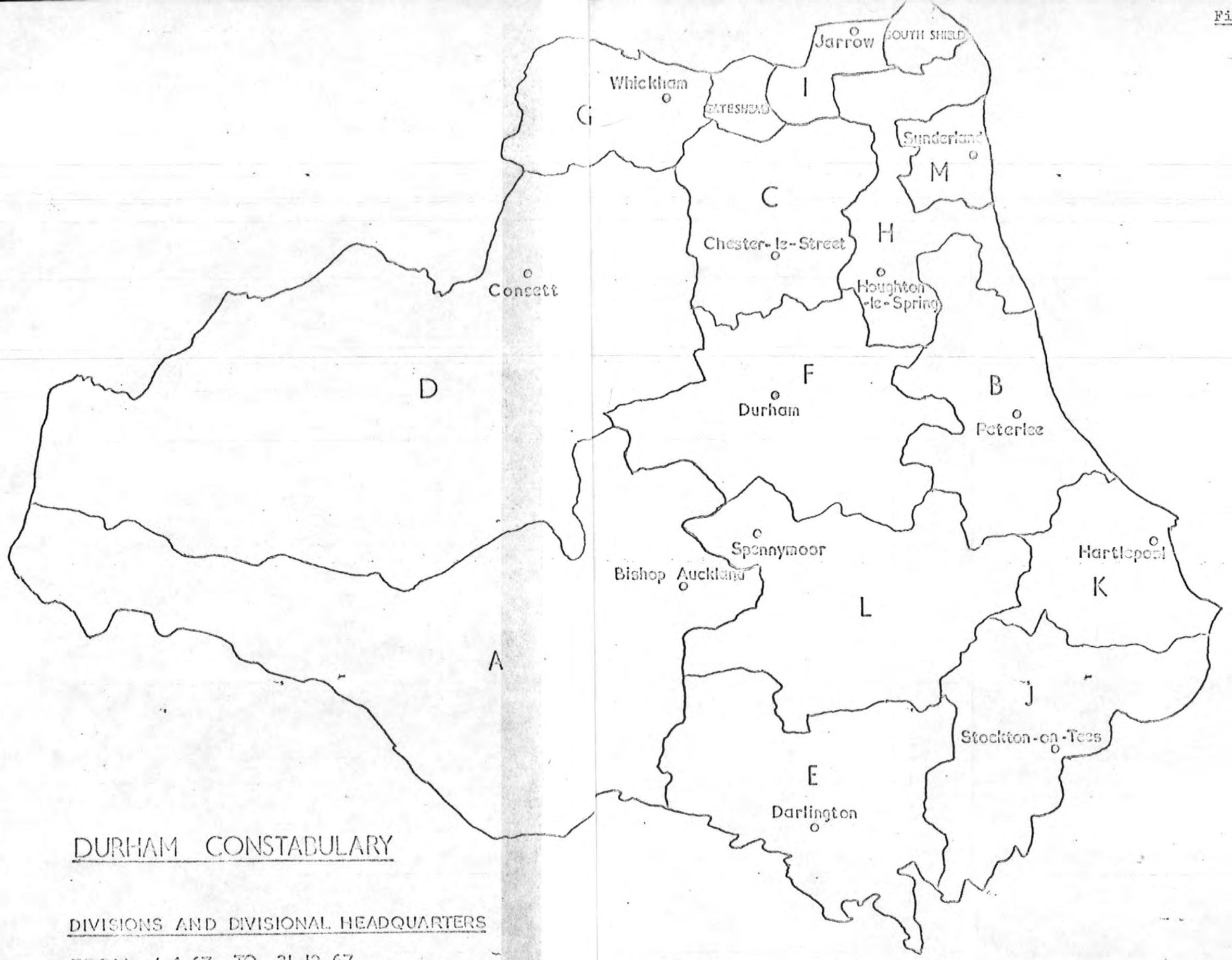


Figure 2.

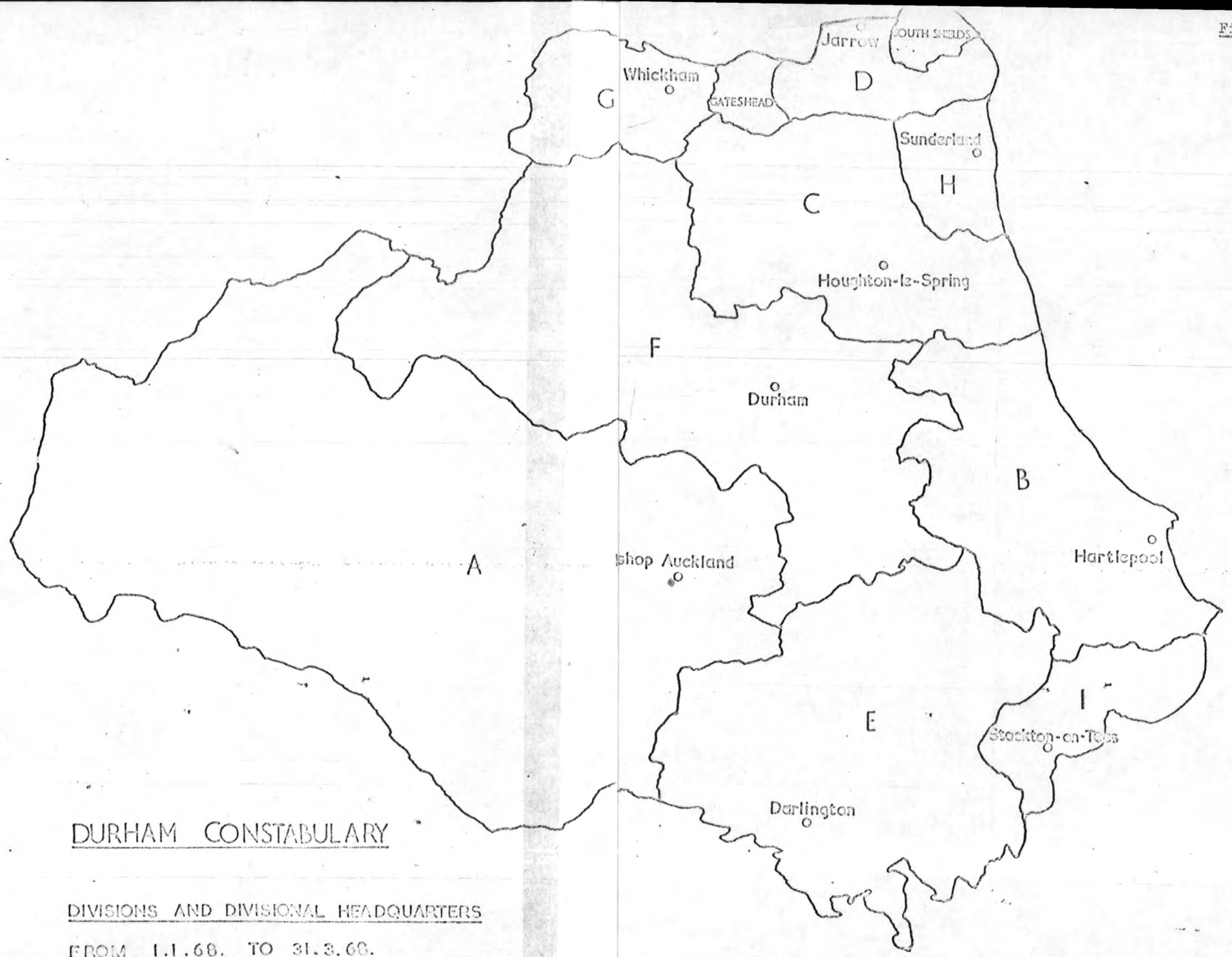


DURHAM CONSTABULARY

DIVISIONS AND DIVISIONAL HEADQUARTERS

FROM 1.4.67 TO 31.12.67.

Figure 3.

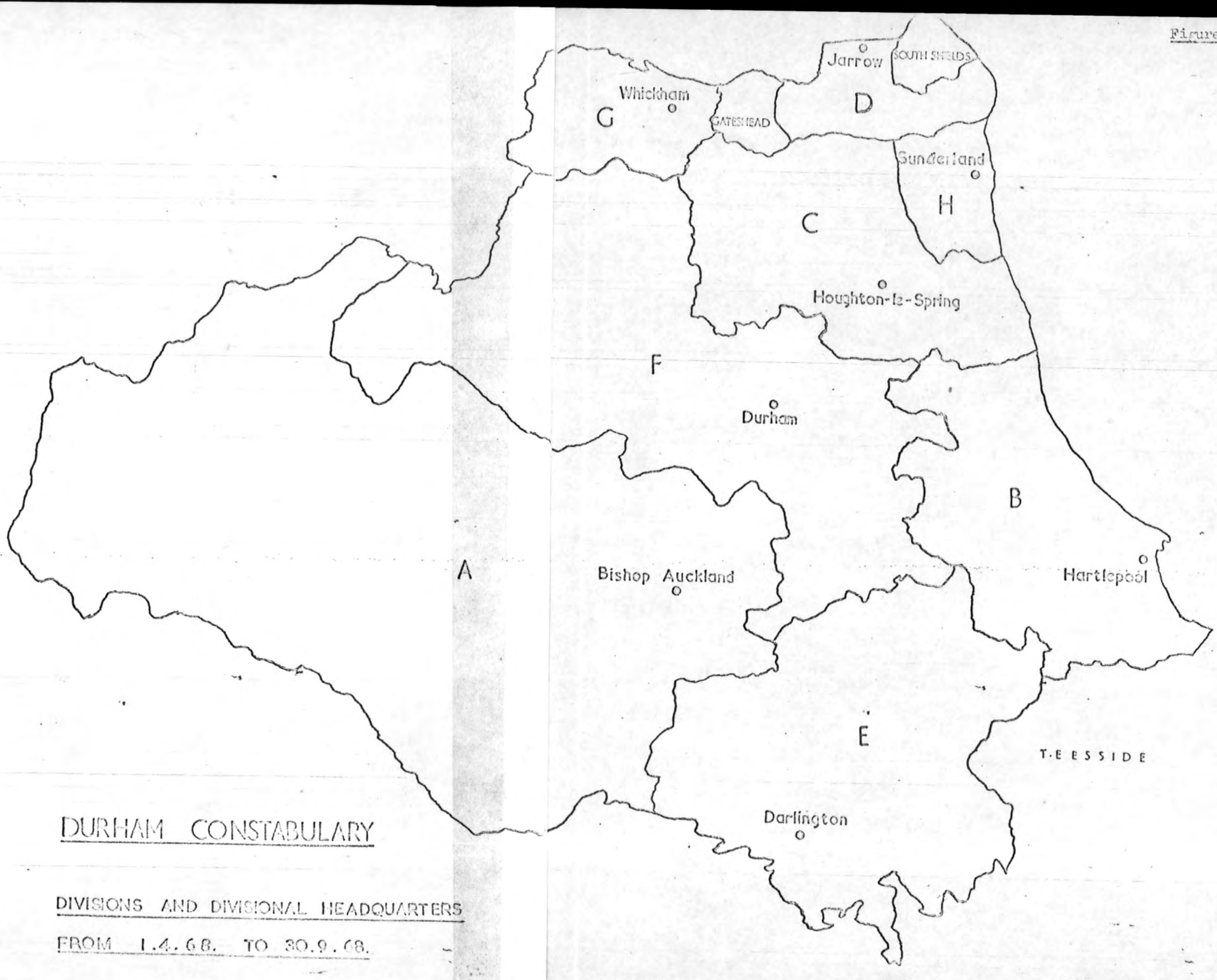


DURHAM CONSTABULARY

DIVISIONS AND DIVISIONAL HEADQUARTERS

FROM 1.1.68. TO 31.3.68.

Figure 4.



DURHAM CONSTABULARY

DIVISIONS AND DIVISIONAL HEADQUARTERS

FROM 1.4.68. TO 30.9.68.

COMMENCEMENT OF PROJECT

Between 1st and 9th August, 1967, all Motor Patrol, Serious Incident Squad and supervisory personnel were briefed in detail. In addition these visits introduced the project team to crews and officers. Care was taken in the briefing sessions to stress that the project was not intended to investigate or measure the efficiency of one man or section and to compare one against another. A patrol Questionnaire Form was specially designed to be anonymous for this reason. (See Figure 5.) Instructions were given that any crew who patrolled or travelled on any of the designated Routes, Route 1 through Route 4 were to complete a Patrol Form giving details of time spent on route, accidents and other incidents dealt with on route. The Forms were to be submitted daily, through the Police internal mail system to Chief Inspector Taylor. The forms were not to be checked by motor patrol supervision or used in any way by them to evaluate performance or efficiency. During the period 1st to 9th August, 1967, the first Motor Patrol Form was tested operationally. It was found to require amendments. These were made, the Form was again tested and found to be satisfactory.

The project commenced at 6 a.m. on Wednesday 9th August, 1967.

PATROL STRENGTHS (NOMINALLY) AVAILABLE AT THE COMMENCEMENT OF THE PROJECT.

(See Table 1)

PHASING OF THE PROJECT

(See Table 2)

PHASE 1.

Phase 1 covered the period 9th August to 19th November, 1967, a total of 103 days, 61 of which were prior to the introduction of The Road Safety Act 1967 (Breathalyser) and 42 subsequent. The Aycliffe Bradbury section of A1(M) was opened on 15th October, 1967. It was expected that this would effect the traffic flow on the Southern Section of Route 1. This phase was extended in time to see if any effects from these two factors could be measured.

During this period no changes were made in existing Police practices and measurements were taken of time crews spent on route, accidents and other incidents dealt with over the whole of the four routes.

PHASE 2.

Phase 2 ran from 20th November, 1967 to 11th February, 1968, a total of 84 days. During this phase Route 1, Route 3 and Route 4 were

3. Activities on Routes:

	Route		No.			Route		No.	
No. of traffic offences reported		24		25	No. of defective vehicles checked		26		27
No. of traffic offences reported		28		29	No. of defective vehicles checked		30		31
No. of persons reported		32		33	Assistance to Motorists		34		35
No. of persons reported		36		37	Assistance to Motorists		38		39
No. of verbal cautions (traffic offences only)		40		41	C.R.O. Checks		42		43
No. of verbal cautions (traffic offences only)		44		45	C.R.O. Checks		46		47

Total length of time spent on escort duties (48) .....

CAR _____ Punch 49(1)

MOTOR CYCLE _____ Punch 49(2)

Please use 24 hour Clock

Route A.B.C. or D.		Time entered Route		Time Left Route	
	50		51-54		55-58
	59		60-63		64-67
	68		69-72		73-76
	50		51-54		55-58
	59		60-63		64-67
	68		69-72		73-76
	50		51-54		55-58
	59		60-63		64-67
	68		69-72		73-76

Figure 5.

Any enquiries to be made to
Chief Inspector Taylor
Durham 5261.

(REVISED FORM)

DURHAM CONSTABULARY

MOTOR PATROL EXPERIMENT

Route A	TRUNK ROAD A.	1	(Aycliffe Interchange to Cock of the North)
Route B	TRUNK ROAD A.	1	(Cock of the North to Gateshead Boundary)
Route C	TRUNK ROAD A.	19	(Tees Bridge, Yarm to Junction of A.179)
Route D	TRUNK ROAD A.	19	(Junction of A.179 to Monkwearmouth Bridge, Sunderland)
Route E	TRUNK ROAD A.	184	(Gateshead - South Shields)
Route F	TRUNK ROAD A.	177	(Durham - Sedgefield)
Route G	TRUNK ROAD A.	690	(Durham - Sunderland)
Route H	TRUNK ROAD A.	6127	(The Hermitage - Teams Colliery)

1. General Information:

DATE ...../...../6..... (1-6) CALL SIGN ..... (7-11) DIVISION ..... (12-13)

NO. IN CREW ..... (14)

Average weather during patrol (Please tick) (15)

(1)	(2)	(3)	(4)
Rain	Snow	Fog	Fine
Hail	Sleet	Mist	

Average Road conditions during patrol (Please tick) (16)

Dry	Wet	Snow	Ice

2. Information relating to accidents on above routes.

No. of accidents reported (17) .....

(Use 24 hour clock)

TIME		ROUTE		LOCATION OF ACCIDENT
	18/21		22	

Punch R in Column 23 to indicate that the revised form is in use.

TABLE 1

PATROL STRENGTHS (NOMINALLY) AVAILABLE AT THE COMMENCEMENT OF THE PROJECT

Divisions	Cars	Personnel			
		Above Sergeant	Sergeant	P/Constable	P/Women
A	5		2	17	
B	5		1	21	
C	7		2	25	
D	4		1	11	
E	6	1	1	17	
F	8	1	2	25	
G	4		1	14	
H	8	1	2	23	
H.Q. Cars	10	3	4	42	2
Supervisory Cars	6				
Motor Cycles	18				

SUB-TOTALS

Cars	Motor Cycles	C/Inspectors	Inspectors	Sgt.	P.C.	P.W.
63	18	1	5	16	195	2

FINAL TOTALS

Vehicles	Personnel
81	219

TABLE 2.

PHASING OF THE PROJECT

SPECIFICATION OF ROUTES, PHASES AND EXPERIMENT PERIODS.

	Phase 1* 9.8.67 to 19.11.67	Phase 2 20.11.67 to 11.2.68	Phase 3 12.2.68 to 19.5.68	Phase 4 27.5.68 to 30.9.68
Route 1. Trunk Road A.1 from Cock O' The North Roundabout to Aycliffe Interchange.	Control	Control	Control	Control
Route 2. Trunk Road A.1 from Gateshead Borough Boundary to Cock O' The North Roundabout.	Control	First Experiment	Control	Third Experiment
Route 3. Trunk Road A.19 from Junction with A.179 Road to North Riding County Boundary.	Control	Control	Control	Control
Route 4. Trunk Road A.19 from Monkwearmouth Bridge, Sunderland to Junction with A.179 Road.	Control	Control	Second Experiment	Third Experiment

*Phase 1 was sub-divided at midnight 8/9.10.67 to allow analysis of introduction of breathalyser.

‡Except Route 2 which terminated on 13.8.68 due to extensive road improvements commencing.

maintained as Controls. Two additional patrol cars were allocated to Route 2, (Trunk Road A1 Northern Section) between 8 a.m. and 6 p.m. It was decided to use this period of the day because patrol cars would be visible in daylight. It was thought that at night time the deterrent value of a patrol car is minimal because of the lack of conspicuity. In fact it is thought that during darkness a Police patrol unit merely becomes a pair of head or tail lights and only visible to the driver immediately in front or behind.

PHASE 3

Phase 3 ran from 12th February to 19th May, 1968, a total of 98 days. During Phase 3 Route 1 (Trunk Road A1 South) and Route 3 (Trunk Road A19 South) were used as Controls. Seven additional motor cycles were allocated to Route 4 between 8 a.m. and 6 p.m. Motor cycles were specially selected for this route as it is substandard in vertical and horizontal alignment and in places quite narrow. These constraints do not allow a car freedom in pursuit because of the difficulty in changing direction or overtaking. In addition a patrol car stationary on this route becomes as great a potential hazard as any other vehicle. Motor cycles, under these conditions are much more versatile, they can turn, overtake and stop with much greater ease and safety than a car. It was appreciated that basically it is really impracticable for any Police Force to provide such a large section of men and machines in addition to the normal patrol allocation, to patrol twelve miles of road but it was thought that the effect of saturation patrol levels should, if possible be established.

PHASE 4

Phase 4 ran from 27th May to 30th September, 1968, on Route 1, Route 3 and Route 4, a total of 127 days. Route 2 became none effective on 14th August 1968, after a period of 79 days due to massive reconstruction of Trunk Road A1 (Birtley By-Pass) to Motorway standard. Route 1 and Route 3 were control routes during this period.

During Phase 4 an additional four motor cycles were used, alternating, in successive ten day periods on Route 2 and Route 4. This concept of patrolling was named "Pulse Patrolling" and it is based on the idea of grouping patrol units and using them in strength. A minimum background level of patrol must be maintained to deal with service and emergency calls. The remainder are then allocated, randomly, in groups to routes or areas. If a Force area can be imagined diced like a chess board then the Pulse Patrol Force can be allocated to black or white areas. The motoring public, meeting patrol units in strength on black squares for a few days will expect to see them and it is hoped, alter their driving habits to conform to Traffic legislation. The re-allocation to white squares after a time period should create the illusion that the whole of the Force area is very heavily patrolled.

It was hoped that during this Phase some evidence of "carry over" would be seen and possibly that the "decay" period would be established. Further experimentation by this method of patrolling is still required to establish, the ideal strength of the Pulsing Force, the size of area or length of route such a Force should patrol and the time period of the pulses measured against the decay.

MEASUREMENTS OF PATROL LEVELS

Throughout the experiment allocation of Police Patrol Units by time to routes and shifts was entirely controlled by Operational Commanders and not by the project team.

The measurements made were designed to record the actual patrol levels achieved. (See Figures 6:1, 6:2, 6:3, and 6:4)

Figure 6:1 shows that on Route 1 (Trunk Road A1 South, Control Route for the entire experiment) that at the start of the experiment a relatively high level of patrol by hours per day was achieved but that this progressively became lower and lower. A higher level of patrol was reported on the route at the end of May 1968, when a coloured variant of the Motor Patrol Form was introduced and which is discussed later.

Figure 6:2 shows the reported patrol levels on Route 2 (Trunk Road A1 north). Again initially a high level of patrol was reported which progressively fell away during Phase 1. At the commencement of Phase 2, when two additional patrol cars were allocated to this Route a higher level of patrolling was again reported. This level never reached the same volume as had been reported at the start of Phase 1 and by the time the end of Phase 2 was reached the reported patrol level had again progressively fallen away.

During Phase 3 the reported patrol level on this route fell to the lowest recorded during April/May, but was again briefly increased at the end of May when the coloured forms were introduced. In Phase 4 during which four additional motor cycles were alternating between this Route and Route 4, in ten day cycles, higher levels of patrol were recorded. However, the levels were still less than had been reported in Phase 1 when only normal patrol unit allocation was made. Again in Phase 4 the reported patrol levels progressively fell away.

Figure 6:3 shows the recorded patrol levels on Route 3 (Trunk Road A19 South). This route was used as a control during the entire project. The reported patrol level is somewhat constant from August 1967, to March 1968.

After a 50% reduction commencing in April 1968, the reported patrol level again remains relatively steady.

Fig. 6.1

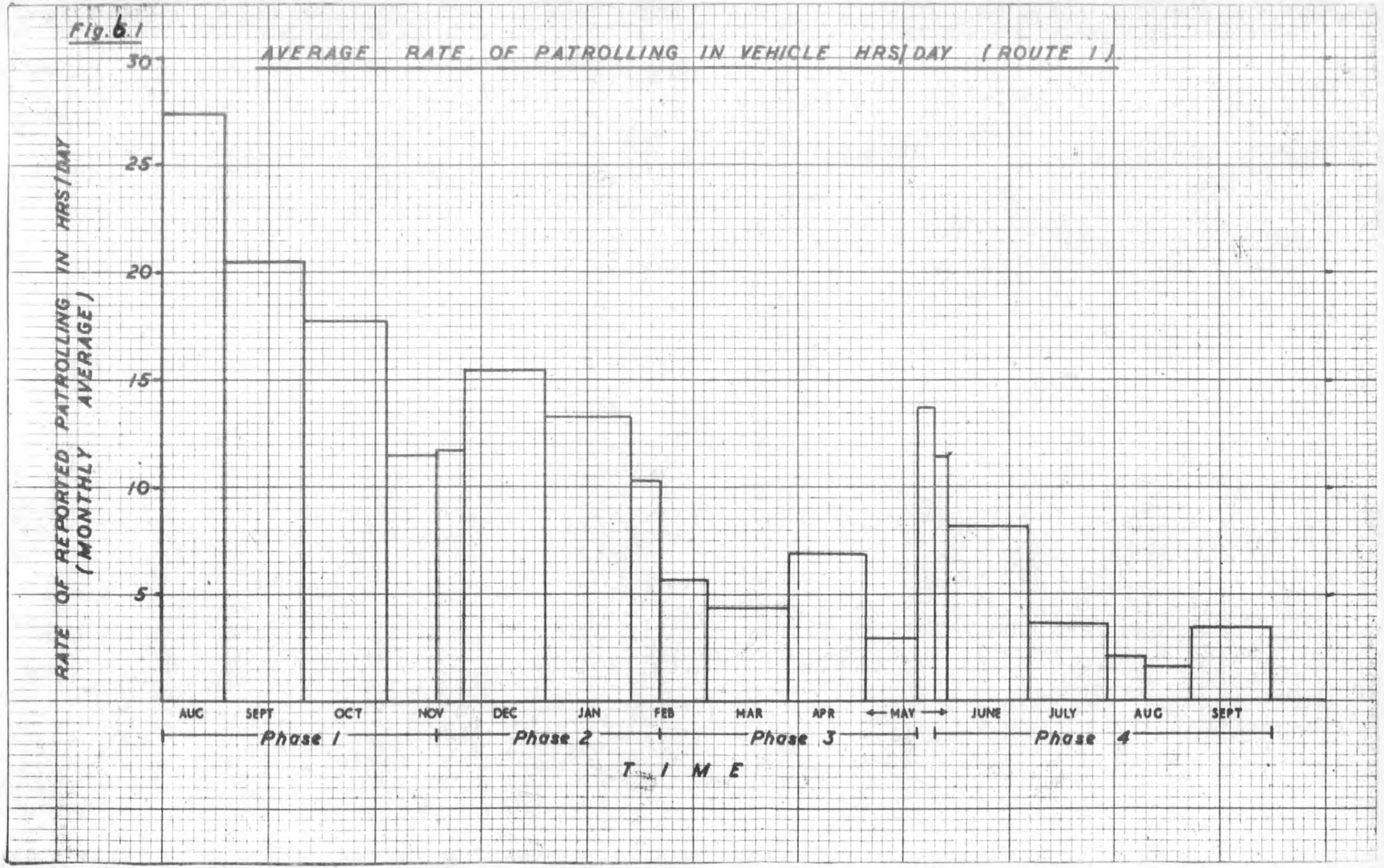

AVERAGE RATE OF PATROLLING IN VEHICLE HRS/DAY (ROUTE 1)
RATE OF REPORTED PATROLLING IN HRS/DAY (MONTHLY AVERAGE)
30
25
20
15
10
5
AUG
SEPT
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
Phase 1
Phase 2
Phase 3
Phase 4
TIME

Fig. 6.2

AVERAGE RATE OF PATROLLING IN V.HRS / DAY. (ROUTE 2)

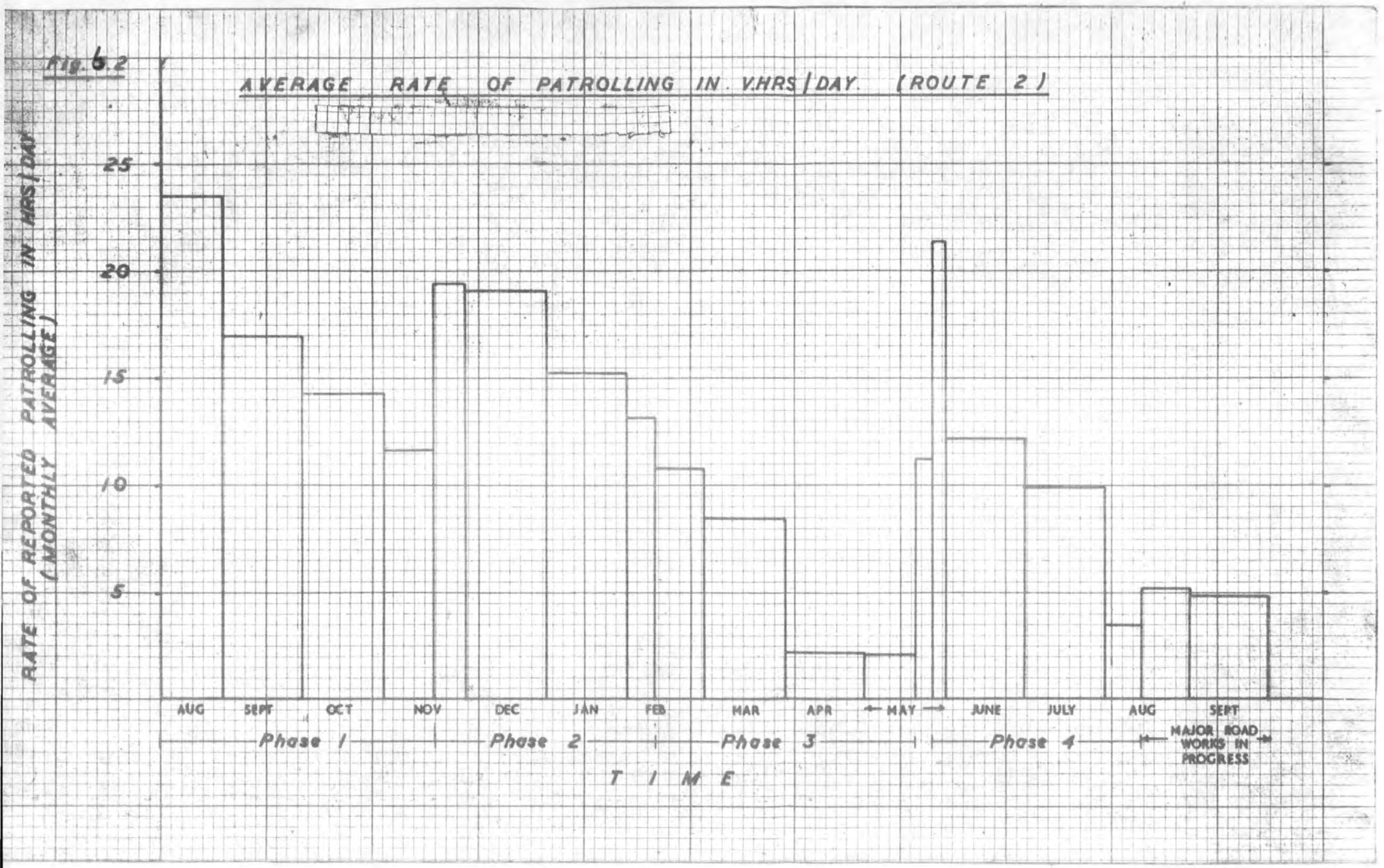


Fig 6.3

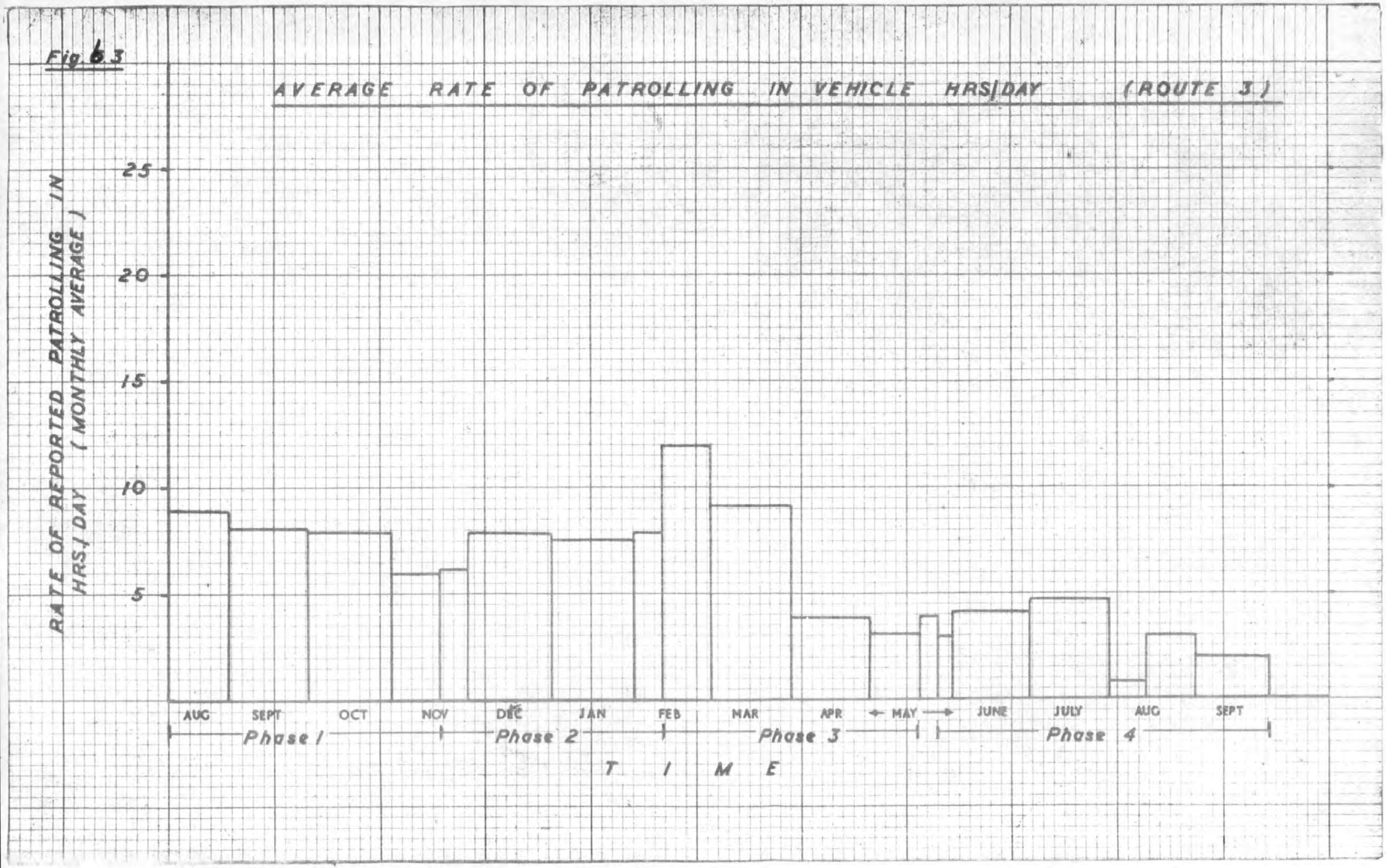
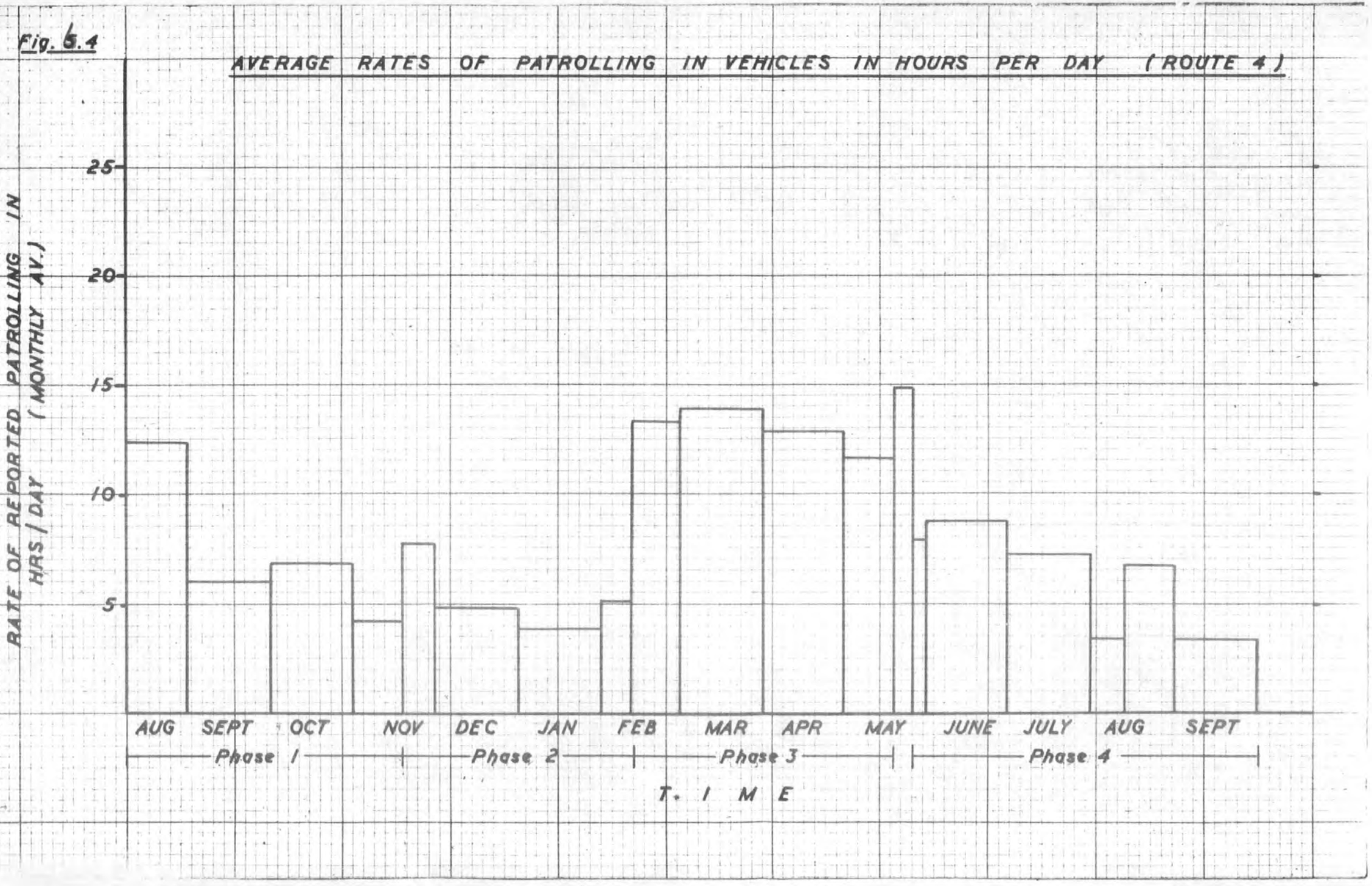

AVERAGE RATE OF PATROLLING IN VEHICLE HRS/DAY (ROUTE 3)
RATE OF REPORTED PATROLLING IN HRS./DAY (MONTHLY AVERAGE)
25
20
15
10
5
AUG
SEPT
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
Phase 1
Phase 2
Phase 3
Phase 4
TIME

Fig. 5.4

AVERAGE RATES OF PATROLLING IN VEHICLES IN HOURS PER DAY (ROUTE 4)



The most likely reason for this 50% reduction is that on 1st April 1968, the greater part of Stockton Division, which included a large part of this route was transferred to the newly formed Teesside Constabulary. Prior to this occurring the co-operation of Mr. Davison, Chief Constable of Teesside Constabulary had been obtained to continue the flow of information for the section of the route which would be in his Force area. Full liaison was maintained with Teesside motor patrol Commanders and it can only be assumed that this new Force patrolled at a lower level generally than had Durham Constabulary.

Figure 6:4 shows the reported patrol levels for Route 4(Trunk Road A19 North). A marked increase in levels is recorded for Phase 3 when seven additional motor cycles were allocated to the Route. Again a sharp temporary increase is shown at the end of May 1968, when the coloured form was introduced. During Phase 4 in which four additional motor cycles alternated between this route and Route 2, the reported patrol levels again progressively fell.

OBSERVATIONS OF PATROL LEVEL MEASUREMENTS

As can be seen from Figures 6:1, 6:2, 6:3, and 6:4 initially relatively high patrol levels were recorded. Any change, either in reporting procedure or patrol activity led to an increase in reported patrol levels which progressively fell away. In addition to the regular patrols it was also necessary to establish what background level of patrol was accruing from indentifiable Police vehicles travelling on the experimental Routes, although not detailed to do so. On a certain day each month an instruction was issued that the drivers of all identifiable Police vehicles who travelled on any of the four Routes, even if a Male Civilian Employee, would complete a Motor Patrol Form. This was found to be an unsatisfactory method of recording background patrolling. Coloured variants of the form were introduced at the beginning of Phase 4 and at the same time the form was re-designed to allow recording of offences and incidents by Route. (See Figures 7 & 8).

The only result obtained by using the green form on selected days in Phase 4 was that there was such a high level of activity from Panda vehicles, primarily on the Teesside Section of Route 3 that the reported patrol levels were completely swamped.

The patrol forms were sent to Chief Inspector H. Taylor daily by internal mail. If none were received from a Division for two to three days the Motor Patrol Commander in that Division was reminded. It was not possible to check that all forms were received, for although by duty sheet a crew may have been allocated to a Route they may, in fact have spent a day or more at Court, sick, taking time off or attending to numerous other duties which prevented them patrolling the Route. No method of ensuring that Patrol Forms were completed and returned could be devised without interferring with operational command.

Any enquiries to be made to
Chief Inspector Taylor
Durham 5261.

DURHAM CONSTABULARY

MOTOR PATROL EXPERIMENT

Route A TRUNK ROAD A.1 (Aycliffe Interchange to Cock of the North)

Route B TRUNK ROAD A.1 (Cock of the North to Gateshead Boundary)

Route C TRUNK ROAD A.19 (Tees Bridge, Yarm to Junction of A.179)

Route D TRUNK ROAD A.19 (Junction of A.179 to Monkwearmouth Bridge, Sunderland)

Route E TRUNK ROAD A.184 (Gateshead - South Shields)

Route F TRUNK ROAD A.177 (Durham - Sedgefield)

Route G TRUNK ROAD A.690 (Durham - Sunderland)

Route H TRUNK ROAD A.6127 (The Hermitage - Teams Colliery)

1. General Information:

DATE ...../..../6..... (1-6) CALL SIGN ..... (7-11) DIVISION..... (12-13)

NO. IN CREW ..... (14)

Average weather during patrol (Please tick) (15)

(1)	(2)	(3)	(4)
Rain	Snow	Fog	Fine
Hail	Sleet	Mist	

Average Road conditions during patrol (Please tick) (16)

Dry	Wet	Snow	Ice

2. Information relating to accidents on above routes.

No. of accidents reported (17) .....

(Use 24 hour clock)

TIME		ROUTE		LOCATION OF ACCIDENT
	18/21		22	

Punch R in column 23 to indicate that the revised form is in use.

3. Activities on Routes:

	Route	No.			Route	No.	
No. of traffic offences reported		24	25	No of defective vehicles checked		26	27
No. of traffic offences reported		28	29	No. of defective vehicles checked		30	31
No. of persons reported		32	33	Assistance to motorists.		34	35
No. of persons reported		36	37	Assistance to motorists.		38	39
No. of verbal cautions (traffic offences only)		40	41	C.R.O. Checks		42	43
No. of verbal cautions (traffic offences only)		44	45	C.R.O. Checks		46	47

Total length of time spent on escort duties (4E) .....

CAR _____ Punch 49(1)

MOTOR CYCLE _____ Punch 49(2)

Please use 24 hour Clock

Route A.B.C. or D.	Time entered Route	Time Left Route
50	51-54	55-59
60	61-64	65-69
70	71-75	76-79
50	51-54	55-59
60	61-64	65-69
70	71-74	75-79
50	51-54	55-59
60	61-64	65-69
70	71-74	75-79

Figure 7.

3. Activities on Routes:

	Route		No.			Route		No.	
No. of traffic offences reported		24		25	No of defective vehicles checked		26		27
No. of traffic offences reported		28		29	No. of defective vehicles checked		30		31
No. of persons reported		32		33	Assistance to motorists.		34		35
No. of persons reported		36		37	Assistance to motorists.		38		39
No. of verbal cautions (traffic offences only)		40		41	C.R.O. Checks		42		43
No. of verbal cautions (traffic offences only)		44		45	C.R.O. Checks		46		47

Total length of time spent on escort duties (48) .....

CAR _____ Punch 49(1)

MOTOR CYCLE _____ Punch 49(2)

Please use 24 hour Clock

Route A.E.C. or D.		Time entered Route		Time Left Route	
	50		51-54		55-59
	60		61-64		65-69
	70		71-75		76-79
	50		51-54		55-59
	60		61-64		65-69
	70		71-74		75-79
	50		51-54		55-59
	60		61-64		65-69
	70		71-74		75-79

Figure 8.

Any enquiries to be made to
Chief Inspector Taylor
Durham 5261.

DURHAM CONSTABULARY

MOTOR PATROL EXPERIMENT

Route A TRUNK ROAD A.1 (Aycliffe Interchange to Cock of the North)

Route B TRUNK ROAD A.1 (Cock of the North to Gateshead Boundary)

Route C TRUNK ROAD A.19 (Tees Bridge, Yarm to Junction of A.179)

Route D TRUNK ROAD A.19 (Junction of A.179 to Monkwearmouth Bridge, Sunderland)

Route E TRUNK ROAD A.184 (Gateshead - South Shields)

Route F TRUNK ROAD A.177 (Durham - Sedgefield)

Route G TRUNK ROAD A.690 (Durham - Sunderland)

Route H TRUNK ROAD A.6127 (The Hermitage - Teams Colliery)

1. General Information:

DATE ...../..../6..... (1-6) CALL SIGN ..... (7-11) DIVISION ..... (12-13)

NO. IN CREW ..... (14)

Average weather during patrol (Please tick) (15)

(1)	(2)	(3)	(4)
Rain	Snow	Fog	Fine
Hail	Sleet	Mist	

Average Road conditions during patrol (Please tick) (16)

Dry	Wet	Snow	Ice

2. Information relating to accidents on above routes.

No. of accidents reported (17) .....

(Use 24 hour clock)

TIME		ROUTE		LOCATION OF ACCIDENT
	18/21		22	

Punch R in column 23 to indicate that the revised form is in use.

Mean monthly patrol levels on Route 1 through Route 4 are shown in Figure 6, the experimental phases being marked on the figures. In general it is clear that an initially high level of patrolling reported (First 30 days of Phase 1) rapidly decreased (by approximately a factor of two on Route 1) within Phase 1. No operational requirement was imposed which would have been expected to lead to a change in actual patrol activity in that period. It appears, therefore, that the rapid decrease in reported patrolling represents a loss of interest, rather than a real decrease in patrol activity. This is confirmed by the sudden very large increase (of as much as a factor of 5) in reported patrol hours on a control route when the coloured version of the report form was introduced later (May, 1968). This sudden burst of reporting had decreased by a factor of two within two weeks (control route R1) and by a factor of five within six weeks.

However, the results from A.19 patrolling may be somewhat more reliable. Certainly they show a large increase in reported patrol hours on Route 4 in Phase 3 when the additional motor cycle patrols were introduced. Comparing the reported patrolling on Route 3 and Route 4 in Phase 3 with the level when both were controls in Phase 2, it would appear that almost a factor of three increase in reported patrol activity was achieved on Route 4 in Phase 3.

There is some evidence, but not so conclusive, that the Phase 2 experiment (2 additional cars on Route 2) also resulted in an increase on reported patrol levels of about a factor of two.

The highest level of patrolling reported was approximately 24 hours per 12 mile stretch per day, i.e. an average of one patrol car on the route, and the lowest was $1\frac{1}{2}$ hour per 12 mile route per day. Even at the higher figure, the average motorist is extremely unlikely to see a patrol vehicle, and it would appear that, at the levels of patrolling achieved in this experiment, the deterrent effect must be very small.

The reported patrol hours on Route 2 and Route 4 during Phase 4, the pulse experiment, are shown in more detail in Figure 9. They are plotted as 10 day averages corresponding to 'pulse on' and 'pulse off' periods, and the mean level in the 'on' period is found to be approximately a factor of two higher than that in the 'off' period. From the third pulse onwards, interest apparently began to fall off rapidly, so that at this stage reported patrol levels with the pulse 'off' were sometimes higher than those with the pulse 'on'.

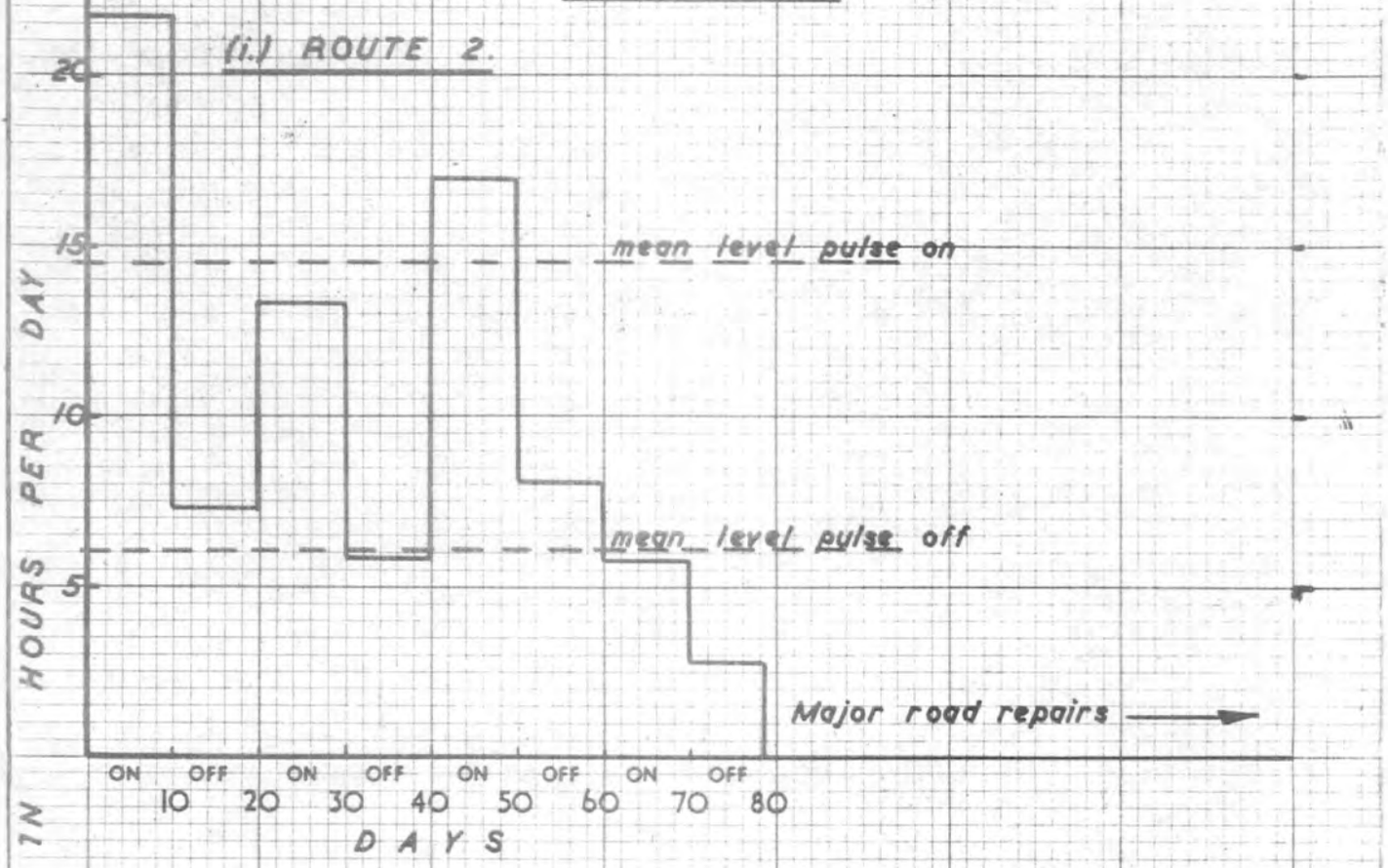
TRAFFIC FLOW RATES

At the commencement of the project the Durham County Council Surveyor's Planning Department stated that full comprehensive measurements of traffic flows were available for all four routes.

Fig. 9

RECORDED PATROL LEVELS BY 10 DAY PULSING PERIOD IN PHASE 4

(i.) ROUTE 2.



(ii.) ROUTE 4.

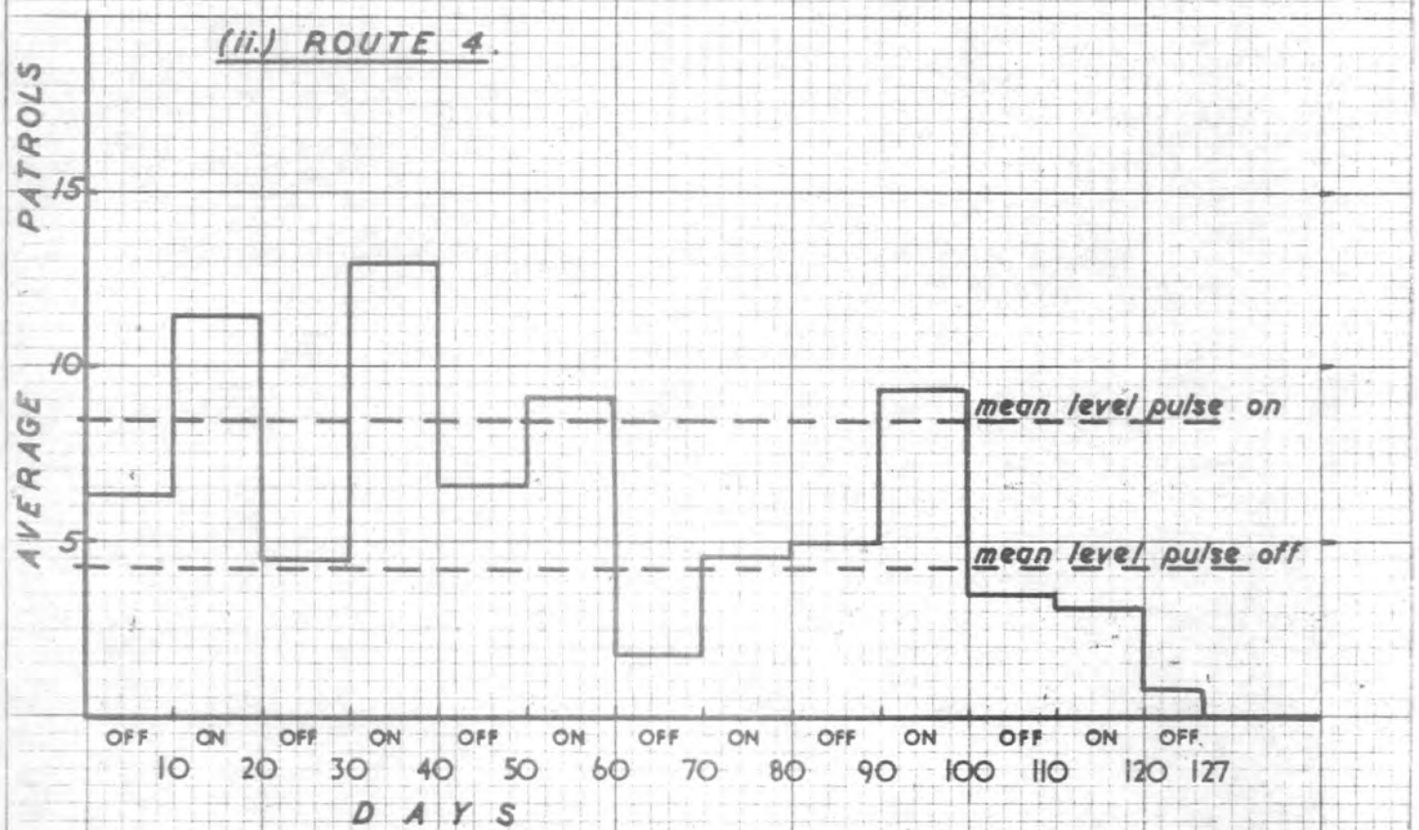


Figure 9.

In the event it was revealed that, far from being complete, the data referred to different points on a road and were compiled at different times of the year and at irregular time periods. No attempt being made to keep the parameters constant. It appears that it is the established practice of the County Surveyor's Department to scale the traffic flow counts taken at arbitrary times of the year to what is known and accepted as "August Traffic Flow" by using the National average variation figures. The conversion factor for Urban Trunk Roads for 1964/7 indicated that a traffic flow measurement taken in January should be multiplied by 2.33 to convert it into "August Traffic Flow".

Chief Inspector H. Taylor was of the opinion that an increase in traffic flow to this extent did not occur in reality.

A search was made to find a source of information which could be accepted as accurate. The Tyneside Conurbation Traffic Survey Unit was able to supply data in the form of a continuous traffic count on Trunk Road A1 and the A19 as they approach the Tyneside Conurbation. There were a few isolated short gaps due to equipment failure. The recording points were situated at the North end of Route 2 and about two miles North of the end of Route 4.

Average daily traffic flows were calculated for one week per month for the period December 1966, to September 1968. The average daily traffic flow for the period 8 a.m. - 6 p.m. was also calculated and the results are shown in Figures 10a & b and 11a & b.

It is apparent from these graphs that there is no measurable trend or seasonal variation in traffic flow on these two roads. It is assumed that the lack of trend or seasonal variation equally applies along all four routes but this cannot be substantiated as the measurements only emanate from one point on each road.

Published figures indicate that Nationally there was a 5% per annum increase in vehicle registration in the period 1965/8. Due to reorganisation of Local Taxation Office boundaries within the Durham Constabulary area it is not possible to establish if a similar increase has occurred in County Durham, but the traffic flow data does not give any indication of such an increase.

The diurnal variation in reported patrol hours has been obtained for the period of Phase 1 for Route 2, and is compared with variations in traffic flow and accident rate in Figure 12. From this it is clear that if the prime function of Police motor patrols is to enforce traffic laws, deter traffic offenders and deal with accidents an excessive amount of patrolling takes place between 0000 hours and 0700 hours when traffic flow is minimal, and too little patrolling occurs in the period 1800 hours to 2000 hours when the main traffic and accident peaks occur.

If the objectives of motor patrols are as stated then reconsideration of the allocation of available manpower by shift is indicated.

Fig. 10a

TRAFFIC FLOW - 24 hour day - averaged over 7 days (Mon. - Sun.) for each month.

TRUNK ROAD - A.1.

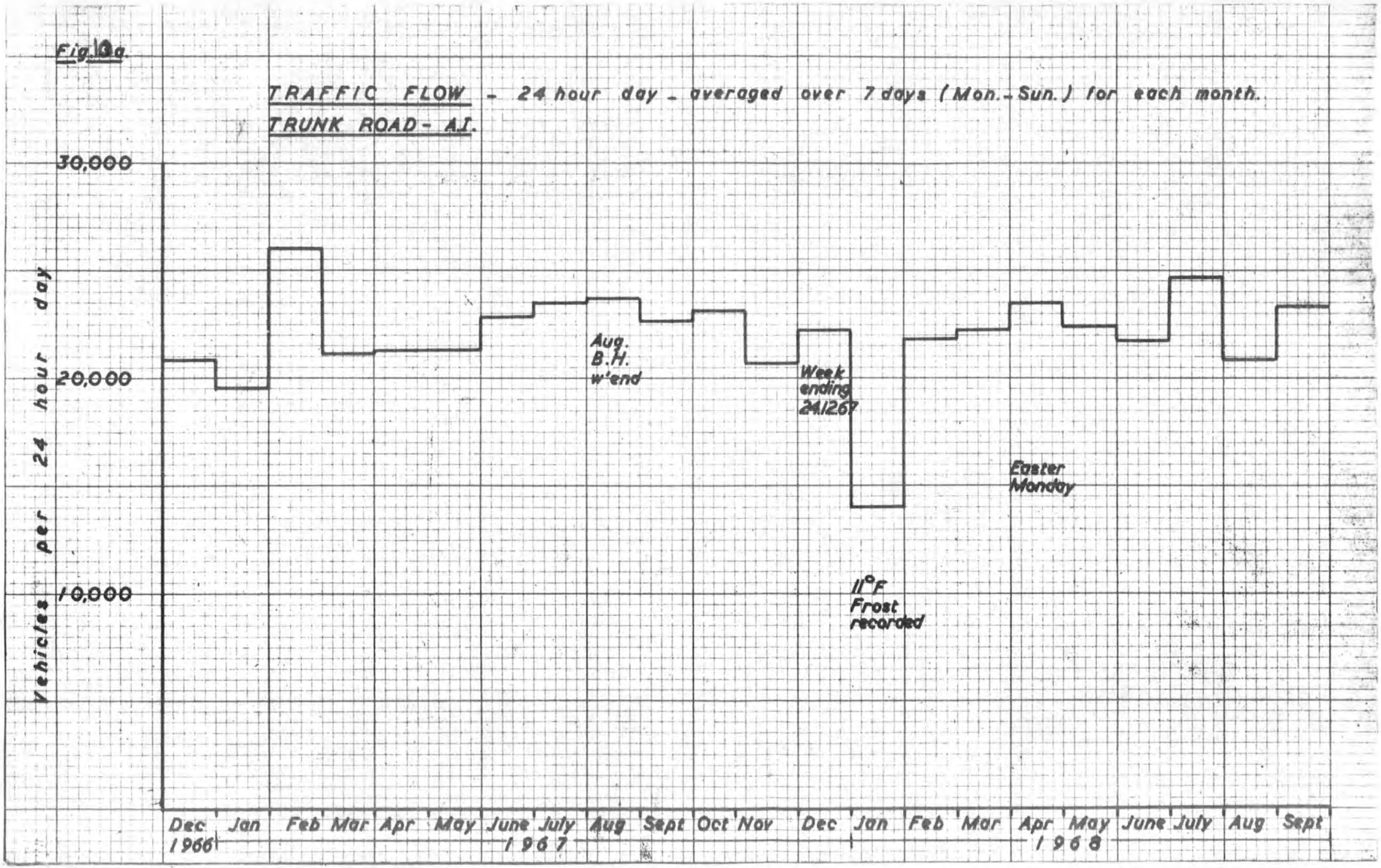


Fig. 10b.

TRAFFIC FLOW - TRUNK ROAD A19 - 24 hour day - averaged over 7 days (Mon.-Sat.) for each month

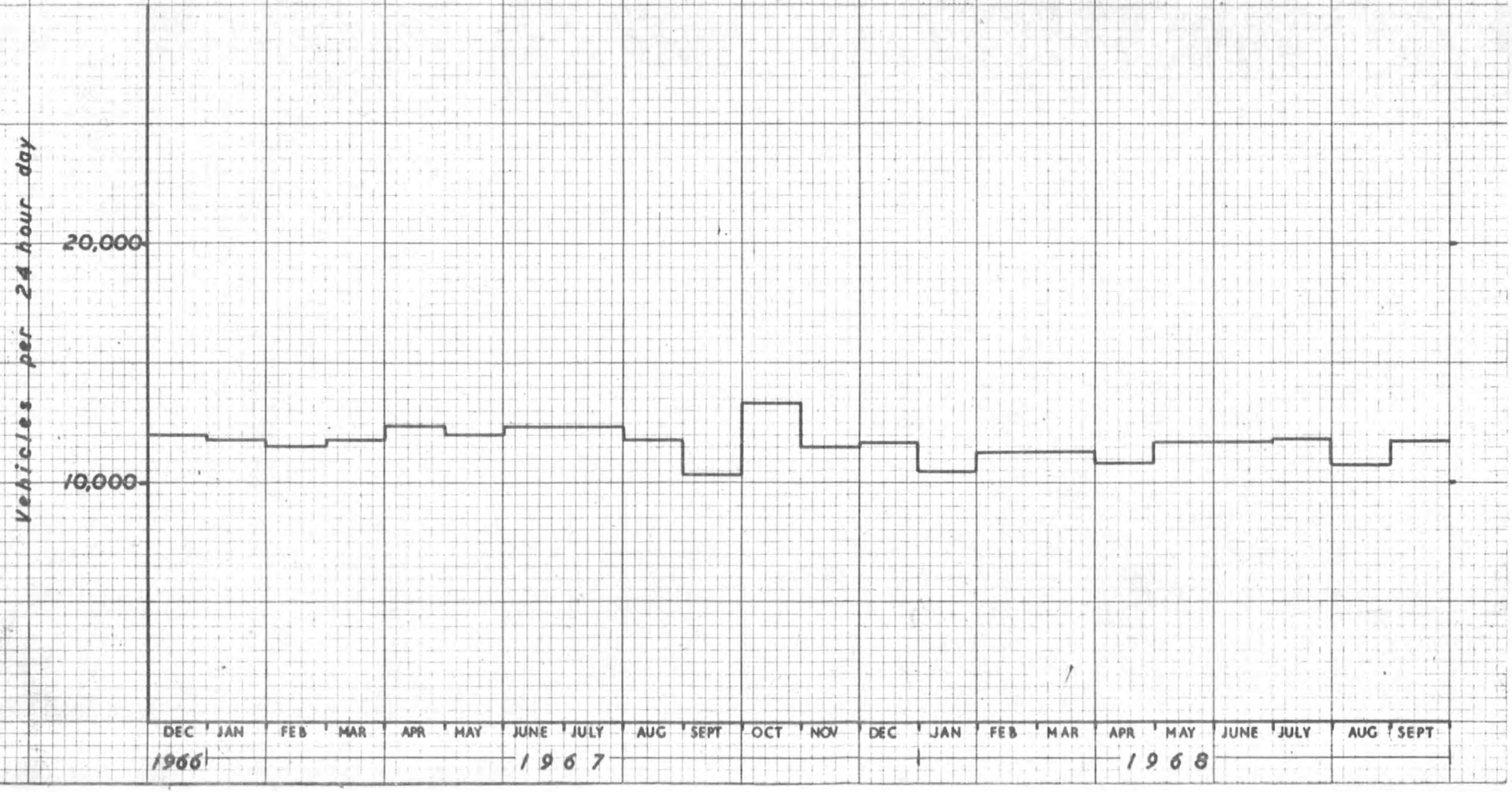


Fig 4a.

TRAFFIC FLOW - TRUNK ROAD A1 [10 hour day (8a.m. - 6p.m.) averaged over 7 days (Mon. - Sun.)]

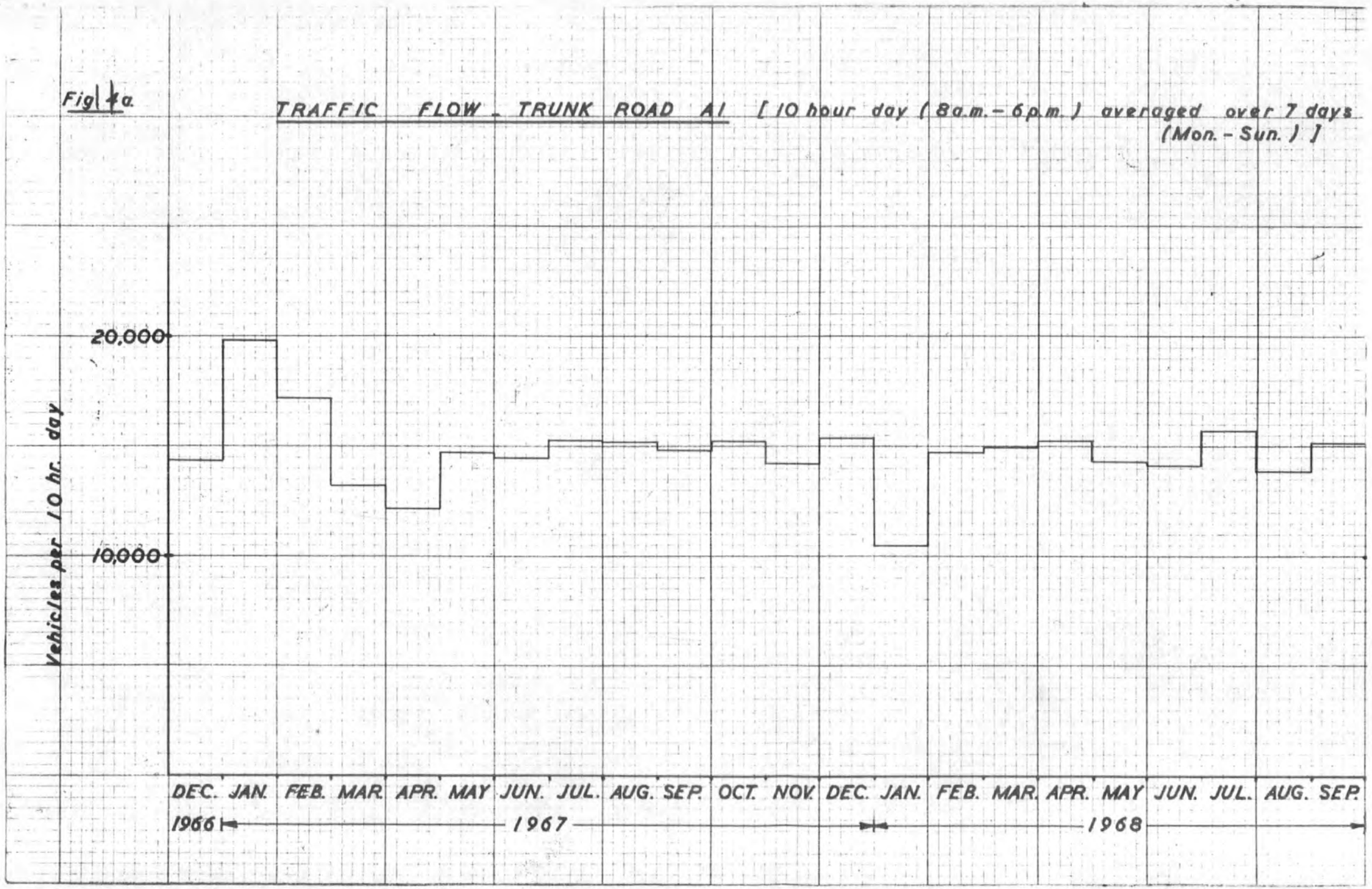


Fig. 14b.

TRAFFIC FLOW - TRUNK ROAD A19 - 10hour day - averaged over 7 days (Mon.-Sun.) for each month.

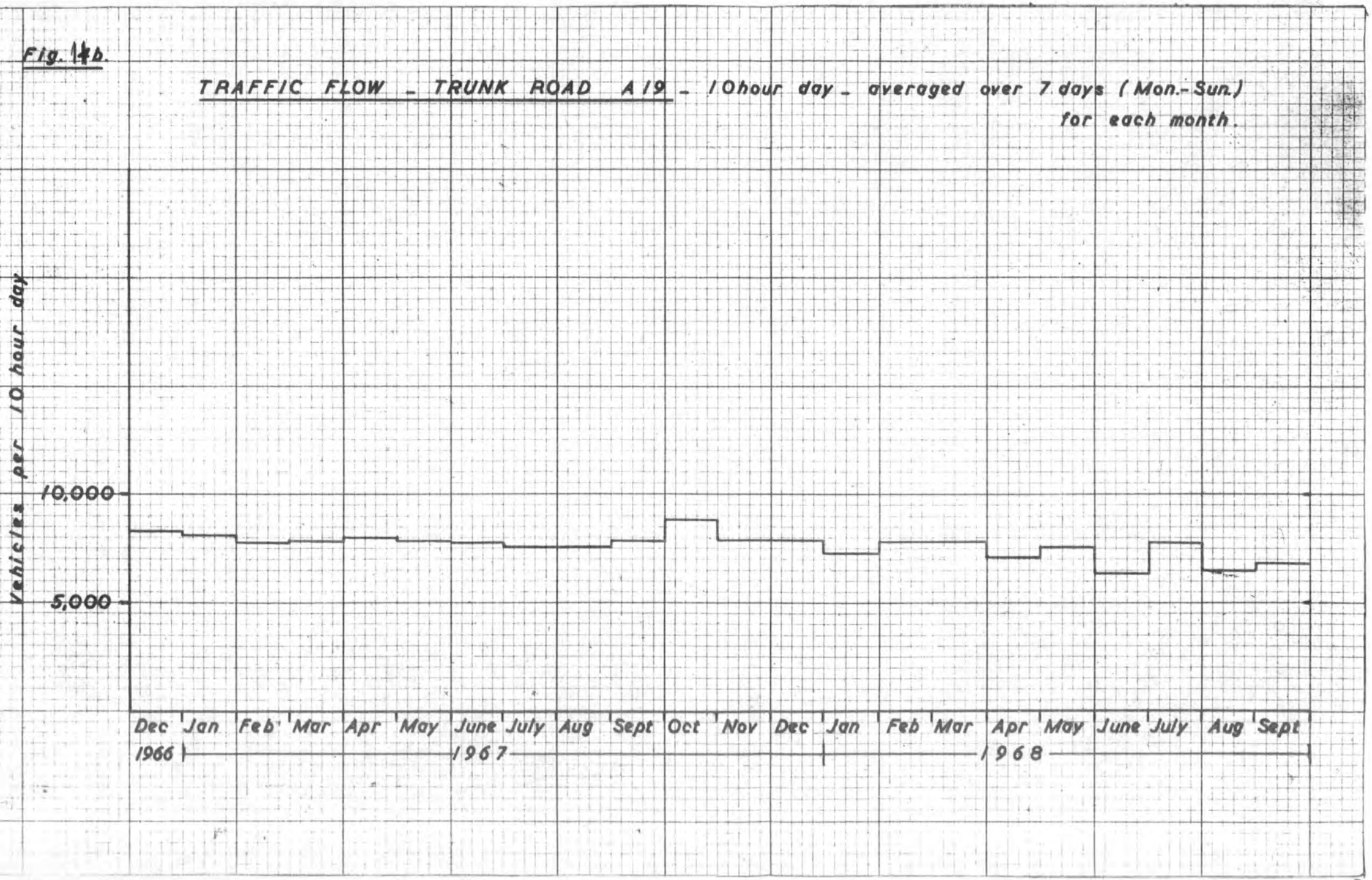
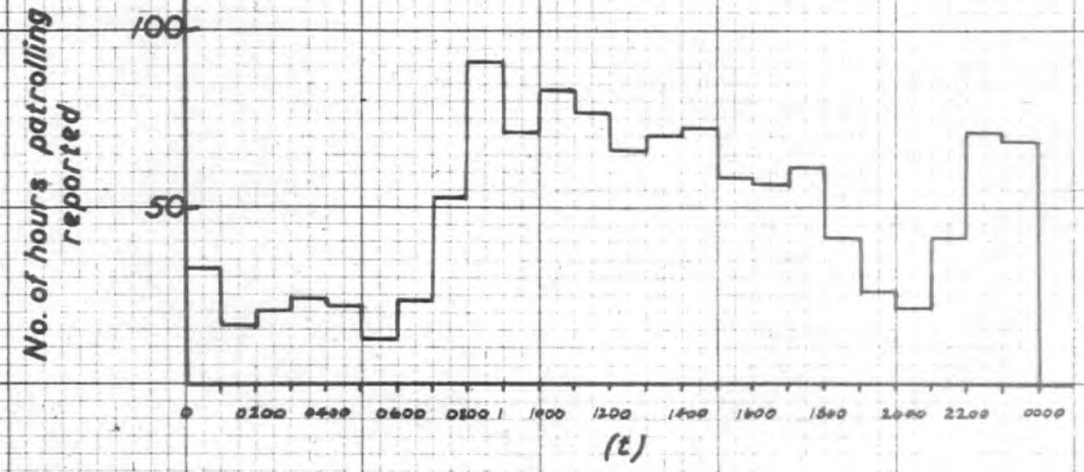
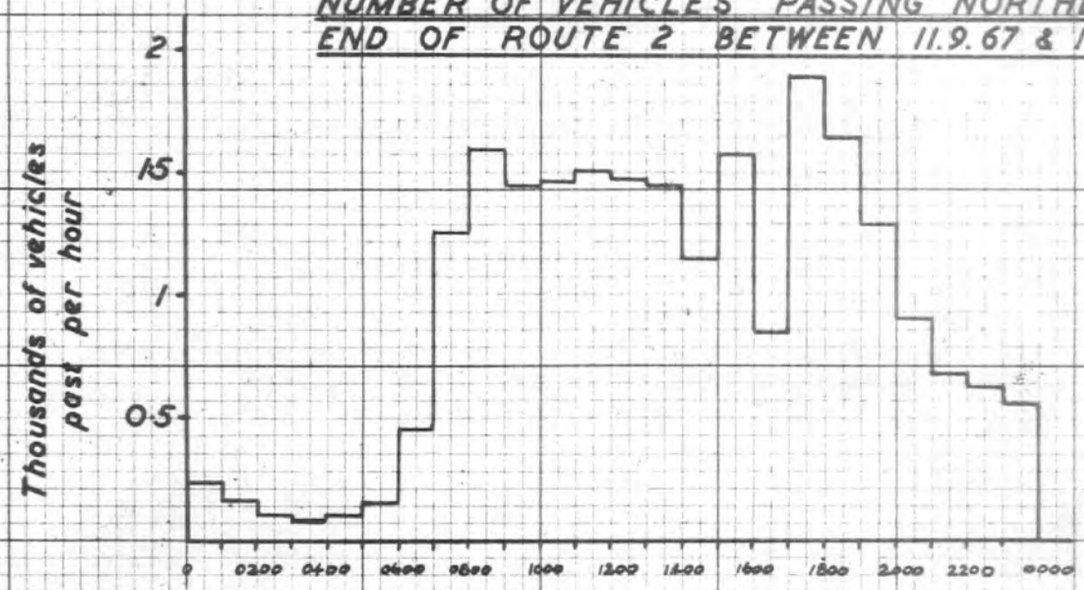


Fig. 12

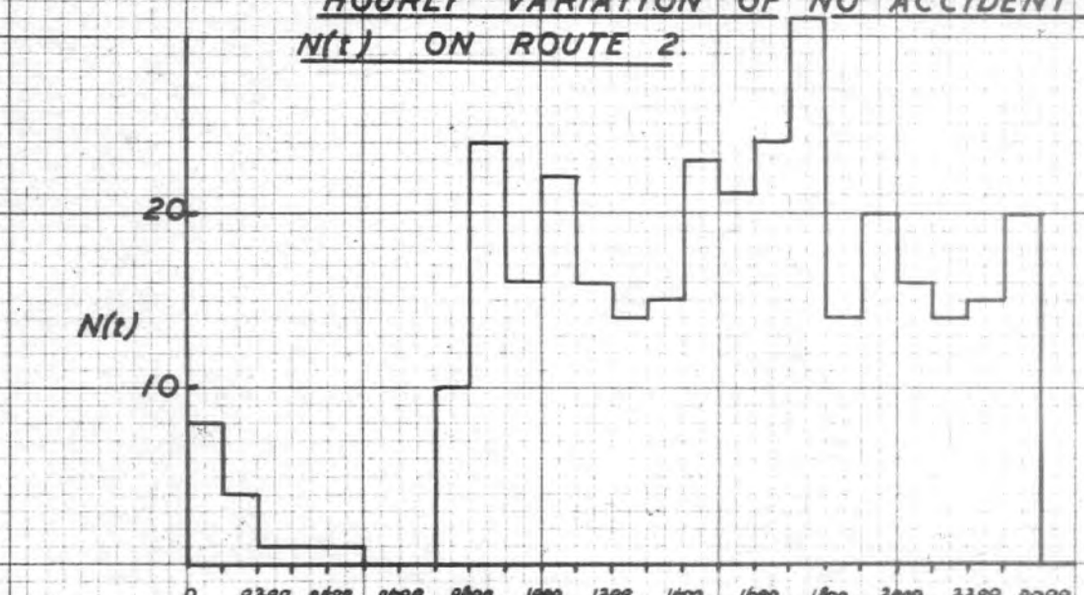
TOTAL HOURS PATROLLED BETWEEN 9.8.67 & 9.10.67 ON ROUTE 2.



NUMBER OF VEHICLES PASSING NORTHERN END OF ROUTE 2 BETWEEN 11.9.67 & 17.9.67



HOURLY VARIATION OF NO ACCIDENT RATE N(t) ON ROUTE 2.



[9/8 - 9/10. summed for years 1963-67.]

Figure 12.

ACCIDENT RATES

Durham Constabulary accident records for fatal, injury and damage accidents are held on 80 column Hollerith punch cards.

Historical data was held back to 1963. The cards held for the years 1963/65 were found not to have been punched with the normal rectangular slot but with a double elliptical hole. To establish accident trends it was necessary to extract, by mechanical sorting, from these records the accidents which had occurred on the four routes. At first it was thought impossible to accomplish this as no machine could be found that would sort this shape of hole. Persistent enquiries traced a machine at the Ministry of Social Security, Longbenton, Newcastle on Tyne. The Manager of the Data Processing Unit allowed use of the machine and some 40,000 cards were mechanically sorted to extract accidents which had occurred on one of the routes.

Details of current accidents were supplied at weekly intervals by the Headquarters Traffic Department of Durham Constabulary.

All historical and current accident records were converted to I.B.M. punch cards and a program was written which would analyse the data. However, as the University's new I.B.M. 360/67 computer was not completely installed until February it was not possible to use it for analysis. Even after this date teething troubles in the computer, periods of none availability etc., did not allow the use of the computer for full analysis of the accident data until July 1968.

The montly progressive accident totals published by Durham Constabulary were very closely watched for changes in accident rates on Trunk Road A1 and Trunk Road A19. By June 1968, the depression of the accident rate, especially on Trunk Road A19, was so large in comparison with the progressive totals for the same time periods of previous years that Chief Inspector Taylor regarded them with deep suspicion. A spot check revealed descrepancies in the Monthly Statistical Analysis. As a result a complete check of all the accident data was made by Mr. T. H. Biss and Chief Inspector Taylor in collaboration with Traffic Department clerical staff. This took several weeks but the effort in considered well worthwhile as it is now known that the accident data is absolutely correct.

Figure 13 shows an extract from the Monthly Statistical Analysis for June 1968, before check made, and for August 1968, which includes all the corrective changes. The corrected progressive totals for August are clearly inconsistent with those for June.

STUDY OF ACCIDENT RATES

The accident rates recorded in the periods of the year corresponding to each of Phases 1, 2, 3 and 4 has been obtained for:-

FIGURE 13.

EXTRACTS FROM MONTHLY ANALYSIS OF ACCIDENTS

June 1968 (before correction)

	Fatal	Ser.	Slt.	Dam.	Monthly Total	Prog. Total				Total for end of June 1968
						Fat.	Ser.	Slt.	Dam.	
1. (M)	-	-	2	4	6	-	3	22	49	74
1 Trunk	2	1	4	19	26	5	8	42	106	161
19 Trunk	-	-	2	2	4	2	3	28	16	49

August 1968 (after correction)

	Fatal	Ser.	Slt.	Dam.	Monthly Total	Prog. Total				Total for end of August 1968
						Fat.	Ser.	Slt.	Dam.	
. (M)	-	-	-	2	2	-	-	3	3	6
. Trunk	1	1	14	17	33	6	14	88	203	311
9 Trunk	-	2	5	6	13	4	22	89	142	257

(i) 1963/4 through 1967/8.

(ii) For Routes 1, 2, 3 and 4.

(iii) For (a) all reported Injury Accidents.
(b) all reported Accidents.

(iv) For (a) 24 hour day.
10 hour (8 a.m. - 6 p.m.) day.

The data, normalised to 100 day periods are shown on Figures 14a, b, c & d, for a 24 hour day and Figures 15a, b, c & d, for a 10 hour day, as a function of year, for each of the four phases.

A historical trend can be seen on some routes by comparing past identical time periods corresponding with the projects phases as for example, Route 4 Phase 2 on Figure 15d. The trend is however, broken or interrupted by effects of major engineering or changes in legislation, such as occurred in Phase 2 on Route 1.

Route 3 (Control Route) during Phase 1 and Phase 2 (Figure 15c.) shows large fluctuations in recorded accidents from year to year which are unexplained. They are not associated with any obvious changes in legislation, engineering or Police activity. The control routes thus show variations at least as large as those occurring on the experimental routes. (Route 2 - Phase 2; Route 4 Phase 3; Route 2 - Phase 4; Route 4 - Phase 4), during the experimental variations in patrol intensities and tactics.

ANALYSIS

It is apparant from Figures 10a & b and 11a & b, that within the accuracy of the data, traffic flow may be assumed constant throughout the period of the project.

This statistical analysis of the accident data is restricted to the time period 8 a.m. - 6 p.m., when generally a patrol car would be visible to the motoring public. This period eliminates most of the effect of the introduction of the Road Traffic Act 1967 (Breathalyser).

Phase 1 on Route 1 is restricted to the 35 days subsequent to the opening of the Aycliffe Interchange - Bradbury link of the Motorway A1(M) to eliminate the expected effect of reduction in traffic flow.

Phase 4 on Route 2 is curtailed to 79 days by major road works on Birtley By-Pass which commenced on 14th August, 1968.

The number of days in Phase j on Route i, M(i,j) are shown in the following table:-

TRUNK ROAD A.I. (SOUTH) ROUTE 1. 24 hour day. CONTROL ROUTE

Fig. 14a.

x ..... Total Accident Rate

• ..... Injury Accident Rate

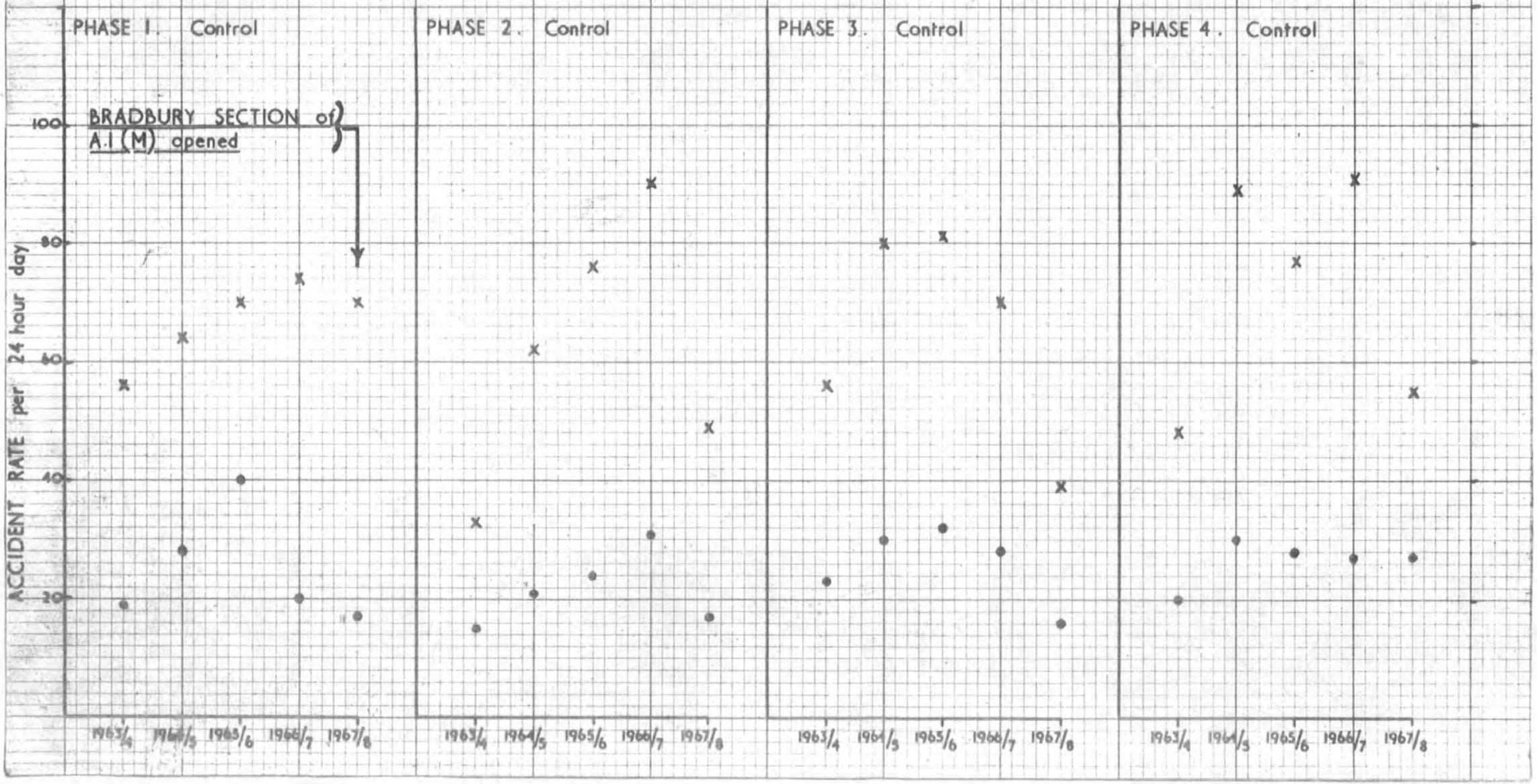
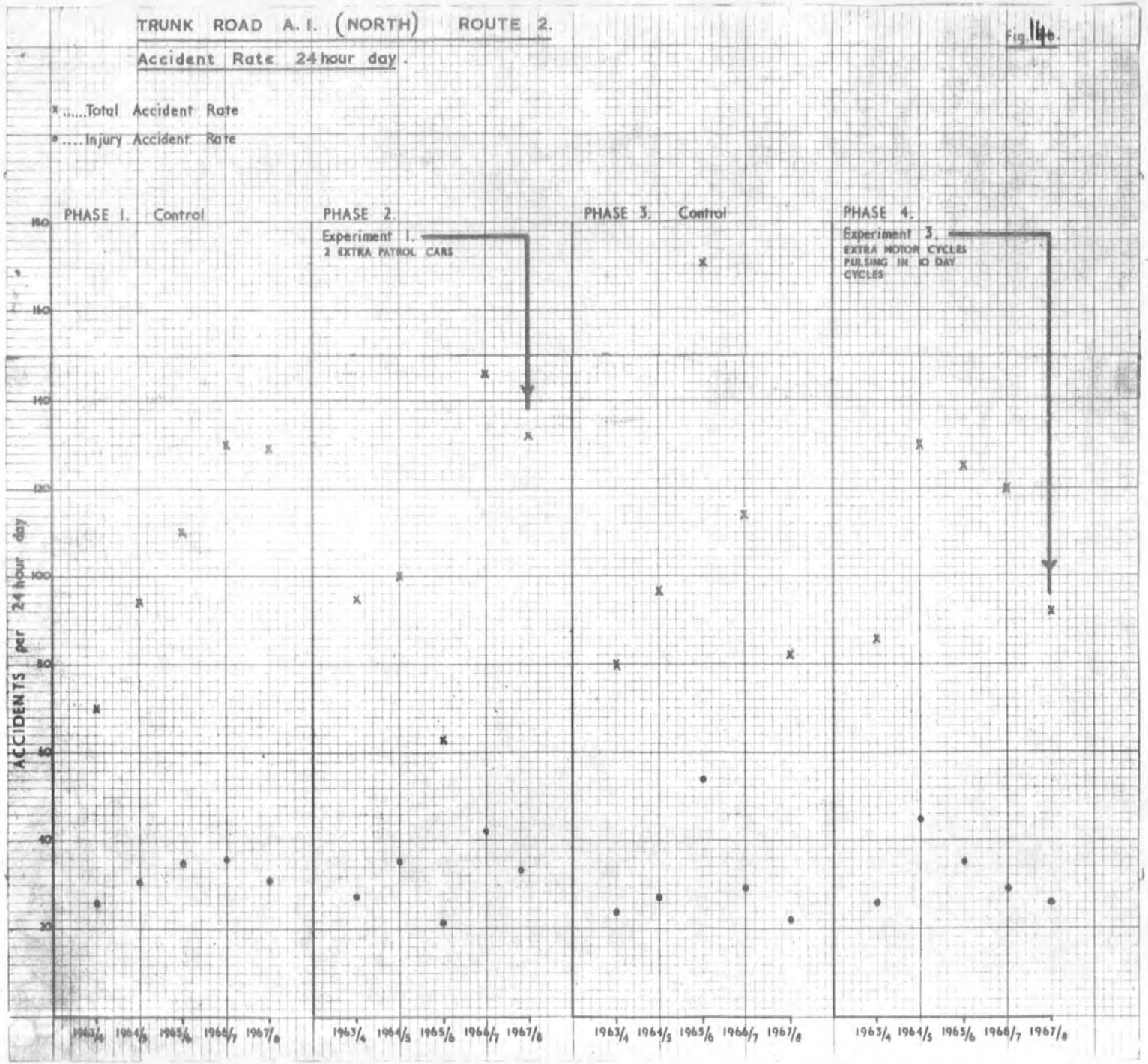


Fig. 11a.


TRUNK ROAD A.1. (NORTH) ROUTE 2.
Accident Rate 24 hour day.
x .....Total Accident Rate
• ....Injury Accident Rate
PHASE 1. Control
PHASE 2.
Experiment 1.
2 EXTRA PATROL CARS
PHASE 3. Control
PHASE 4.
Experiment 3.
EXTRA MOTOR CYCLES PULSING IN 10 DAY CYCLES
ACCIDENTS per 24 hour day
180
160
140
120
100
80
60
40
20
1963/4 1964/5 1965/6 1966/7 1967/8

TRUNK ROAD A 19 (SOUTH) ROUTE 3

Accident Rate 24 hour day

FIG. 14

X ....Total Accident Rate

• ....Injury Accident Rate

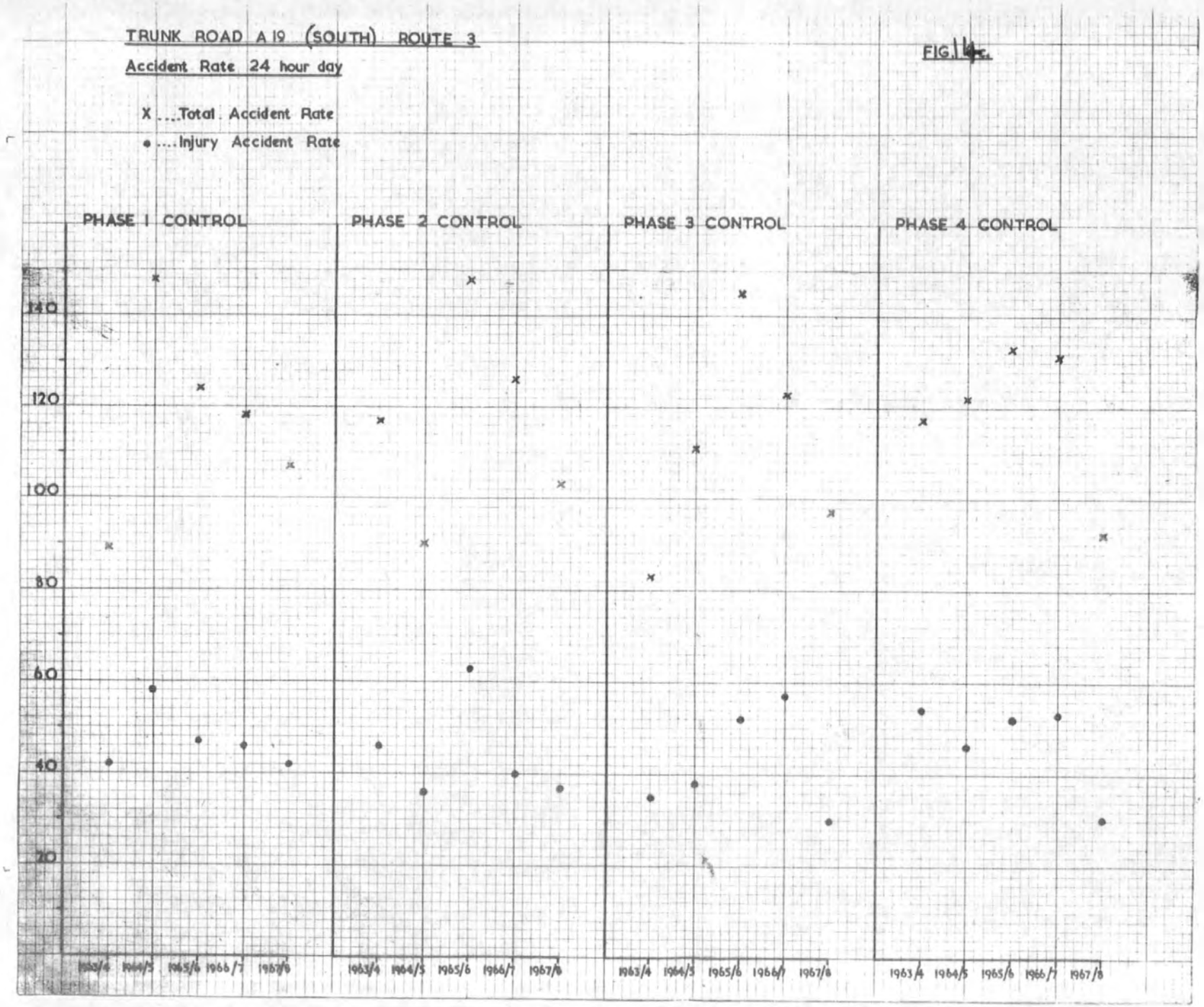


Fig 14e

TRUNK ROAD A 19 (NORTH) ROUTE 4

Accident Rate 24 hour day

X ....Total Accident Rate

• ....Injury Accident Rate

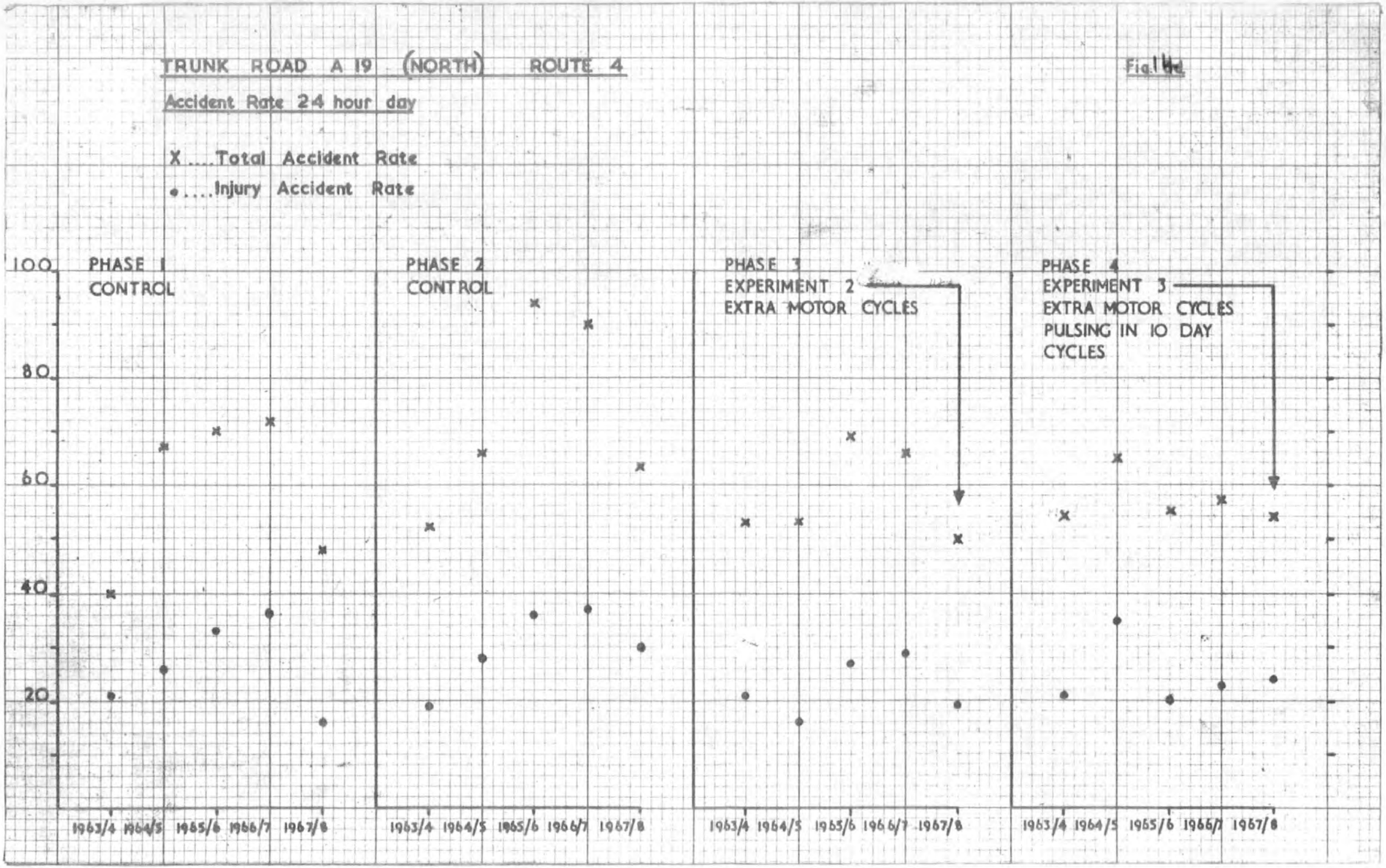


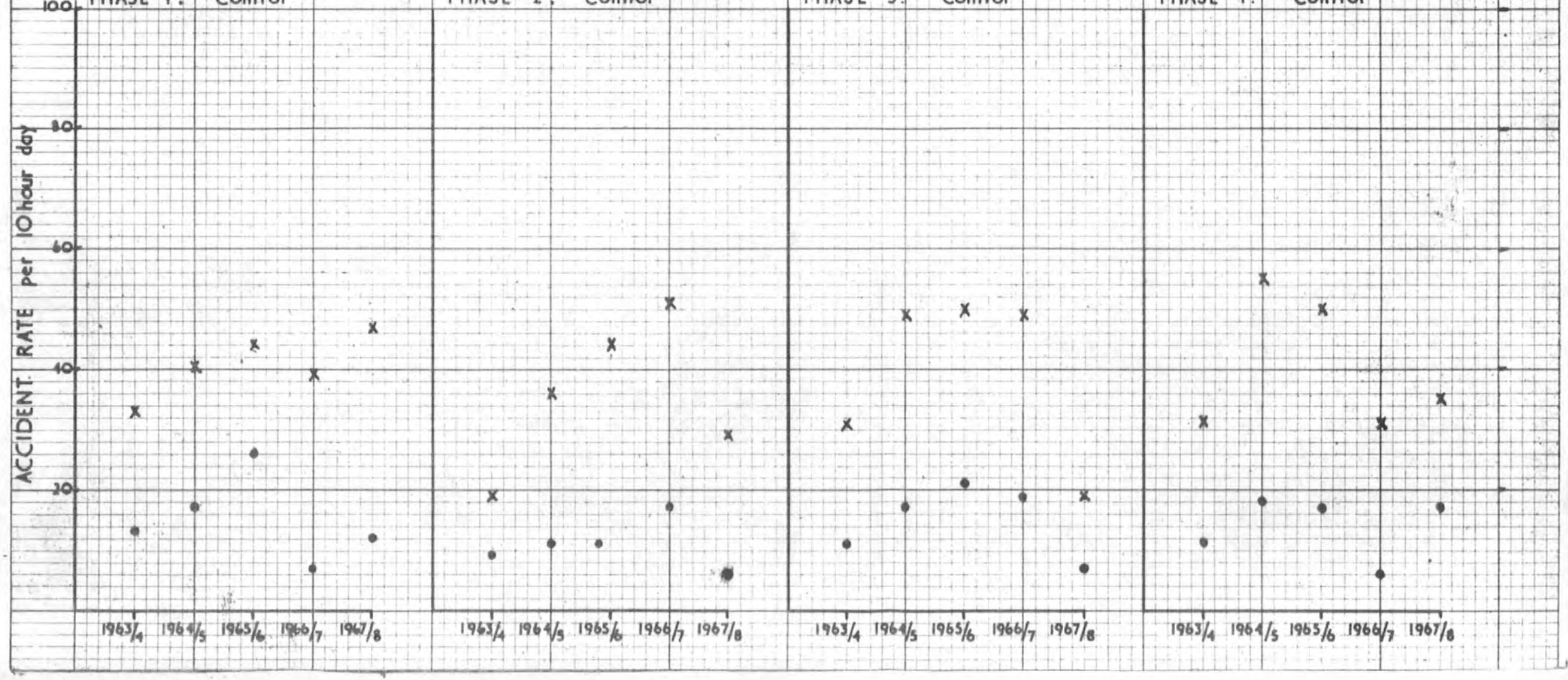
Fig. 15a

TRUNK ROAD A.1 (SOUTH) ROUTE 1.

Accident Rate 8a.m. - 6p.m.

x ....Total Accident Rate

●....Injury Accident Rate



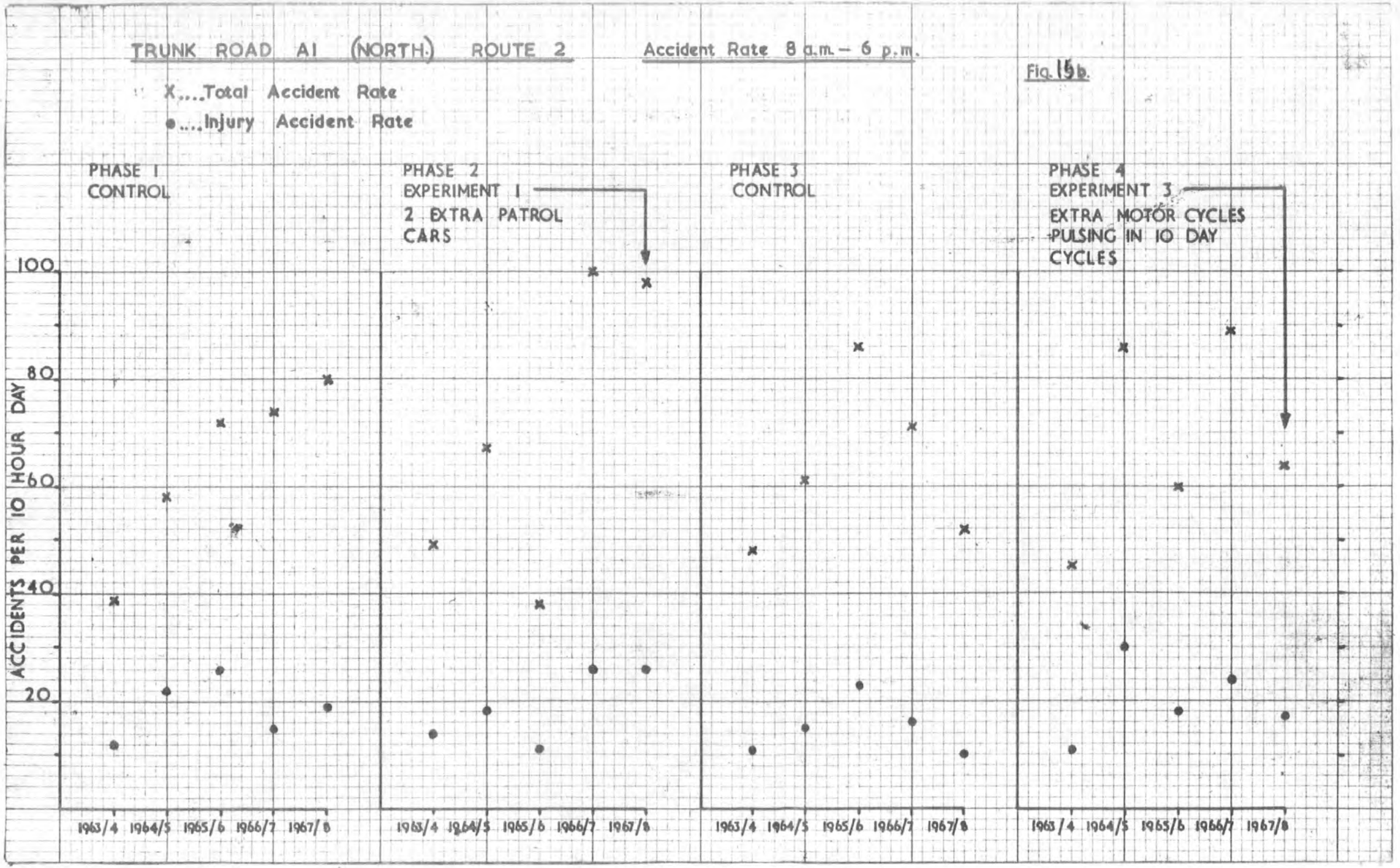
TRUNK ROAD A1 (NORTH.) ROUTE 2

Accident Rate 8 a.m. – 6 p.m.

Fig. 15b.

X....Total Accident Rate

•....Injury Accident Rate



TRUNK ROAD A.19 (SOUTH) ROUTE 3.

Fig. 15c.

Accident Rate 8a.m. - 6p.m.

x ..... Total Accident Rate

● ..... Injury Accident Rate

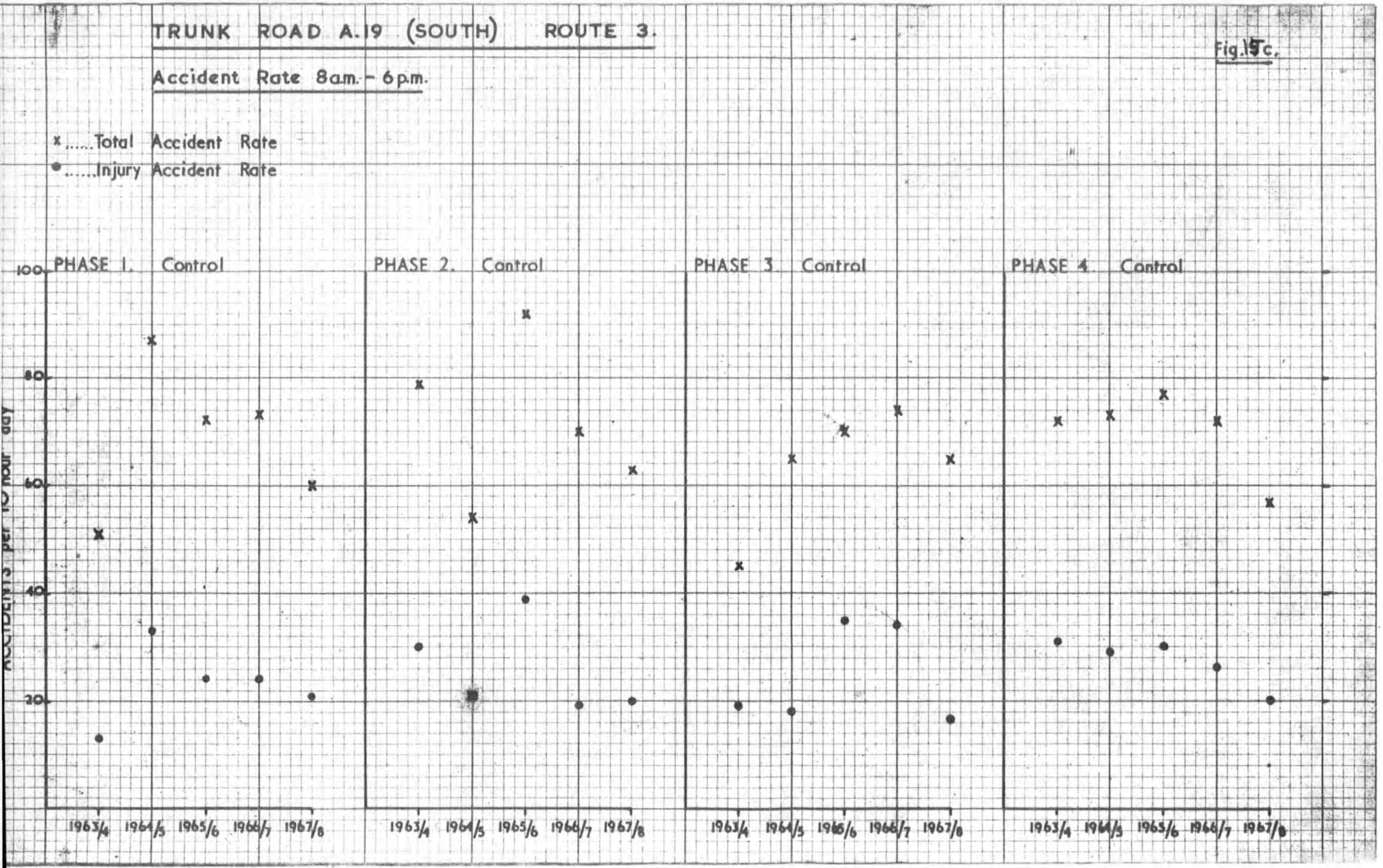


Fig 16d.

TRUNK ROAD A19 (NORTH) ROUTE 4

ACCIDENT RATE 8a.m. – 6p.m.

x Total Accident Rate
o Injury Accident Rate

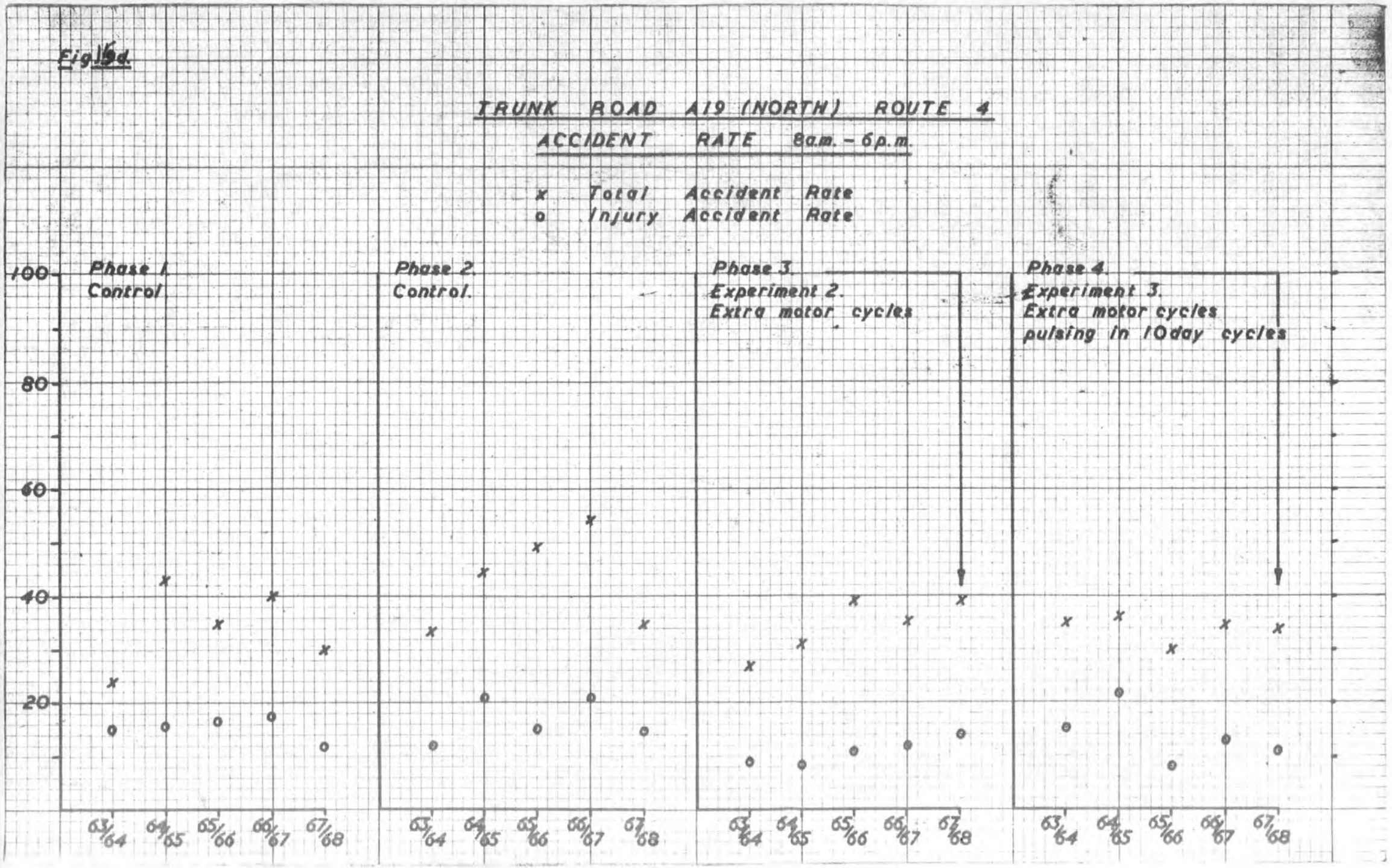


TABLE 3.

Number of days in Phase j on Route i (m(i,j))

	j = 1	j = 2	j = 3	j = 4
i = 1	35	84	98	127
i = 2	103	84	98	79
i = 3	103	84	98	127
i = 4	103	84	98	127

If the experiments have no statistically significant effect it would be expected that the number of accidents in any Phase j, or any Route i, to be approximately equal to:-

$$e(i,j) = t(i)\ s(j)\ m(i,j).$$

Where $\Sigma\ t(i) = 1$, t(i) is a factor depending on Route, s(j) is a seasonal factor depending only on phase. The difference between this estimate of the accidents in Phase j on Route i, e(i,j) and the actual number of accidents n(i,j) could arise totally or in part from random causes. In order to derive values of $e(i,j) = t(i)\ s(j)\ m(i,j)$ it is necessary to obtain values of t(i) and s(j) which minimise the difference between e(i,j) and n(i,j) for all i and j. Note that there are eight free parameters (t(i), i = 1, i = 2, i = 3, i = 4; s(j), j = 1, j = 2, j = 3, j = 4) to fit 16 observations. This is done by the method of maximum likelihood. (See the Advanced Theory of Statistics by M. G. Kendall and A. Stuart. Charles Griffon and Co., London 1958. Reference 7).

This method indicates that the required values of t(i) and s(j) must satisfy the equations:-

$$t(i) \sum_{j=1}^{4} m(i,j)\ s(j) = \sum_{j=1}^{4} n(i,j) \qquad i = 1 \text{ to } 4,$$

$$s(j) \sum_{j=1}^{4} m(i,j)\ t(i) = \sum_{j=1}^{4} n(i,j) \qquad j = 1 \text{ to } 4$$

$$\text{and } \sum_{j=1}^{4} t(i) = 1.$$

Kendall and Stuart, (Reference 7) show that with values e(i,j) so derived, for large values of n(i,j) the statistic

$$X^2 = \sum_{i=1}^{4}\sum_{j=1}^{4}\left\{\frac{(n(i,j) - e(i,j))^2}{e(i,j)}\right\} = \sum_{i}\sum_{j} B(i,j)$$

has a chi-squared distribution with nine degrees of freedom. The size of X^2 is indicative of the degree to which e(i,j) is a good estimator of n(i,j). If X^2 is large it is most unlikely that the difference between the elements of n(i,j) and e(i,j) could have risen from random fluctuations, but if X^2 is small then these differences may well be the result of random fluctuations. If X^2 is small there could be no justification for claiming that the experiments had any significant effect on accidents.

Reference to a Standard Table of values of X^2 indicated the probability that a value of X^2 as large as that encountered could have arisen from random causes.

The number of fatal and injury accidents occurring in the period 8 a.m. - 6 p.m. in Phase j on Route i n(i,j) is given in the following Table.

TABLE 4

	j = 1	j = 2	j = 3	j = 4
i = 1	3	8	7	22
i = 2	20	22	10	14
i = 3	22	17	17	25
i = 4	12	13	14	14

This produces the following values of s(j) and t(i):-

s(1) = .6311 s(2) = .7143 s(3) = .4898 s(4) = .6640

t(1) = .1866 t(2) = .2927 t(3) = .3148 t(4) = .2060

Hence e(i,j) is given by table:-

TABLE 5.

	j = 1	j = 2	j = 3	j = 4
i = 1	4.1	11.2	9.0	15.7
i = 2	19.0	17.6	14.0	15.4
i = 3	20.5	18.9	15.1	26.5
i = 4	13.4	12.4	9.9	17.4

From Tables 3 and 4 it is possible to calculate the values of B(i,j) for fatal and injury accidents (8 a.m. - 6 p.m.) and these are shown in Table 6.

TABLE 6

	j = 1	j = 2	j = 3	j = 4
i = 1	0.3(-)	0.9(-)	0.4(-)	2.5(+)
i = 2	0.1(+)	1.1(+)	1.1(-)	0.1(-)
i = 3	0.1(+)	0.2(-)	0.2(+)	0.1(-)
i = 4	0.1(-)	0.0(+)	1.7(+)	0.7(-)

Note all values are positive, (+) following an element indicates that the corresponding element of n(i,j) was larger than that e(i,j), and (-) indicates the converse.

This gives a value for X^2 of 9.6. By reference to tables it is found that it may be exceeded from random causes with a probability of a little more than .3, or one occasion out of three.

Any effects on injury accidents that might have been achieved during the project as a result of experiments are therefore not distinguishable from random fluctuations in the reported injury accident rates.

Reference to the bracketed signs in Table 6 for i = 2, j = 2 and for i = 4, j = 3 shows that the actual reported accident rate was higher than expected when additional Police units were patrolling. Although the increases are not statistically significant they do suggest that more accidents are reported when more Policemen are available.

TABLE 7

Values of n(i,j) for all reported accidents (8a.m. - 6 p.m.)

	j = 1	j = 2	j = 3	j = 4
i = 1	14	24	19	45
i = 2	82	82	51	51
i = 3	62	53	64	73
i = 4	36	29	38	43

This produces the following values of s(j) and t(i):-

s(1) = 2.098 s(2) = 2.2381 s(3) = 1.7551 s(4) = 1.9366

t(1) = 0.1502 t(2) = 0.3652 t(3) = 0.3068 t(4) = 0.1778

and hence the following values of e(i,j):-

TABLE 8.

	j = 1	j = 2	j = 3	j = 4
i = 1	11.0	28.2	25.8	36.9
i = 2	78.6	68.7	62.8	55.9
i = 3	66.1	57.7	52.8	75.5
i = 4	38.3	33.4	30.6	43.7

From Tables 7 & 8 we derive the table of values of B(i,j) for all reported accidents (8 a.m. - 6 p.m.), and these are shown in Table 9.

TABLE 9.

Values of B(i,j). All these values are positive but are marked by (+) to indicate that n(i,j) is greater than e(i,j) and by (-) to indicate the converse.

	j = 1	j = 2	j = 3	j = 4
i = 1	0.8(+)	0.6(-)	1.8(-)	1.8(+)
i = 2	0.1(+)	2.6(+)	2.2(-)	0.4(-)
i = 3	0.3(-)	0.4(-)	2.4(+)	0.1(-)
i = 4	0.1(-)	0.6(-)	1.8(+)	0.0(-)

From Table 9 a value of X^2 of 16 is obtained, and consulting chi-squared tables find that the probability of obtaining a value of X^2 as high as this or higher from random causes is a little over .05. That is on a little over 1 in 20 occasions differences between actual and expected numbers of accidents might have been as large if the experiment had no effect at all. The changes in accidents observed as therefore not statistically significant at the 5% level.

There are, however, strong indications that a change in the accident rate might have taken place, and the elements corresponding to Phase 2 on Route 2 and Phase 3 on Route 4 both make large contributions towards X^{22} and in both cases the number of accidents reported are larger than expected. This tends to indicate that the proportion of accidents reported increases more than sufficiently to compensate for any deterrent effect of extra patrols on accidents. Another large element in Table 9., corresponds to Phase 3 on Route 2, supporting to some extent the proposition that there might be quite a long memory effect from a higher level of patrolling. It should, however, be noted that a high element occurs for Phase 3 on Route 3 with no apparent cause except perhaps that there may have been an increase in the actual amount of patrolling which was not required, see Figure 6:3.

CONCLUSIONS AND RECOMMENDATIONS RELATIVE TO THE MAIN PROJECT

a. Conclusions

i) There is no definate relationship detectable in this series of experiments, between Police patrol levels and the accident rates on the four routes.

ii) There is some evidence of an increase in reported damage accidents when enhanced patrolling takes place.

iii) The levels of patrolling reported were low. The average patrol strength per twelve mile route at maximum was one unit and as low as one twelfth at minimum.

iv) The daily variations in reported patrol strength is out of phase with the variation in accident rate and traffic flow. Between 1 a.m. and 7 a.m. when traffic flow and the accident rate is minimal excessive patrolling takes place. Between 5 p.m. and 11 p.m., when traffic and accident peaks occur, low patrol levels were recorded.

b. Recommendations

i) The current practice of normalising traffic flow measurements to an "August Traffic Flow" by using a National conversion factor has been found to be unreliable in respect of Trunk Roads A.1 and A.19 in Durham Police area. Therefore, where such data is used as a base for a decision, it should be thoroughly checked.

ii) The present allocation of patrol units provides too great a cover when traffic flow and the accident rate are at minimum, and too little when they are at their peak. The system of allocation should be re-examined and local diurnal variations in traffic flow and accident rate taken into account.

iii) In this experiment control of the patrolling force was with a number of senior and junior Supervisory Police Officers. Some stationed in Divisions and others at Force Headquarters. Support for the project ranged from whole hearted enthusiasm through to down right sceptism. This attitude no doubt would be reflected by patrolling officers. There is also little doubt that as the experiment progressed interest waned.

In any future project of a similar nature it would be sensible for the Senior Police Officer, seconded to the project

team, to have absolute control of the patrol force. This operational and administrative control should ensure a regularity and consistent evenness in the flow of data and the activities of the patrols.

iv) Whilst this project was in progress certain pilot experiments were conducted to establish whether or not the presence of a patrol unit had an effect on driver behaviour. (These experiments are outlined in detail later). Statistically significant results were obtained and resulted in The Home Office commissioning a further experiment, to be conducted under very stringent controls, with the objective of comparing normal Police patrols with "pulse patrolling" and using changes in driver behaviour as measurements.

It is always difficult in Police orientated experiments, to evaluate changes by measurement. Consideration has been given in this experiment to accident rates and this has proved to be none conclusive. The present experiment may show changes in driver behaviour but this will not really point the way to optimisation of Police resources. It may be that as measurements of Police effectiveness and efficiency are difficult to obtain, that a study should be made of what the objectives of a Traffic Branch are in relation to traffic problems. By this means, having clearly defined objectives, it may then be possible to experiment and find the best method of achieving them.

DISTRIBUTION OF PATROL CREWS DUTY PERIOD

During Phase 1 of the experiment Chief Inspector H. Taylor informed the project team that he was dissatisfied at actual patrol time being recorded on route. From his motor patrol experience he had expected much higher patrol levels than were being submitted. Divisional and Headquarters Motor Patrol Duty Sheets enabled the maximum potential route coverage to be calculated. This confirmed Chief Inspector Taylor's views. He suggested that the Motor Patrol Form should be altered to establish how the work time period was being distributed between tasks. This was agreed by the project team and the Form was amended. (See Figure 16.)

Patrol crews were instructed to complete the amended Form, giving details of duties for a period of six weeks. This was not a man/hours survey (except for Serious Incident Squad personnel where variations in crew, up to three men, and diversity of duties made this necessary) but a patrol unit availability survey. No account was taken of single or double crewed cars.

The result of the survey is shown in Table 10.

From this survey it was established that on average a patrol car is patrolling for 61% of $7\frac{1}{4}$ hours (duty period less refreshment time) i.e., 4 hours 20 minutes, or out of each ten units on duty, six are parolling and four are dealing with other matters.

The survey highlighted the amount of time, almost 10%, spent by patrol crews on clerical duties. Improvements in administrative procedures which decreased this would proportionately increase the time available for patrolling.

Chief Inspector H. Taylor suggested to the project team that he should examine certain administrative processes in Durham Constabulary and investigate, the possibility of changes in systems to reduce time spent by operational and administrative staff dealing with paper work. This was agreed.

ACCIDENT REPORTING AND ADMINISTRATIVE PROCEDURE

The first Police Officer to whom an accident is reported was required by Durham Constabulary Standing Orders to complete an Accident Report Book (See Document 1.). The procedure in Durham Constabulary up to 31st March, 1968, was as follows:-

If the reporting officer was able to complete his enquiries and obtain all the details required, he submitted the Accident Report Book (hereafter A.R.B.) together with typed statements; sketch of scene and his recommendation of what action should be taken through his supervisory officers to Divisional Office within 48 hours of the accident occurring.

3. Activities on Routes:

No. of traffic offences reported		36	No. of defective vehicles checked		39
No. of persons reported		37	Assistance to Motorists		40
No. of verbal cautions (traffic offences only)	/	38	C.R.O. Checks	/	41

Total length of time spent on escort duties (42) .....

CAR ✓ Punch 43 (1)

MOTOR CYCLE Punch 43 (2)

Please use 24 hour clock.

Route A,B,C, or D.		Time entered Route.		Time left Route	
B	44	06.15.	45-48	08.45.	49-52
D	53	1200	54-57	13.45.	58-61
	62		63-66		67-70
	71		72-75		76-79
	14		15-18		19-22
	23		24-27		28-31
	32		33-36		37-40
	41		42-45		46-49
	50		51-54		55-58
	59		60-63		64-67

TICK ONE SQUARE TO REPRESENT ¼ HOUR.

DISTRIBUTION OF PATROL TIME	
Patrol	✓ ✓
At scene of accident	
At scene of crime	
Complaints	
Escort	
Radar	
Static Check	
'999' Calls attended	
Clerical	
Dictating	
Typing	
Court	
Taking statements	
Enquiries	
Interviews	
Duty in connection with car.	
Miscellaneous	

To be completed by Officers who are primarily engaged on Motor Patrol Duties.

Figure 16.

Any enquiries to be made to
Chief Inspector Raylor
Durham 5261.

DURHAM CONSTABULARY

MOTOR PATROL EXPERIMENT

Route A TRUNK ROAD A.1 (Aycliffe Interchange to Cock of the North).
Route B TRUNK ROAD A.1 (Cock of the North to Gateshead Boundary).
Route C TRUNK ROAD A.19 (Tees Bridge, Yarm, to Junction of A.179).
Route D TRUNK ROAD A.19 (Junction of A.179 to Monkwearmouth Bridge, Sunderland).

1. General Information:

DATE: 4/12/67 (1-6) CALL SIGN AR107 (7-11) DIVISION HQ (12-13)

NO. IN CREW 1 (14)

Average weather during patrol (Please tick) (15)

(1)	(2)	(3)	(4)
Rain	Snow	Fog	Fine ✓
Hail	Sleet	Mist	

Average road conditions during patrol (Please tick) (16)

Dru	Wet ✓	Snow	Ice

2. Information relating to accidents on above routes.

No. of accidents reported (17) —

(Use 24 hour clock)

IME		ROUTE		LOCATION OF ACCIDENT	TICK IF INJURY OR FATAL	
	18/21		22			23
	24/27		28			29
	30/33		34			35

TABLE 10.

DISTRIBUTION OF PATROL TIME AMONG VARIOUS DUTIES

PATROL TIME	TIME SPENT		% OF TOTAL TIME	
Patrol time	7082 hours	15 mins.	61.2	
Scene of accident	303	15	2.6	
Scene of crime	84	15	.7	
Attention to complaints	67	15	.6	
Escort duties	332	30	2.9	
Static check	37	15	.3	
Attention to 999 calls	193	00	1.7	
Taking statements	153	00	1.3	
Making Enquiries	371	00	3.2	
Interviews	122	45	1.1	
Court attendance	180	00	1.6	
Clerical duty	692	45	6.0	
Typing	317	45	2.8	9.5
Dictating	86	00	.7	
Miscellaneous	1075	15	9.3	
Car duty	473	30	4.1	
TOTAL TIME	11553	45	100.1	

Divisional	
Letter	Number

DURHAM CONSTABULARY

ACCIDENT REPORT BOOK

OFFICER REPORTING

Name.....*Rank*..... *No.*.....

Station.....

ASSISTED BY

Name.....*Rank*..... *No.*.....

Station.....

Day and Date.....Time

Accident.....a./p.m.

Arrived .....a./p.m.

Was it lighting up time? (1) Yes No

By whom reported (Name and Address).....

.....

To whom reported.....Time and date.....

Nature of accident.....Was Officer reporting a witness? Yes No

Place.....Map Ref.....

Parish.....Local Authority.....

Classification Nos. of road(s).....Were names and addresses exchanged Yes No

Type of road sign within 50 yards.....

WAS ANY OFFENCE COMMITTED?.....

Warning formula given to.....

Damage to other property—if any (including animals) and owners particulars.....

.....

.....

STRIKE OUT IRRELEVANT ITEMS

Pedestrian Crossing

On Police Controlled Crossing
Within 50 yds. of Crossing
On Light Controlled Crossing
Within 50 yds. of Crossing
On Uncontrolled Flashing Crossing
Within 50 yds. of Crossing
On Uncontrolled Non-Flashing Crossing
Within 50 yds. of Crossing
Not on or within 50 yds.

Movement Before Accident

One Moving Vehicle only
Two Vehicles travelling in same direction
Two Vehicles travelling in opposite direction
Two Vehicles travelling along different roads
More than two Moving Vehicles
No Moving Vehicle

Type of Road

Undivided Two-way Road
Dual Carriageway
Offset/Double White Lines
Level Crossing
One-way Street

Reliability of Information

Police Visited Scene—Vehicles there/Not there
Police Visited Scene—Vehicles moved/Not moved
Scene Not Visited

Not at Junction

Curve to Right for 1st Vehicle
Curve to Left for 1st Vehicle
Blind Bend to Right for 1st Vehicle
Blind Bend to Left for 1st Vehicle
Straight
Hill Up for 1st Vehicle
Hill Down for 1st Vehicle
Hill Top or Hump Back Bridge
No Hill
Not Known

At Junction

Type

T Junction
Y Junction
Crossroads
Roundabout
Other Junction

Control

Police Controlled
Light Controlled
Halt Sign
Slow Sign
Uncontrolled

Weather

Rain or Hail
Snow or Sleet
Fog or Mist
Fine
Not Known

Speed Limit

Yes No

Traffic

Dense
Light
Very Light

Bus Stop

Yes No

Cycle Track

Yes No

Within Guard Rails

Yes No

Road Surface

Dry
Wet
Snow or Ice
Not Known

Footpath

Both Sides
One Side
None

Light

Daylight
Dark

Vehicle Action

Skidded
Did Not Skid

1st VEHICLE

Driver or Rider: Mr., Mrs. or Miss.....

Full Postal Address (Business or Private).....

.....Badge No.....Estimated age.....

Owner .....

Full Postal Address (Business or Private).....

Reg'd. No.....Year Reg'd.....Make.....R.F. licence correct.....

If not, give particulars.....

Driver's Lic. issued at.....From.....To.....

Insurance Cert. issued by.....

No. of Certificate.....From.....To.....

Test Certificate issued on.....

Class and type of vehicle.....H.P. or C.C.....U.W.: Tons.....Cwts.....Lbs.....

Public Service Lic.....Seating capacity.....

If motor goods vehicle state whether A, B or C Licence.....Give No.....Was licence displayed? Yes / No

Were records of work in order? Yes / No Is a Report being submitted? Yes / No

HO/RT issued for Licence / Certificate / Test Certificate to be produced at.....Police Station

Part of Vehicle in collision: Head; N/Side; O/Side; Rear; None.

Damage to Vehicle.....

.....

Statement .....

.....

.....

.....

.....

Driver's Initials.....

2nd VEHICLE

Driver or Rider: Mr., Mrs. or Miss.....

Full Postal Address (Business or Private).....

.....Badge No.....Estimated age.....

Owner .....

Full Postal Address (Business or Private).....

Reg'd. No.....Year Reg'd.....Make.....R.F. licence correct:.....

If not, give particulars.....

Driver's Lic. issued at.....From.....To.....

Insurance Cert. issued by.....

No. of Certificate.....From.....To.....

Test Certificate issued on.....

Class and type of vehicle.....H.P. or C.C.....U.W.: Tons.....Cwts:.....Lbs.....

Public Service Lic.....Seating capacity.....

If motor goods vehicle state whether A, B or C Licence.....Give No.....Was licence displayed? Yes / No

Were records of work in order? Yes / No Is a Report being submitted? Yes / No

HO/RT issued for Licence / Certificate / Test Certificate to be produced at.....Police Station

Part of Vehicle in collision: Head; N/Side; O/Side; Rear; None.

Damage to Vehicle.....

.....

Statement .....

.....

.....

.....

.....

Driver's Initials.....

PERSONS INJURED (7)

1. Name and full postal address (Mr., Mrs., Miss).....

.....Estimated age.....
(Exact age if child)

Whether driver, rider, pillion rider, passenger in Veh. No.....Pedestrian or horse rider.....

Nature of injury (state if fatal).....

Conveyed to.....

Friends to be informed.....

If attending school within County
Police Area give name and No. of school.....

Statement .....

.....

.....

.....Initials.....

STRIKE OUT IRRELEVANT ITEMS

ACTIONS OF PERSONS HURT

Pedestrians	Passengers
Crossing Road Masked/Not Masked by Stationary Vehicle	Boarding, Alighting or Falling from P.S.V. Authorised Stop
Crossing Road Masked by Moving Vehicle	Boarding, Alighting or Falling from P.S.V. Moving or not at Authorised Stop
Walking on Road With/Without Footpath Facing Traffic	Sitting or Standing in P.S.V. (including on Stairs)
Walking on Road With/Without Footpath with back to traffic	On Cycle, Catching Feet in Wheels
Standing or Playing in Road	Otherwise on Cycle
On Footpath or Refuge	Boarding, Alighting or Falling from Vehicle other than P.S.V.
In Perambulator, etc.	On or in Vehicle other than P.S.V.
Playing Under or Near Vehicle Moving off	Unknown
Stepping, Walking or Running off Footpath	
Unknown	

Seat Belts		Wearing Crash Helmet	
Fitted	Worn	Motor Cyclist	Pillion Passenger

Estimated age.....
(*Exact age if child*)

Whether driver, rider, pillion rider, passenger in Veh. No.....Pedestrian or horse rider.....

Nature of injury (state if fatal).....

Conveyed to.....

Friends to be informed.....

If attending school within County
Police Area give name and No. of school.....

Statement .....

.....

.....

.....Initials.....

STRIKE OUT IRRELEVANT ITEMS

ACTIONS OF PERSONS HURT

Pedestrians

Crossing Road Masked/Not Masked by Stationary Vehicle
Crossing Road Masked by Moving Vehicle
Walking on Road With/Without Footpath Facing Traffic
Walking on Road With/Without Footpath with back to traffic
Standing or Playing in Road
On Footpath or Refuge
In Perambulator, etc.
Playing Under or Near Vehicle Moving off
Stepping, Walking or Running off Footpath
Unknown

Passengers

Boarding, Alighting or Falling from P.S.V. Authorised Stop
Boarding, Alighting or Falling from P.S.V. Moving or not at Authorised Stop
Sitting or Standing in P.S.V. (including on Stairs)
On Cycle, Catching Feet in Wheels
Otherwise on Cycle
Boarding, Alighting or Falling from Vehicle other than P.S.V.
On or in Vehicle other than P.S.V.
Unknown

Seat Belts

Fitted		Worn	
Yes	No	Yes	No

Wearing Crash Helmet

Motor Cyclist		Pillion Passenger	
Yes	No	Yes	No

Ambulance called by.....at.....a./p.m. Arrived.....a./p.m.....

Doctor..... Called by.....

If it is alleged that a stationary vehicle was a contributory cause of the accident though not actually involved state

Type, i.e., Private car, light goods, P.S.V., etc.....

Additional Particulars .....

Witnesses and statements (State whether Pedestrian, Cyclist, Passenger in Vehicle, No., etc.)

ROUGH SKETCH OF SCENE OF ACCIDENT

(To include measurements taken or marks noted)

Mark
North Point

How Accident happened (including Direction of Travel of Vehicles, and Officer's Recommendations on Action to be taken, if any).....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....Date forwarded.....Officer's Signature.....Rank.....No.

MINUTES

INSTRUCTIONS

1. This book must be used to record particulars of every accident reported to the Police which involves injury to any person or injury to any animal (excluding dogs) or damage to a vehicle or other property.

2. Injured persons must be attended to first.

3. Full particulars as to how the accident happened, names and addresses, and action taken should be given under the appropriate headings, so that a complete account of the occurrence may be obtained from the notes taken.

4. When taking particulars, complete one thing at a time as far as possible, e.g. If two or more vehicles are involved, obtain all the required information relating to one before dealing with another. Allow vehicles to go as soon as dealt with to relieve obstruction.

5. Particulars or road fund licences, driving licences and certificates of insurances need not be recorded provided they are correct, except that where personal injury has been caused, full particulars of the insurance cerificate should be entered.

6. If more than two vehicles are involved, use an additional book.

7. If more than two persons are injured or if any space is insufficient, utilise the space marked "additional particulars" or the last seven lines of page 14.

8. If space is left after recording a statement, draw a pencil line to the end and initial.

9. To enable particulars of accidents to reach Headquarters not later than five days from the time of occurrence, all particulars must be promptly reported.

A. A. MUIR,
Chief Constable.

Document 1.

If enquiries were not complete within 48 hours, then the A.R.B. was submitted to Divisional Office to allow the accident to be recorded, a Divisional sequential number allocated and then returned to the officer for completion and resubmission with his final recommendation. Any A.R.B. endorsed with a recommendation for court proceedings, or which had been previously submitted, had to be submitted as a file, complete with typed statements, sketch and note sheet.

At each Divisional office, a typist was fully employed transcribing the written detail in the A.R.B.'s onto flat forms, white for damage, yellow for fatal or injury. (See attached document 2.). Two copies were completed, one for transmission to Headquarters and one for retention at Divisional Headquarters.

After completion of process, or if a recommendation of no further action had been approved, the file was forwarded to Headquarters for storage. The Divisional and Headquarters yellow or white forms were endorsed with the final note on the Accident file note sheet.

Where civil action followed or was contemplated, any authorised person was supplied on request with an individually typed abstract of details from the file plus statements and sketch.

Revised System (From 1st April, 1968)

The Accident Report Book was redesigned and the final form is attached (Document 3.) and referred to below as A.R.F.. Consideration was given to designing the form as a punching document but this made the form too complex. The new form provides space to record details of 3 vehicles and 6 injured persons. (The A.R.B. allowed for 2 vehicles and 2 injured persons).

When an accident is reported, a Constable completes the A.R.F. in black ball point pen and submits it with handwritten statements and his recommendation of action to be taken. If supervisory officers agree with the reporting officer's recommendation, they initial it and submit for decision, otherwise a contrary recommendation is written on the Report Form. When the A.R.F. arrives at Divisional Office, two copies of the handwritten original are photostated, one is forwarded to Headquarters and one retained at Divisional level.

A decision is made whether Court action is to be taken based on the handwritten statements and the original sketch. If no further action is to be taken, the A.R.F. is so endorsed and forwarded to Headquarters. If the recommendation is for Court action, the Court file is prepared by the typist who was formerly employed transcribing the A.R.B. onto Yellow/white forms and is returned to the reporting officer as a complete court file to be checked for content, accuracy and for a plan of the scene to be included.

When the file is "dead", should aby authorised person require any information in it, he is supplied with photostat copies of the original documents.

Form No. 246.

FOR USE AT H.Q. ONLY	
Stats. 19	
Recorded	

DURHAM COUNTY CONSTABULARY.

REPORT OF ROAD ACCIDENT INVOLVING INJURY TO ANY PERSON

DIVISIONAL	
Letter	Number

STATION DIVISION Date

Officer reporting If a witness? Assisted by If a witness?

By whom reported (Name and address)

To whom reported Time and date

Time day and date of occurrence Was it lighting up time?

Place Map reference

Nature of accident Road classification

Local Authority Code No. Parish Process report. Yes/No

Ambulance called by at Arrived at Doctor

* Strike out irrelevant items

*Not At Junction
Curve to Right for 1st Vehicle
Curve to Left for 1st Vehicle
Blind Bend to Right for 1st Vehicle
Blind Bend to Left for 1st Vehicle
Straight
Hill Up for 1st Vehicle
Hill Down for 1st Vehicle
Hill Top or Hump Back Bridge
No Hill Not known

*At Junction	
Type	Control
T Junction	Police Controlled
Y Junction	Light Controlled
Crossroads	Halt Sign
Roundabout	Slow Sign
Other Junction	Uncontrolled

*Pedestrian Crossing
On Police Controlled Crossing
Within 50 yds. of Crossing
On Light Controlled Crossing
Within 50 yds. of Crossing
On Uncontrolled Flashing Crossing
Within 50 yds. of Crossing
On Uncontrolled Non-Flashing Crossing
Within 50 yds. of Crossing
Not on or within 50 yds.

*Movement Before Accident
One Moving Vehicle Only
Two Vehicles travelling in same direction
Two Vehicles travelling in opposite direction
Two Vehicles travelling along different roads
More than Two Moving Vehicles
No Moving Vehicle

*Reliability of Information
Police Visited Scene—Vehicles There/Not There
Police Visited Scene—Vehicles Moved/Not Moved
Scene Not Visited

*Type of Road	
Undivided Two-way Road	Level Crossing
Dual Carriageway	One-way Street

*Road Surfaces	*Footpath
Dry	Both Sides
Wet	One Side
Snow or Ice	None
Not Known	

Cause of Accident Code No.		
Primary	Secondary	Other

*Weather
Rain or Hail
Snow or Sleet
Fog or Mist
Fine
Nor Known

*Traffic
Dense
Light
Very Light

*Light
Daylight
Dark

*Speed Limit	
Yes	No

*At Bus Stop	
Yes	No

*Cycle Track	
Yes	No

*Within Guard Rails	
Yes	No

*Vehicle Action
Skidded
Did Not Skid

PERSONS INJURED:—

(1) Name, age and address (Mr., Mrs., Miss)

Driver, Pedestrian, etc.

Nature of Injury (Fat. Ser. Slt.)

Conveyed to

School name and number

Statement made at time of accident

ACTIONS OF PERSONS HURT

Pedestrians

Crossing Road Masked/Not Masked by Stationary Vehicle
Crossing Road Masked by Moving Vehicle
Walking on Road With/Without Footpath Facing Traffic
Walking on Road With/Without Footpath With Back to Traffic
Standing or Playing in Road
On Footpath or Refuge
In Perambulator, etc.
Playing Under or Near Vehicle Moving off
Stepping, Walking or Running off Footpath
Unknown

Passengers

Boarding, Alighting or Falling from P.S.V. Authorised Stop
Boarding, Alighting or Falling from P.S.V. Moving or not at Authorised Stop
Sitting or Standing in P.S.V. (including on Stairs)
On Cycle, Catching Feet in Wheels
Otherwise on Cycle
Boarding, Alighting or Falling from Vehicle other than P.S.V.
On or In Vehicle other than P.S.V.
Unknown

Wearing Crash Helmet			
Motor Cyclist		Pillion Passenger	
Yes	No	Yes	No

(2) Name, age and address (Mr., Mrs., Miss)

Driver, Pedestrian, etc.

Nature of injury (Fat. Ser. Slt.)

Conveyed to

School name and number

Statement made at time of accident

ACTIONS OF PERSONS HURT

Pedestrians

Crossing Road Masked/Not Masked by Stationary Vehicle
Crossing Road Masked by Moving Vehicle
Walking on Road With/Without Footpath Facing Traffic
Walking on Road With/Without Footpath With Back to Traffic
Standing or Playing in Road
On Footpath or Refuge
In Perambulator, etc.
Playing Under or Near Vehicle Moving off
Stepping, Walking or Running off Footpath
Unknown

Passengers

Boarding, Alighting or Falling from P.S.V. Authorised Stop
Boarding, Alighting or Falling from P.S.V. Moving or not at Authorised Stop
Sitting or Standing in P.S.V. (including on Stairs)
On Cycle, Catching Feet in Wheels
Otherwise on Cycle
Boarding, Alighting or Falling from Vehicle other than P.S.V.
On or In Vehicle other than P.S.V.
Unknown

Wearing Crash Helmet			
Motor Cyclist		Pillion Passenger	
Yes	No	Yes	No

	VEHICLE PRIMARILY RESPONSIBLE	OTHER VEHICLE
(1)	Index number — H.P. or CC. — U.W. Tons — Cwt. — lbs.	(1) H.P. or C.C. — U.W. Tons — Cwt. — lbs.
(2)	Owner—name and address	(2)
(3)	Driver/rider—full name, age, address	(3)
(4)	Driver's licence — Issued at — Date of expiry	(4) Issued at — Date of expiry
(5)	R.F.L.	(5)
(6)	Insur. Cert. — By — From — To	(6) By — From — To
(7)	Class and type — Make	(7) Make
(8)	Statement	(8)

Give overleaf:—How accident happened (including the recommendation of the Officer reporting); additional information and other recommendations.

Form No. 245.

For Use at H.Q. Only	
Recorded	

DURHAM COUNTY CONSTABULARY.

ROAD ACCIDENT REPORT—CAUSING DAMAGE OR INVOLVING DOGS

Divisional	
Letter	Number

Station Division Date

Officer reporting If a witness? Assisted by If a witness?

By whom reported (Name and address)

To whom reported Time and date

Time, day and date of occurrence Was it lighting up time:

Place Map reference:

Nature of accident Road classification

Local Authority Code No. Parish Process report. Yes/No

At Bus stop—Yes/No.

* Strike out irrelevant items

*At Junction		*Pedestrian Crossing	*Road Surface	*Weather	*Movement Before Accident
Type	**Control**	On Police Controlled Crossing Within 50 yds. of Crossing On Light Controlled Crossing Within 50 yds. of Crossing On Uncontrolled Flashing Crossing Within 50 yds. of Crossing On Uncontrolled Non-Flashing Crossing Within 50 yds. of Crossing Not on or within 50 yds.	Dry Wet Snow or Ice Not Known	Rain or Hail Snow or Sleet Fog or Mist Fine Not known	One Moving Vehicle only Two Vehicles travelling in same direction Two Vehicles travelling in opposite direction Two Vehicles travelling along different roads More than two Moving Vehicles No Moving Vehicle
T Junction Y Junction Crossroads Roundabout Other Junction	Police Controlled Light Controlled Halt Sign Slow Sign Uncontrolled		***Speed Limit**		
***Light**	***Vehicle Action**		Yes No	**Cause of Accident Code No.:**	
Daylight Dark	Skidded Did Not Skid		***Within Guard Rails**	Primary	Secondary / Other
			Yes No		

Vehicle Primarily Responsible

Index number H.P. or C.C. U.W. Tons cwt. lbs.

Owner—Name and address

Driver/rider—Full name, age and address

Driver's licence Issued at Date of expiry

Road fund licence

Insurance certificate by From To

Class and type Make

Statement

Other Vehicle

Index number H.P. or C.C. U.W. Tons cwt. lbs.

Owner—Name and address

Driver/rider—Full name, age and address

Driver's licence Issued at Date of expiry

Road fund licence

Insurance certificate by From To

Class and type Make

Statement

How Accident Happened (including the recommendation of the Officer reporting):

Give overleaf:—Additional information and other recommendations.

VEHICLE NO. 1

er/Rider: Mr./Mrs./Miss ..... Age. .....
ess .....
ies ..... Fat./Ser./Slt. Conveyed to .....
er .....
No. ..... Make ..... 1st Reg'd ..... RFL Expires .....
NCES ETC:– IN ORDER/PROCESS. - DRIV/PSV/GOODS/T.CERT/RECORDS 'L'/PLATES/ACCOMP.
Cert. By ..... From ..... To ..... No. .....
IT for Lic/Ins./Test to be produced at .....
s & Type veh. ..... C.C. ..... UW ..... Seating Cap. .....
/Caravan/Other tow. Skidded/ J.Knifed Overturned

.	Dr.	F/Ns	R/Os	R/Ns	No. Passengers	Lights/Side/Head/Full/Dipped/Dim
d					Front	Damaged Front/Rear/N.-S/O.-S/All/None
					Rear	Potential Write Off YES/NO

ge (State where towed to)
.....
.....
ment.....
.....
.....
.....
.....
.....
.....
Signature

VEHICLE NO. 2

r/Rider: Mr./Mrs./Miss ..... Age .....
ess .....
es ..... Fat./Ser./Slt. Conveyed to .....
r .....
No. ..... Make ..... 1st Reg'd ..... RFL Expires .....
NCES ETC:– IN ORDER/PROCESS - DRIV/PSV/GOODS/T.CERT/RECORDS 'L'/PLATES/ACCOMP.
Cert. By ..... From ..... To ..... No. .....
T for Lic./Ins./Test to be produced at .....
& Type veh. ..... C.C. ..... UW ..... Seating Cap. .....
/Caravan/Other tow. Skidded/J. Knifed Overturned

	Dr.	F/Ns	R/Os	R/Ns	No. Passengers	Lights/Side/Head/Full/Dipped/Dim
					Front	Damaged Front/Rear/N-S/O-S/All/None
					Rear	Potential Write Off YES/NO

ge (State where towed to)
.....
.....
ent.....
.....
.....
.....
.....
.....
Signature

DURHAM CONSTABULARY - ACCIDENT REPORT

Letter	No.

Time, Day & Date .....
Precise Location ..... Map Ref. .....
Nature of Accident ..... Fat./Ser./Slt./Damage.
Classification of Road ..... N/A Exchanged YES/NO. Officer Witness YES/NO.
Sign within 50 yards ..... Local Auth. ..... Code No. .....
DAYLIGHT/DARK/STREETLIGHTS LIT/UNLIT/OVER/UNDER/20FT HIGH/NONE.

SCENE VISITED/NOT VISITED VEHICLES THERE/NOT THERE/MOVED/NOT MOVED
WEATHER RAIN/SNOW/FOG/FINE
ROAD SURFACE DRY/WET/SNOW/ICE
ROAD 1-2 WAY-DUAL CARRIAGE-CLEARWAY-OTHER
LANE MARKINGS 1-2-3-4-OFFSET-DOUBLE-NONE
JUNCTION T-Y-X-MULTI ROADS-ROUNDABOUT-OTHER
CONTROL POLICE-LIGHT-STOP-GIVE WAY-NONE
PEDESTRIAN CROSSING ON/WITHIN 50 YDS OF AT/NOT AT JUNCTION
CONTROL POLICE-LIGHT-NONE
MOVEMENT 1-2-3-NONE-TRAV.-SAME-OPP.-DIRECTION ALONG SAME/DIFFERENT ROADS-STATIONARY VEHICLE INVOLVED.
SPEED LIMIT 30/40/50/60/70 **BUS STOP** YES/NO **SKIDDED** YES/NO

SPECIAL CONDITIONS AT SCENE
DOG/ANIMAL/IN CARRIAGEWAY
PARKED VEHICLE CONTRIBUTORY CAUSE
AUTOMATIC LEVEL CROSSING INVOLVED
LAMP POST/TELEGRAPH POLE HIT
OBJECT IN ROAD

PRIMARY	SECONDARY	OTHER

ACTIONS (DRIVERS) TICK OR ENDORSE COLUMNS	1	2	3
OPENING DOOR (INC. PASSENGERS)			
DISOBEYED JUNCTION CONTROL			
DISOBEYED DOUBLE CENTRE OR OFFSET LINE			
FAILED TO GIVE PRECEDENCE AT PED. CROSSING			
ENTERING OR LEAVING LAYBYE/HARD SHOULDER.			
REVERSING			
PARKED			
STOPPING			
STARTING			
TURNING - R - L - AROUND			
STATIONARY TEMPORARY			
OVERTAKING			
GOING AHEAD OTHER			
PROCESS DEFECTIVE TYRES			

ACTIONS OF PEDESTRIANS	1	2	3
CROSSING ROAD AT/WITHIN 50 YDS. OF PED. CROSSING			
CROSSING ROAD ELSEWHERE			
MASKED BY STATIONARY VEHICLE			
IN ROAD NOT CROSSING			
ON FOOTPATH/VERGE/REFUGE/CENTRE STRIP			
PASSENGER BOARDING/ALIGHTING FROM PSV			

INJURED

(1) Mr./Mrs./Miss ..... Age ..... Pass. in F-R of Veh. No. .....
Address ..... Pedestrian
Injuries ..... Fat./Ser./Slt. Conveyed to .....
Statement .....
.....
..... Signature

(2) Mr./Mrs./Miss ..... Age ..... Pass. in F-R of Veh. No. .....
Address ..... Pedestrian
Injuries ..... Fat./Ser./Slt. Conveyed to .....
Statement .....
.....
..... Signature

WITNESSES (State whether Cyclist, ped. passenger in vehicle No.) .....
.....
.....
.....
.....
.....
.....

DAMAGE TO PROPERTY/ANIMALS .....
OWNERS .....

INFORMED YES/NO

DOCUMENT 3.

INJURED

(3) Mr./Mrs./Miss. ..... Age..... Pass. in F-R of Veh, No.....
Address ..... Pedestrian
Injuries .....Fat./Ser./Slt./ Conveyed to .....
Statement .....
.....
..... Signature

ROUGH SKETCH OF SCENE OF ACCIDENT Mark North Point *
(To include Measurements taken or marks Noted).

By whom reported ..... Time & Date .....
Officer reporting ..... Station .....
BREATH TEST – NOT/REQUIRED/REFUSED/POSITIVE/NEGATIVE
DRIVER (1) ..... (2) ..... (3) .....
VEHICLE DEFECTS (LOAD/TYRES/BRAKES/LIGHTS/F or R/BRAKE LIGHTS/TRAFFICATORS/VISION
VEHICLE (1) ..... (2) ..... (3) .....
EXAMINER ..... Call Sign ..... Report Requested YES/NO
If Vehicle Potential Write Off Date Form HO/TL/1 Submitted .....
Doctor Attending .....
Offences Committed .....
Warning formula to driver 1/2/3 N.I.P. Served upon Driver 1/2/3.
HOW ACCIDENT HAPPENED - (Give direction of vehicles - additional particulars, recommendation c
action to be taken and Supervisory Officers Minutes). .....

VEHICLE NO. 3.

Driver/Rider: Mr./Mrs./Miss. ..... Age .....
Address .....
Injuries ..... Fat./Ser./Slt./ Conveyed to .....
Owner .....
Reg. No. .....Make ..... 1st Reg'd ..... RFL Expires .....
LICENCES ETC:– IN ORDER/PROCESS - DRIV/PSV/GOODS/T.CERT./RECORDS L/PLATES ACCOMP
Ins. Cert. By ..... From .....To ..... No.....
HO/RT for Lic./Ins./Test to be produced at .....
Class and Type veh.....C.C. .....UW .....Seating Cap. .....
Artic/Caravan/Other tow. Skidded/J. knifed Overturned

Belts.	Dr.	F/Ns	R/Os	R/Ns	No. Passengers	Lights - Side/Head/Full/Dipped/Dim
Fitted					Front	Damaged - Front/Rear/ N-S/ O-S/All / None
Used					Rear	Potential Write Off YES/NO

Damage (State where towed to)
.....
.....
Statement.....
.....
.....
.....
.....
.....
Signature

Date ....Chief Superintendent.

Comparison of the Old and New Systems

A statistical analysis of two samples; one collected under the "Old" and one under the "New" system has been carried out. The total operational and administrative clerical time to deal with an A.R.B. or A.R.F. respectively was measured for N_1 and N_2 items representing two sequential series. The analysis is summarised in Table 11, and was aimed at establishing 95% confidence limits on the mean times for similar samples.

TABLE 11.

Time to complete Clerical work on Accident Reports

	Old System	New System
Number N of accidents included in the survey	128	83
Mean Time "T" (minutes)	255	145
Standard deviation	142	78
Standard error	12.5	8.5
95% Confidence limits	230 To 280	128 To 162

That is to say, the sample indicates that under the new system, the mean time to complete an accident report in a similar sample of accident reports should be between 128 and 162 minutes per report, whereas on the old system it would lie between 230 and 280 minutes per report 95% of the time.

It is clear from this table that a very significant improvement has been achieved. The result of the experiment was reported to the Chief Constable who instructed that the revised procedure should be introduced in the Durham Police Area on 1st April, 1968.

The apparent advantages of the revised system are:-

1. The release of a typist at each Divisional Office for other duties.

2. The elimination of the work of preparing files which were known not to be required.

3. Duplication of Accident Reports and statements for other persons and authorities is made much easier.

4. A marked decrease in the time spent by operational officers compiling files produces a corresponding increase in operational time.

The Accident Report form (A.R.F.) has proved to be popular at all levels in the Force.

The mean time saved per accident reported is 1 hour 50 minutes. In 1968, 12,500 accidents were reported to and recorded by Durham Constabulary. The introduction of the revised accident reporting system saved about 23,000 hours of work.

A Constable with six years service is paid 10s.0d. per hour, excluding housing, uniform and other allowances. A typist on a salary of £810 per annum is paid 8s.2d. per hour. Assuming that the time saving is equally distributed between operational and clerical staff the cash saving is 9s.1d. per hour or over £10,000 per year. In fact there was no hard cash money saving but more operational time is available. Administrative staffs' duties have been re-allocated to other more productive work. The Form and system have to date been adopted by five other Forces.

PROCESS REPORTING AND ADMINISTRATIVE PROCEDURE

a. The original system (Durham Constabulary up to 31st December, 1968)

The procedure previously in use for all offences (traffic, crime and general) in which proceedings were initiated by summons was as follows:-

i) When an officer dealt with an offence, full details were entered in his pocket book, as his investigation proceeded.

ii) The initiating officer's notes on particulars of offender(s) and evidence of offence(s) were later dictated onto a dictating machine and a process form was then prepared in duplicate from this recording by a civilian typist. (Process form attached, document 4.).

iii) After checking by the reporting officer the process forms were submitted, through supervisory officers, with recommendation of action to be taken, to the Divisional Superintendent for final decision.

iv) If process was authorised the process form was sent to the Magistrates' Clerk with a request for a summons to be issued.

OBSERVATIONS ON THE SYSTEM

1) When an officer left his beat to travel to an office to dictate reports, his beat was unmanned and as soon as he entered a Police Office, he and his vehicles' policing value were lost. The response time for an emergency or call on that beat was increased.

DURHAM CONSTABULARY

Annual Process No. .....

Court Sheet No. .....

Summons Report Form

.....Sessional Division

(Adult)
.....(Juvenile) Court held on.....

.....Section. .....DIVISION

(1) PERSON(S) REPORTED Name and address, age and occupation. Date of birth, parents or guardians names and school attending in cases of Juvenile offenders.		
(2) OFFENCE(S) (Quote Act and Section)	(Div. Crime No..... Div. Accident No. .....)	
(3) Date and time of offence(s)		
(4) Place committed (Give parish)		
(5) WITNESSES.		
(6) LIST OF PROPERTY Connected with offence		
Signature and address of recipient		Witness to signature Date.....

Form No. 342 submitted .....(date)

.....Rank and No.

APPENDIX

To be used for either of the following purposes :—

1. Additional Offenders.
2. Additional Offences.

STATEMENT OF EVIDENCE

DOCUMENT 4.

Exam'd and submitted

Sgt. .....

Date .....

Date _____ Signed _____ Insp. _____

Rank..... No. ..... Date _____

Superintendent's Decision.

Proceedings/Caution/No Further Action.

..... 19..... .....

Superintendent.

Issue & Service of Summons(es) Forms (M.C. Act, 1957)	Date issued ..... Date served ..... By whom .....
RESULT OF CASE	

Manning difficulties do not allow for replacement on duty for routine clerical work.

ii) Most officers preceeded dictation with a longhand draft. Bad dictating and transcription caused reports to be returned for re-typing.

iii) On occasions unavailability of typists (especially at weekends) caused long queues of work to form.

iv) Much time and work is spent on cases which resulted in a caution or were marked 'No Further Action' by a Divisional Superintendent.

b. The Revised System

i) When an offence is reported, the officer makes a brief entry in his pocket book to record the time sequence of events. Full particulars of offender(s) are recorded on a Process Card. (See attached document 5.).

ii) The process card, when complete, is handed in either at the end of duty or when visited by a Supervisory Officer.

iii) Supervisory Officers endorse their recommendation on the card and submit it for final decision.

iv) If Court proceedings are authorised the card is sent to the Magistrates' Clerk for issue of a summons. (Every Magistrates' Clerk in the Durham Police area has agreed to accept the process card an an information).

APPARENT ADVANTAGES OF THE NEW SYSTEM

i) As it is easier to make a Process Report there seems to be a tendency for more offences to be reported.

ii) The Process Card provides a check list of information required, especially in traffic offences, thereby assisting the less experienced officer to obtain all the particulars required.

iii) Dead travelling time from the place of assigned duty to nearest office and back, to dictate reports is eliminated. Mobile units and beat officers remain on the route or beat to which they have been detailed, thereby providing further opportunity for the prevention and detection of offences, better coverage, a more constant visible deterrent and a better service to the public. No attempt has been made to measure loss of efficiency due to operational units being displaced.

iv) Dictating (and prior longhand draft) is eliminated.

Additional Defendants .....

.....

Occupation.....Age.....

Address .....

.....

.....

Name .....

Occupation .....Age .....

Address .....

.....

.....

Offences .....

.....

.....

.....

.....

.....

.....

Relevant Evidence to Additional Offences:-

Vehicle.....Type.....No.....
Make

WITNESSES.....
.....
.....
.....
.....

Police Vehicle Check/Radar Check

Location/Direction of Travel.....
.....

Built up Area/Not Built Up Area

Legal Speed Limit.....

Distance Followed.....

From: .....

To: .....

Speed attained Max.....mph.Min.....mph.

Reply on Offence pointed out.....
.....
.....

Verbal Warning Given/Not Given

Reply to Warning Formula.....
.....
.....

Written Warning Formula Served/Sent - Not Served/Sent

Goods Vehicle - Laden/Unladen

'A' 'B' 'C' Licence Not/In Order

Traffic & Road Conditions.....
.....

Driving Licence - In Order/Not in Or

Insurance - In Order/Not in Order

Test Certificate - In Order/Not in Order

HO/RT 1 - D/L.Ins.T/C at.....

Date Radar Meter Checked.....

Date Speedometer Checked.....

Reg. No. of Police Vehicle.....

N.I.P. Sent - Yes/No

Convenient Court Date.....
.....

Other relevant details and summary of evidence:

DURHAM CONSTABULARY

REPORT FOR PROCESS. No:-

Division.....Section.....

Station.....Date.....

Court

OFFENDER

Full Name.....

Address.....

.....

Occupation.....Date of Birth.....

If Juvenile

School Attended.....

.....

Parents/Guardians.....

Address.....

.....

OFFENCE.....

.....

.....

.....

.....

.....

Act & Section.....

Date.....Time.....a.m./p.m.

Place.....

..... P.C. No.....

Date / /

To: Insp.	To: Ch/Insp.	To: Supt.	Decision
Recommend P/C/NFA	Recommend P/C/NFA	Recommend P/C/NFA	P. C. N.F.A.
..... Sgt / /	..... Insp. / /	..... Ch/Insp. / /	..... Supt. / /

Document 5.

v) Typing, and where errors and omissions are detected, re-typing of Process Forms is no longer necessary.

vi) Checking and correcting of typed transcripts is no longer required.

vii) A backlog of dictated discs no longer builds up where there is a shortage or temporary absence of typists.

viii) Typists who previously have been engaged in typing Process Forms can be re-allocated to other work.

ix) Process goes more quickly through Police channels therefore, there is a reduction in time between commission and trial.

THE DISADVANTAGES OF THE NEW SYSTEM

i) Supervisory Officers are required to read and make decisions on handwritten reports.

ii) A Process Card may be lost, if so, there is no other record.

The Chief Constable gave permission for the new system to be tried experimentally in 'H' (Sunderland) Division. The Magistrates' Clerk J.P. Wilson, Esq., was informed of the experiment and agreed to accept the Process Card as an information.

c. Comparison of the Two Systems

Two sequential series of procedures were taken as samples, from 'H' (Sunderland) Division of Durham Constabulary, one of $N_1 = 118$ items with the "OLD" system in force, and one of $N_2 = 110$ items with the "NEW" system. The total civilian clerical time, and total police time (operational, administrative, supervisory and clerical) on each. Time spent by operational officers on making enquiries etc., is not included. The analysis is summarised in Table 12.

It is not possible to evaluate the saving in labour or costs this system has made as total annual process rates are not recorded. However, as an indication of gross savings in 1968, Headquarters motor patrol section, comprising 42 operational constables, reported over 6,500 offences.

SINGLE AND DOUBLE CREWING OF PATROL UNITS

Senior Police Officers have differing views on crewing of patrol units. One strong opinion is that patrol cars should at all times be double crewed. This allows the driver to concentrate on driving and the observer to operate the radio and "Observe" in the true sense of the word. In the event of an arrest or incident, in theory, the double crew should be able to contain it without calling for assistance. The disadvantage of double crewing is that

TABLE 12.

Time spent on process under two methods of recording information

	"OLD"		"NEW"	
Number of process reports in sample	118		110	
	hrs.	mins.	hrs.	mins.
Total Police time	59	0	44	16
Mean Police time	0	30	0	24
Total Civilian time	29	0	5	12
Mean Civilian time	0	15	0	3
Total time	88	0	49	28
Mean Total time	0	45	0	27
Standard deviation	0	19	0	6
Standard error	0	1.8	0	0.6
95% confidence limits	(45 ± 4) mins		(27 ± 1) mins.	

That is to say, samples of similar size from the old method should show a mean process time of between 41 and 49 minutes in 95% of such samples, while for the new system the mean should lie between 26 and 28 minutes. There is therefore a highly significant statistical improvement.

due to manpower shortage it leads to some patrol cars not being crewed at all. This in turn means that patrol units are more widely distributed in space, which causes longer response times and generally a less effective service to the public. If units are double crewed and one requires assistance then the re-inforcement also must be despatched in units of two Constables.

The advantage of single crewing patrol cars is that motor patrol command can make the greatest use of available strength by distribution.

At the request of the Home Office a survey of the activities of single and double crewed patrols was carried out. The survey is based on information generated by the patrols operating on Trunk Roads A1 and A19 for the period 9th August 1967, to 1st February 1968.

Table 13 gives a summary of activities reported:-

	Crew	
INCIDENTS	1	2
Number of Patrols Reporting	1,758	1,780
Accidents Reported	120	140
Traffic Offences Reported	560	652
Traffic Offenders Reported	354	439
Verbal Cautions (Traffic Offences)	886	1,031
Defective Vehicles Checked	264	270
C.R.O. Checks	276	440

A more detailed analysis of single and double crewed patrol units was carried out in the period 1st February to 13th March 1968.

See Appendix 'C' for full report of survey.

TABLE 14

INCIDENTS REPORTED (1/2/68 to 13/3/68)

Incidents dealt with by single crewed vehicles	112
Incidents dealt with by double crewed vehicles	226
Total number of incidents recorded	338

Number in Crew	Number of Incidents		Number of Additional Constables Required
1	74)		0
1	16)	112	1
1	22)		2+
2	*185)		0
2	8)	226	1
2	33)		2+

(*Double crews reported that 70 (31%) of the 226 incidents they attended could have been dealt with by a single officer).

Tables 15 and 16 give data on the breakdown of incidents between day duty and night duty, indicating the number of incidents in which assistance was required and the mean response time to such requests.

TABLE 15.

SINGLE CREWS (INCIDENTS)

Time	Crew	Number of Incidents	Assistance Required	Average Response Time
06.00/22.00	1	61	0	-
06.00/22.00	1	14	1	8 mins.
06.00/22.00	1	16	2+	4 mins.
22.00/06.00	1	13	0	-
22.00/06.00	1	2	1	5 mins.
22.00/06.00	1	6	2+	4 mins.

(N.B. The response time is a support response time and includes requests for specialist assistance).

TABLE 16.

DOUBLE CREWS (INCIDENTS)

Time	Crew	Number of Incidents	Assistance Required	Average Response Time
06.00/22.00	2	106(*1.)	0	-
06.00/22.00	2	3	1	-
06.00/22.00	2	16	2+	11 mins.
22.00/06.00	2	79(*2)	0	-
22.00/06.00	2	5	1	17 mins.
22.00/06.00	2	17	2+	7 mins.

*1. (44 could have been dealt with by a single crewed unit)

*2. (26 could have been dealt with by a single crewed unit)

CONVERSION OF ACCIDENT RECORDS TO COMPUTER BASE

A monthly statistical analysis of accident rates, by degree of injury, or damage, Police division, road, class of vehicle, driver and causation is produced by Durham Constabulary at a cost of 21/28 man hours per month. (Excluding typing, duplication and circulation).

Difficulties arise when specific information is required about types of accident caused by a class of vehicle or the total number of accidents which have occurred in a given time period at one or between two points. Where this information has not been specifically transferred onto the punch card, thereby allowing a mechanical sort, a manual search has to be made. The cost of these manual searches is calculated to be £800 per year.

Early in the project Chief Inspector Taylor recognised the limitations of the Durham Constabulary accident recording system. It was known that other Police Forces were using computer files for accident records. It was hoped to develop an accident storage and interrogation system based on the programs necessary to the project and hand them over as a working entry to Durham Constabulary for use on the Durham County Council computer. Unfortunately this was not possible for although both the Council and University were using I.B.M. computers of the 360 series the programs written for the University's 360/67 computer in PL/1 were not acceptable to the County Council's 360/40 computer on which only Assembler Language was used.

It was realised that a change to computer based accident records would be beneficial so this was recommended to The Chief Constable, who instructed that a feasibility study be done.

It is expected that it will be possible to provide from the computer out put detailed management information in addition to the statistical summaries. The management information should lead to more realistic allocation of motor patrol resources and an earlier recognition of accident black spots, hazards and causes. This detailed information will be of great assistance in the evaluation of enforcement, engineering requirements and driver/pedestrian/child educational campaigns. The use of a computer will eliminate costly and time consuming manual searches for specific information and for periodic statistical returns.

The cost of conversion to computer based data and purchase of magnetic storage tapes was estimated to be less than £400.

The Accident Report Form introduced in Durham Constabulary on 1st April 1968, whilst not itself a punching document was designed with computer storage of records in view.

The result of the feasibility study was reported to The Chief Constable who authorised the conversion to go ahead.

It is now expected that the conversion will be completed by 1st July 1967. From this date detailed information on all accidents occurring in the Durham Constabulary area will be available. The data held includes eight figure map reference, which will allow very accurate locations, time,

(hour/day/month/year), make, age of vehicle, type, registration number. A description of the program and data storage is available as a Durham Constabulary paper.

OTHER RELATED STUDIES

An intensive search for literature combined with information received from The Home Office produced the following reports of similar work done elsewhere.

a. The Wisconsin project of the Traffic Institute, North Western University (U.S.A.) 1958/59. Refs. 1 and 2.

b. Swedish Road Research Projects 1965/66. Ref. 3.

c. California (U.S.A.) Route for Experiment, 1964. Ref. 4.

d. The Home Office West Country Experiment. Ref. 5.

e. North Riding Constabulary Experiments 1967 and 1968.

f. Offset Double White Line Experiment. Ministry of Transport.

(a) THE WISCONSIN PROJECT

The Wisconsin project was conducted on four routes (roads) totalling 390 miles in length with four similar control routes. Patrol Units were assigned to each route, which were of varying lengths, at an intensity of eight cars per 9 hour shift for 18 hours per day. The traffic flow on each route for the remaining 6 hours per day was negligible. This allocation gave a theoretical coverage of 0.038 to 0.307 patrol units per mile of route.

The control routes were not patrolled. Accidents, fatal, injury and damage, traffic flow, the mean and variance of speed distributions were measured for 1955 and 1957.

The hypotheses that increased Police patrol levels would lead to a statistically significant decrease in accident rates, was tested for both 1955 and 1957 on each route and, in respect of each control route using a 2 x 2 chi-squared test at the 0.05 level of significance. The data indicated that the hypothesis must be rejected. A weaker hypothesis that high levels of patrolling results in a decrease in the variance, but not the mean, of speed distributions was confirmed. A suggestion was made but not tested, that a decrease in variance of speed implied that drivers would have to take fewer relative speed decisions, which would be of less magnitude; consequently the chances of errors of judgement resulting in an accident would be reduced. Even if this suggestion were true, it is second order effect and may not in fact have an accident reducing effect.

The main criticism of this project is that no physical checks were made to see if the actual route coverings reached the

calculation level. No check was made to see if the number of sightings of patrol units coincided, per mile travelled, with what was expected. Experience in the Durham project seems to indicate that this would be unlikely even allowing that the Wisconsin experiment did have a replacement system for a unit where it was previously known that it was going to be absent for a prolonged period.

A further observation on the Wisconsin project is that the routes used had never before been patrolled. In addition the patrol force was a newly formed Highway Patrol. If Police presence has an impact then the introduction of the Patrol Section on previously unpatrolled roads must have had fairly high impact once the motoring public realised their existence and function. The results of using an unexperienced group of patrol officers, newly trained, for this Highway Patrol Section, may not be truly representative of the effect that would emanate from an experienced, long established section.

(b) THE SWEDISH EXPERIMENTS, 1957 and 1965.

These experiments were based on intensive traffic control by Police enforcement of traffic laws. It was felt that the marginal effect in accident reduction by less expensive methods had been used up making it necessary to rely on more costly methods to reduce further the toll of accidents.

The researchers accepted such variables as the individual officer's attitude and ability, publicity and method of control would have an effect. Therefore a long experimental period is necessary to accurately measure the connection between the degree of traffic control and accident frequency. In a long period the intensity of traffic control could be varied and at the same time measure the effect on accident frequency.

The research team found it was not possible to mount a lengthy experiment.

They therefore, decided to experiment on a few levels of controls for short periods in the expectancy that data would be produced from which a theoretical estimate of an optimum level of control.

The first experiment lasted for three months during August, September and October 1957. In a joint action between the Swedish National Police Police and the Swedish National Road Safety Council the control intensity on the road between Stockholm and Nyköping was increased by a factor of four. A similar nearby road was nominated a control section.

In addition to,registering the accident frequency, traffic density and weather conditions, some studies were made of the behaviour of road users. These studies covered formal obedience to

law, halt signals, speed restrictions and the practice followed by road users in overtaking and speed in derestricted zones. These studies were carried out on the experimental and control route both before and during the experiment.

The accident rate on the experimental section fell by about one third (no figures provided).

As regards the behaviour study the results pointed on the whole to the fact that intensified control had influenced road safety in a positive direction. (No figures produced).

The second experiment was conducted in 1965 and was a renewal of the previous experiment. May and June were used as a control period with normal Police controls. July was omitted due to temporary speed restrictions. August and September was the experimental period with intensified Police controls.

In May and June 44 Police Officers provided 24 hour coverage with 24 cars and 16 motor cycles. In this period thirty-five speed checks and eight weighing checks were made. During the experimental period the number of Police was increased to 84 with 45 cars and 30 motor cycles. On 3 days of each week air cover was provided by a helicopter. 62 speed and 35 weighing checks were made.

It was recognised that intensified patrols would increase the likelihood of accidents being detected and reported. So as a follow up in respect of this accident variable it was decided to supplement the accident data by obtaining from garages and breakdown services details of vehicles salvaged after damage in accidents.

TABLE 17.

Number of accidents by classification that occurred on the preliminary and experimental periods.

Period	Experimental Route			Control Routes		
	Serious Injury	Slight Injury	All Accidents	Serious Injury	Slight Injury	All Accidents
May/June (Control)	16	39	82	9	21	79
Aug/Sept. (Experimental period).	8	27	82	11	38	104

TABLE 18.

No of vehicles which were salvaged

Period	Experimental Section	Control Section
May/June	76	64
Aug/Sept.	85	91

No statistical analysis is included in this report. The time period of the experiment was very brief and no comparison is made with historical accident rates. It may ne that what is considered to be the effect of intensified controls was merely random fluctuation or had accrued from some other unidentified factor.

(c) THE CALIFORNIA ROUTE 101 PROJECT

This operation was formulated to establish if accident rate reduction could be equated to a known quantity of enforcement personnel, introduced to a specific location for a designated period of time. It was based on the hypothesis that vigorous law enforcement does reduce accidents and it was hoped from this experiment to deduce the optimum number of men necessary to cause a specific reduction in accidents. The experiment covered the whole of 1964. The route selected, 101, is 36 miles long and had an annual accident rate of 750/800 per year, 30/34 of which were fatal. The average daily traffic flow was 20/30,000, but at weekends in midsummer reached 40,000.

The Police patrol levels were increased by doubling the existing Force from 18 to 36 patrol officer who provided coverage 24 hours per day, 7 days per week. 64,000 patrol hours were spent on Route 101 in 1964. The patrol officers were instructed to operate a normal selective enforcement procedure, and not introduce an exaggerated enforcement pressure. The research team wanted to establish what the addition of men could accomplish, not the adoption of new techniques or crash enforcement effects. Each officer was required to complete a "Daily Activity Record" which showed in fifteen minute periods, his mileage, beat, description of activity and mile post. (The Mile Post located the site of incidents).

Before and throughout the experiment three teams of concealed Police observers made counts of traffic violations seen. Speed checks were made by a concealed Radar Speedmeter. It was found that all

traffic violations did drop with one major exception, light violations were unchamged.

Injury accident dropped by 24% (84 accidents) damage accidents by 5% (23 accidents). Overall a 13% reduction was recorded and a traffic flow increase of 8%.

On U.S. Highway 101 during 1964, both accidents and violations were reduced. Other factors, such as heavy rain, fog, engineering, drivers diverting were examined to see if they could have contributed to the reduction. None appeared to be significant.

(d) POLICING OF PRIMARY ROUTES

This experiment carried out by the Home Office Research and Development Branch lasted for a period of 22 weeks, 2nd August to 31st December 1965. A special Regional Traffic Squad was formed from ten Police Forces in the South West comprising No.7 Police District.

The object of the experiment included, communications, equipment for patrol cars, evaluation of tactics, vehicle utilisation, development of identification features for Police vehicles and the determination of the relationship between levels of Policing and accident rates, incident rates and, possibly, offence rates.

Prior to the experiment the levels of patrol were estimated to be at maximum, one car per 45 miles of road (Trunk or Class 1) and one motor cycle per 117 miles. During the period of the experiment the planned patrol levels were to be one car and one motor cycle per 20 miles of road during daylight and one car per 40 mile sector during darkness. About 541 miles of road were involved. The weekly planned total patrol hours were 6,400 in the event, on average, about 4,750 patrol hours were achieved weekly.

The primary route selected represented about one third of the total primary route mileage, but in 1964, the control period for the experiment had 44% of the accidents.

A decrease in injury accidents 530 to 444, - 16% from 1964 to 1965, was found on the selected routes, whereas an increase of 4% occurred on the unselected routes. It is also noted from this report that there was some confusion in accident reporting procedures by the officers as the number of accidents reported by the patrols was found to be at variance with the numbers reported to the Ministry of Transport via Stats 19 returns.

No traffic flow measurements are produced in this report in respect of either the experimental or control routes. In a holiday area such as this traffic flow is very likely to be considerably influenced by the weather. 1965 had a much heavier recorded rainfall than 1964.

TABLE 19.

Monthly mean Rainfall

South West England

	August	September	October	November	December	Total
1964	59mm.	45mm.	82mm.	68mm.	112mm.	266mm.
1965	82mm.	138mm.	79mm.	111mm.	202mm.	562mm.

(Source - Meterological Office, Bracknell).

The difference in recorded injury accidents between selected and non-selected primary routes in 1964 and 1965 was examined by a 2 x 2 X^2 test. The value obtained was $X^2 = 6.72$ which was judged significant at the 0.1% level.

This experiment appears to show a significant reduction in the number of serious accidents recorded when Police patrols are substantially increased. The authors of the report estimate that the increase in patrol level may have been as much as a factor of six.

The patrol levels claimed was approximately 0.8 vehicles per 10 miles of road. This is a very high frequency compared with the Wisconsin project, and closely comparable to the highest levels achieved in the Durham experiment.

The period of the South West experiment was rather short(22 weeks). The accident rate for 1965 was only compared with that for the previous year. The historical accident data for primary routes in County Durham shows inexplicable and random variations of as much as 50%. Therefore, the 16% decrease found in the South West experiment would not necessarily be statistically significant if compared with years other than 1964.

(e) NORTH RIDING CONSTABULARY EXPERIMENTS

The Chief Constable of the North Riding Constabulary was concerned at the number of fatal and injury accidents which had occurred on Trunk Road A1., in his Police area during the summer season when many holiday-makers use this route.

In 1967, Superintendent Field, Head of the North Riding Constabulary Traffic Department, mounted an accident prevention experiment for a period of six weeks from mid July to late August. Patrol levels on the route were enhanced by as much as a factor of 9. At selected points mini vans were sited bearing Accident Prevention Propaganda. The vans were maintained in situ during daylight hours and only moved when it was necessary for the driver to deal with an incident on the route. Patrol Units, in theory, were only allowed off route for a meal.

At the end of the project a 43% reduction in accidents had been achieved in comparison with previous data.

No patrol levels were checked and no traffic flow counts were made.

The experiment was deemed, by North Riding Police, to be a success.

An identical operation was mounted in the corresponding period of 1968, using similar Police coverage and propaganda. A 56% increase in accidents was recorded in this period when compared with the previous experiment.

This further illustrates the random fluctuation of accident rate, which was found in the Durham experiment, and which is inexplicable.

(f) THE MINISTRY OF TRANSPORT DOUBLE WHITE LINE EXPERIMENT

The object of the experiment was to see if, by controlling overtaking to certain sections of the road, the accident rate could be reduced. Two lengths of Trunk Road A1. in Durham Constabulary area were used for the experiment.

1. Chester Dene to Sniperley Roundabout, which was laid in October 1964, and was $3\frac{3}{4}$ miles long.

2. Rushyford to Aycliffe interchange, which was laid in June 1965, and was $3\frac{7}{8}$ miles long.

On these two, three lane road sections double white lines were painted in a manner which alternated at about half mile intervals between single and double road widths. Overtaking was therefore, restricted to the sections of double width. The advantage of this system is that if properly used it eliminates the possibility of a head-on collision.

During the period of the experiment the road section from Sniperley Roundabout to Kimblesworth Bridge showed a reduction of 50%

in fatal and injury accidents. The Southern experimental stretch, Rushyford to Aycliffe interchange, showed a reduction in fatal and injury accidents of 23%.

However, the Northern part of the Chester Dene - Sniperley Section, between Kimblesworth Bridge and Plawsworth showed an increase of 57% in fatal and injury accidents.

Most of these accidents were occurring at two points, one at the junction of the B.6312 and the second at Chester Moor Transport Cafe. At both points the predominant accident cause was a turning manoeuvre. The initial simple double white lines were removed and turning bays, marked with diagonal white strips substituted. Before these new measures could be evaluated the Ministry of Transport decided to abandon the scheme as data from six other experimental sites showed a large increase in fatal and injury accidents. The removal was strongly opposed by the Chief Constable of Durham, The County Surveyor, Local Authorities and Representatives of Motoring Organisations.

PILOT EXPERIMENTS CONDUCTED DURING 1968, TO ESTABLISH THE EFFECT IF ANY OF POLICE PRESENCE ON DRIVER BEHAVIOUR

During the course of the 1967/68 project it became apparent that to have any hope of success it was necessary to have a very large sample of accidents to work with. To use a large number of accidents it would be necessary to very much widen the scope of an experiment and by doing so greatly increase the number of Police Officers involved. Increasing Police participation would create greater difficulties in supervising and administrating the patrol force to obtain regular standards of patrolling and enforcement.

It is generally accepted, although not scientifically proved, that speed restrictions, obedience to traffic legislation and greater courtesy are factors which depress the accident rate. Therefore, it was decided to study, through a series of pilot experiments, what changes, if any in driver behaviour, were caused by the presence of a Police patrol unit.

In each experiment a separate aspect of driver behaviour was selected and is expressed as a quantative measurement. Any aspect which required even the slightest degree of subjectivity has been avoided. Each experiment is as far as is possible an objective measurement of driver behaviour.

Each experiment is a before and after study. The before part was done with normal, existing Police patrol cover. None of the patrol officers or supervisors were informed of the intention to take the before measurements as it was thought this might have stimulated interest and thereby, introduced a factor which would not have been truly normal. In the event Police presence during the before measurements was practically nil.

Accident Causation

Inspection of Durham Constabulary's monthly statistical accident analysis for December 1968, in which accumulative totals were recorded, revealed the following accident causes were most prevalent for drivers.

a.	Turning right or left without due care.	1144
b.	Overtaking improperly.	694
c.	Crossing road junction without care.	678
d.	Attention diverted.	442
e.	Following too closely.	379
f.	Excess speed.	357

Left and Right Hand Turns.

Right and left turns are responsible for 11% of accidents in the Durham Police area. The recently issued Highway Code gives the following advice to a driver about to execute one of these manoeuvres.

Paragraph 78. "Well before you turn right, use your mirror to make sure you know the position and movement of traffic behind you. When it is safe, give a right turn signal and, as soon as you can do so safely, take up position just left of the middle of the road, or in the space marked for right-turning traffic. If you can, leave room for other vehicles to pass on the left. Wait until there is a safe gap between you and any oncoming vehicle; then make the turn, but do not cut the corner. Remember - MIRROR - SIGNAL - MANOEUVRE."

Paragraph 79. "When turning right from a dual carriageway, or when joining it from a side road and then turning right, wait in the open in the central reserve until there is a safe gap in the traffic in the second half of the road."

Paragraph 80. "Well before you turn left, use your mirror and give a left turn signal. Do not swing out to the right before or after the turn. Make sure a cyclist or a motor cyclist is not coming up from behind on your left."

It is not possible for a roadside observer to see whether or not a driver does in fact use his driving mirror, so this element must be completely discounted. Observation at junctions showed that signals of intention to turn were almost universally given. Only a very small proportion of drivers did not give a signal and then this was probably because no other driver was near enough to have benefitted from such a signal. The problem of at what point or distance from a junction the signal should be given was studied but as this was an objective assessment it was not pursued. The point at which a driver should be in his correct lane before reaching the road junction was also studied but again discarded because of the objective assessment required.

There were a few drivers who did not comply with the Highway Code's advice. If the observations made during the pilot experiment are typical of driver behaviour at a junction then very long and comprehensive periods of observation will be necessary to obtain a sufficiently large sample for any changes, due to Police presence, to be statistically detectable. This type of measurement was abondoned after eight road junctions of various design had been studied.

Further pilot experiments at road junctions were conducted in which measurements, by time, related to the turning manoeuvre were taken. The

intention was to use the time period, measured by a stop watch, between a vehicle starting to make a right hand turn and the time an oncoming vehicle reached the junction as a quantitative measure. It was found that at a busy junction the oncoming traffic frequently slowed or stopped to allow the turning queue of vehicles precedence because of a stoppage further ahead on the oncoming vehicles route. At less heavily trafficked junctions a turning vehicle has less opportunity of being in opposition to an oncoming vehicle. As an observer it was found extremely difficult to assess whether in fact the turning driver had impeded the oncoming driver's forward progress by making him decelerate or actually brake. If either of these did occur then the timing of the space interval would be increased and the stop watch timings made would have no realistic meaning. A decision was made to completely abandon attempts to measure this aspect of driver behaviour.

Driver Behaviour at Roundabouts

As it was considered impossible to assess driving behaviour at a road junction a study was made of driver behaviour at roundabouts. At first difficulty was encountered in finding a traffic roundabout where there was a sufficiently high volume of traffic and at which the presence of observers would not be an influencing factor. A roundabout was finally selected as being suitable which is situated on the B.1289 Road on the West side of Sunderland.

Paragraph 81 of the Highway Code states:-

"Give way to traffic coming from your immediate right, unless road markings indicate otherwise, but keep moving if the way is clear."

Using this advice as a basis for measurement it was decided to observe traffic entering the roundabout, travelling in a westerly direction. This access road had road markings indicating the traffic coming from the right had precedence.

A private car, parked in a cul-de-sac away from the approach road was used for the observations. Four periods of observation, each of one hour duration between 15.55 and 16.55 hours were made on different days with normal Police patrol activity. Four similar measurements were made on corresponding days, at the same times with identical weather conditions, but with one Police patrol motor cycle detailed to patrol all roads joining the roundabout and on occasions to remain stationary at a point where he could be seen by drivers on the observed approach road,

The result of the observations are shown in Table 20.

Although essentially objective in concept the actual measurement in practice involved a considerable degree of subjective assessment as to whether a driver should or should not have given away to traffic on his right.

TABLE 20.

DRIVER BEHAVIOUR AT A ROUNDABOUT

Observation Number	Vehicles Observed	Stopped and Allowed Precedence	Did not Stop	Stopped But Restarted	Increased Police Supervision
1	90	58 (64%)	24 (27%)	8 (9%)	No
2	83	59 (71%)	16 (19%)	8 (10%)	Yes
3	107	66 (62%)	31 (29%)	10 (9%)	No
4	100	61 (61%)	29 (29%)	10 (10%)	Yes

To establish this the vehicle on the roundabout must have been committed by its driver to passing the mouth of the observed approach road and not drive off the roundabout before reaching the observed approach road junction. The vehicle negotiating the roundabout must not either be so far around it that the other vehicle could drive in behind it without checking speed below that necessary for safety.

The assessment was made on the rule, when a driver committed himself to joining the roundabout from the observed approach road was the opposing vehicle then on the part of the roundabout to his immediate right, on a converging course.

A very serious hindrance to this type of measurement was that on many occasions if the driver on the observed approach road had not stopped then a collision would have occurred. In these circumstances the driver always stopped. In other positions on the roundabout the driver on the observed approach road could frequently enter the roundabout with complete safety and no inconvenience to the other driver. As no risk was involved the majority of drivers did not give way in these circumstances.

There are three types of behaviour referred to in Table: 20.

Stopped and waited means: the driver of a vehicle on the observed approach road stopped and gave way to traffic on his right. He did not restart until the road on his right was absolutely clear.

Did not stop means: the driver of a vehicle on the observed approach road enetered the roundabout in front of a vehicle on the roundabout on his right.

Stopped but restarted means: the driver of a vehicle on the observed approach road stopped and gave way to a vehicle on the roundabout on his right but restarted and entered the roundabout when a second vehicle was on the roundabout on his right.

A 4 x 3 chi-squared analysis of the results of the observations shown in Table 20, shows that the slight changes observed in any of the three classifications are no larger than could be expected from random fluctuation.

As no significance can be attributed to the detected variations it was decided not to pursue this method of assessment.

Overtaking

In the Durham Constabulary Police area, in 1968, 6% of recorded accidents were directly attributed to a driver overtaking improperly.

Initially observations were made to count the number of drivers who overtook on the approach to what is generally accepted to be a potential hazard. (Pedestrian crossing, brow of a hill, double white line etc.,). The observations proved such occurrences to be rare in time and space. Therefore, to observe a sufficiently high number to provide samples to compare with different levels of Police activity would have proved a lengthy process.

It was therefore decided to study overtaking between two points on a section of road. The road selected was the Trunk Road A19, between Cold Heseldon and Easington Village. It is narrow, has many bends and two steep twisting hills. The portion selected is two miles in length.

Some pilot experiments were carried out on this road section by counting the changes in order in the traffic stream. A rather ancient portable tape recorder was used by an observer who was positioned at each end of the section. Primary identification of the vehicle was recorded on tape, by means of the vehicle's registration number, or when this was obscured, by some salient feature on the vehicle. The traffic flow in one direction only could be recorded. The tape recordings were transcribed into two lists. Often it was found that one or other of the tape recorders had mal-functioned and as a result only part of the time period had been recorded.

Comparison of the two lists showed that many vehicles on the second observer's list were out of place. Those out of order were deleted and it was then possible to show those remaining in their original order. The

minimum such deletions, expressed as a proportion of the traffic stream in common is a measure of the amount of overtaking which had taken place. Public service vehicles, which normally would stop at one or more 'bus stops', on the road section were ignored.

Table 21 shows the results from four pilot observations, measured in this way. Two observations were made with normal Police patrol activity and two with a specially detailed Police car patrolling the road between the two observation points.

TABLE 21.

Measurements of Overtaking

Measurement Number	Number of Vehicles recorded by First Observer	Second Observer	Minimum Number Deleted	% of number in common
1 (Normal Policing)	168	132	18	14
2 (1 Extra Patrol Car)	251	204	28	14
3 (Normal Policing)	399	319	39	12
4 (1 Extra Patrol Car)	373	218	16	7

A precise test of significance is not possible by using the chi-square test as the deletion of a vehicle from the list in common is dependent on other vehicles on the road at the time. It is clear that no difference exists between observations 1 & 2. Using a 2 x 2 chi-square list as an approximation for observations 3 & 4, the decrease in overtaking is almost significant at the 5% level. No definate conclusion can be drawn from these observations but it is considered that the results warrant further observations being made, using this method of measurement. A fairly high degree of expertise is required by both observers to ensure that all vehicles are recorded and it was found that practice was necessary. Where a registration number was not visible it was found that both observers, after several recording sessions, were identifying the vehicle by the same salient feature. It would be essential for both observers to be equipped with efficient, fingertip controlled, portable tape recorders.

Speed

Excessive speed was the cause of 3% of the accidents which were recorded in Durham Constabulary area in 1968. A further 3% were caused by a

driver losing control of his vehicle and it is accepted that excess speed is the main contributory factor in most accidents.

The speed of a vehicle is easy to measure with a radar speed meter. Such measurements are absolutely objective and produce large samples in a relatively short time period. A private car was used as an observation point. The radar meter was completely concealed from the public. Two observers are necessary, one to read the meter, and one to record the result.

Observations were made at the following locations:-

(i) In a 30 m.p.h. zone.
(ii) In a 40 m.p.h. zone.
(iii) In a derestricted zone.
(iv) At the approach to a pedestrian crossing.

Care was taken to ensure that the comparative data obtained with normal and increased Police patrol levels was taken on the same day of the week, at the same time with identical weather conditions. One observation, shown in Table 22 was made, with normal Police patrolling, for a period of one hour during which torrential rain fell. In all observations the traffic flow was arbitrarily split into three categories:-

Heavy Goods: All goods vehicles over $2\frac{1}{2}$ tons and Public Service vehicles. Maximum legal speed limit, except on motorways, 40 m.p.h.

Light Goods: All goods vehicles below $2\frac{1}{2}$ tons. Maximum legal speed, except on motorways, 40 m.p.h.

Private: All cars and motor cycles. Maximum legal speed, 70 m.p.h.

Tables 22, 23 and 24 show the results of the observation.

Analysis of the data collected is made on the assumption that vehicle speeds in any half hour period are normally distributed and independent. This is the recognised standard method for such measurements and is recommended in The Traffic Engineering Handbook (Reference 8).

In all observations, and for each class of vehicle a reduction in speed was found when one additional Police motor cyclist was patrolling near the check point, The reductions in speed are significant at the 1% level of significance in each instance.

Assuming an idependent, normal distribution and no changesin mean speed occurring as time of day changes within the limits of the observation times, an estimate can be made of the size of the reduction in mean speed for each class of vehicle at each location. This estimate is shown in Table 25.

TABLE 22.

Site - Just inside a 30 m.p.h. zone

1. Date 26.9.68. Time 1425 hours. Weather Fine.
Normal Police Activity.

Class	No. Recorded	Mean Speed	Variance	Standard Deviation
Heavy Goods	64	32.9 m.p.h.	25.5	5.0 m.p.h.
Light Goods	66	35.1 m.p.h.	23.8	4.9 m.p.h.
Cars	175	36.3 m.p.h.	39.4	6.3 m.p.h.

2. Date 27.9.68. Time 1425 hours. Weather Heavy Rain.
Normal Police Activity.

Class	No. Recorded	Mean Speed	Variance	Standard Deviation
Heavy Goods	86	32.5 m.p.h.	20.8	4.6 m.p.h.
Light Goods	47	34.2 m.p.h.	17.4	4.2 m.p.h.
Cars	179	35.6 m.p.h.	31.3	5.6 m.p.h.

3. Date 30.9.68. Time 1425 hours. Weather Fine.
1 Additional Police Motor Cycle.

Class	No. Recorded	Mean Speed	Variance	Standard Deviation
Heavy Goods	76	30.6 m.p.h.	18.0	4.2 m.p.h.
Light Goods	59	31.9 m.p.h.	28.4	5.3 m.p.h.
Cars	192	32.8 m.p.h.	40.5	6.4 m.p.h.

TABLE 23.

Site - Just inside 40 m.p.h. zone

1. Date 24.9.68. Time 1454 hours. Weather Fine.
Normal Police Activity.

Class	No. Recorded	Mean Speed	Variance	Standard Deviation
Heavy Goods	55	37.3 m.p.h.	35.2	5.9 m.p.h.
Light Goods	45	39.7 m.p.h.	65.2	8.1 m.p.h.
Cars	202	38.3 m.p.h.	44.6	6.7 m.p.h.

2. Date 25.9.68. Time 1452 hours. Weather Fine.
Normal Police Activity.

Class	No. Recorded	Mean Speed	Variance	Standard Deviation
Heavy Goods	34	33.5 m.p.h.	17.3	4.2 m.p.h.
Light Goods	38	34.2 m.p.h.	12.4	3.5 m.p.h.
Cars	210	35.4 m.p.h.	28.1	5.3 m.p.h.

TABLE 24.

Site in 30 m.p.h. zone 80 yards on the approach side of a pedestrian crossing

1. Date 2.10.68. Time 1015 hours. Weather Fine Normal Police Activity.

Class	No. Recorded	Mean Speed	Variance	Standard Deviation
Heavy Goods	88	31.3 m.p.h.	14.1	3.8 m.p.h.
Light Goods	72	33.1 m.p.h.	11.9	3.5 m.p.h.
Cars	249	33.1 m.p.h.	18.6	4.3 m.p.h.

2. Date 3.10.68. Time 1042 hours. Weather Fine. Normal Police Activity.

Class	No. Recorded	Mean Speed	Variance	Standard Deviation
Heavy Goods	107	28.2 m.p.h.	16.5	4.1 m.p.h.
Light Goods	67	29.2 m.p.h.	31.8	5.6 m.p.h.
Cars	228	29.5 m.p.h.	32.0	5.7 m.p.h.

TABLE 25.

Estimated Reductions in Mean Speed under heavy patrol activity.

Location	Group of Vehicles		
	Heavy Goods	Light Goods	Cars, Motor Cycles etc.
) m.p.h. zone.	(2.3±1.6) m.p.h.	(3.2±1.8) m.p.h.	(3.5±1.3) m.p.h.
) m.p.h. zone.	(3.8±2.1) m.p.h.	(5.4±2.7) m.p.h.	(2.9±1.2) m.p.h.
proach to Pedestrian ossing (30m.p.h.zone)	(3.1+1.1) m.p.h.	(3.9±1.6) m.p.h.	(3.7± .9) m.p.h.

The reductions in mean speeds observed in heavy rain are less than those observed in the presence of increased Police patrolling. For all these classes of vehicles the reduction in mean speed observed in heavy rain was not significant at the 5% level of significance.

Courtesy

The Ministry of Transport, The Royal Society for the Prevention of Accidents and other Road Safety Committees constantly appeal to the public for greater courtesy on the roads. It is considered that increased consideration for other road-users leads to a reduction in accidents. A large scale project to promote greater courtesy was mounted by Lancashire Constabulary in 1936/37, (no written information on this project is now available).

The scheme was aclaimed by the press, public and the Police to be extremely successful.

It was therefore decided to see if a change in driver's courtesy could be established and attributed to Police presence. To do this observation was kept from a private car at the approach to a pedestrian crossing, outside the Sunderland Accident Hospital, on Trunk Road A.19. The pedestrian crossing is well used as it links a small shopping zone with a large residential area. During the periods of observation it was rare to see a pedestrian cross the road without using the crossing.


H
PEDX
CROSSING
AHEAD

Regulation 4 of The Pedestrian Crossing Regulations 1954 states:-

> "Every foot passenger on the carriageway within the limits of an uncontrolled crossing shall have precedence within those limits over any vehicle and the driver of the vehicle shall accord such precedence to the foot passenger if the foot passenger is on the carriageway within those limits before the vehicle or any part thereof has come onto the carriageway within those limits."

Penalty for contravention - up to £5 0s. 0d.

During the observation made, both with and without additional Police patrol activity it was rare for a driver not to obey this Regulation where a pedestrian stepped onto the crossing and gave the approaching driver sufficient time to stop.

This pilot scheme was not aimed at establishing obedience to law but courtesy extended by the driver to pedestrians waiting on the footpath, and who were not claiming precedence by stepping onto the crossing.

The results of this series of observations are shown in Table 26.

TABLE 26.

Motorist behaviour at a Pedestrian Crossing in a 30 m.p.h. zone.

Date 18.9.68. Weather Fine. Normal Police Activity.

Time	No. Recorded	Gave Way	Did Not	% who gave way
10-11 a.m.	152	31	121	20%
11-12 noon	108	28	80	26%
3- 4 p.m.	141	23	118	16%
4- 5 p.m.	158	31	127	20%
	559	113	446	20%

Date 19.9.68. Weather Fine. 1 Additional Police Motor Cycle.

Time	No. Recorded	Gave Way	Did Not	% who gave way
10-11 a.m.	109	27	82	25%
11-12 noon	99	29	70	29%
3- 4 p.m.	123	45	78	37%
4- 5 p.m.	164	42	122	26%
	495	143	352	29%

Analysis by a 2 x 2 chi-square test shows a highly significant increase (5% probability level) in the proportion of drivers allowing precendence when one additional Police motor cyclist was patrolling about half a mile on either side of the crossing. A change of this magnitude would occur (statistically) in less than 1 instance in 200 if Police supervision was not effective.

If may therefore be concluded that Police presence does increase courtesy at Pedestrian Crossings.

Conclusions

This set of pilot experiments show that the presence of a Police patrol unit does have an effect on driver behaviour and this is shown by a decrease in the mean speed of a traffic flow in a speed restricted zone and by a higher proportion of drivers giving precedence, when not required to by law, to pedestrians waiting at a pedestrian crossing.

Formulation of follow up Project

As a result of the main project and the findings of the pilot experiments a further major experiment was commissioned by The Home Office. Appendix gives details of this experiment.

APPENDIX 'A'

Research Project on Trunk Road Patrolling

1. Introduction

It is proposed that the Durham University group investigate the effect, if any, of police motor car patrols (hereafter called patrols) on the accident rate on certain primary routes in County Durham.

The investigation will be limited to the lengths of the A1 and A19 in the County Police area. These routes will be considered in two stretches each:

Stretch a_1	Stretch a_2
A1 Darlington - Durham (Cock of the North)	Durham - Gateshead
Stretch b_1	**Stretch b_2**
A19 Sunderland - Castle Eden	Castle Eden - Egglescliffe

Each stretch is approximately 12 miles in length. The gross accident rate for the first three months of 1967 is approximately 30 ± 3 per stretch per month. However, previous experience with this type of experiment indicates that the reported incidence of accidents involving only damage and/or slight injury may not be reliable, and that it is preferable to work only with the figures for accidents which are fatal or cause serious injury. There are about 3 of these per stretch per month at present.

Traffic flow measurements carried out by the County Surveyor's office on each stretch for August 1966 indicate that the accident rate/vehicle mile is about one accident/2×10^5 vehicle miles on the A1 and about three times this figure on the A19. Major improvements in hand on the A19 are expected to greatly reduce this latter figure. During 1967-68 hourly flow levels at two points on each of the a_1 and a_2 stretches (mean over one week in general) will be available.

While levels of patrolling have been minimal, a Headquarters patrol with special responsibility for traffic duties on A-class roads has been in operation since July 17th this year. This patrol uses decorated cars and the level of patrolling must have been altered considerably from previous estimates.

2. Preliminary Studies

(a) Using police punched card records for 1963-66 of serious and fatal accidents on the A1, A19 (about 600) an analysis of diurnal and seasonal variations, and of the corresponding changes in traffic flow, will be carried out to indicate the present pattern and assist in scheduling additional patrol activity to give maximum effectiveness.

(b) The first important step is to establish present patrol levels and tactics. To do this it is proposed that on selected days during the three months August - October 1967 the crews of all police vehicles using the A1 or A19 will be asked to record the times at which they were on any of the four experimental stretches. Further cars specifically assigned to patrol would be asked to record in addition:

1. the number of men in the crew
2. weather and road conditions
3. the time and location of any accident attended
4. the number of warnings of possible process issued, other than accidents
5. the number of verbal cautions given
6. the number of defective vehicles checked
7. the number of CRO checks
8. assistance to motorists
9. escorts provided

Information under the headings 4 - 9 above will be returned on the normal incident form, but filled in daily instead of monthly. The times of entry and exit to the experimental stretches of road, and details 1 - 3 above will be entered on a record pad designed to simplify recording and to act as a punch card transfer.

This information will be analysed to give present levels of overall police activity and of specific patrol activity on the experimental stretches.

3. First experiment November 1967 - January 1968

(a) Two additional patrol cars (subject to availability) will be assigned to each of stretches a_1, b_1, for the shift 4 p.m. - midnight; this period appears to include the peak incidence of accidents.

(b) No changes in tactics or recording will be introduced.

(c) Recording as in the preliminary study will be carried out on random days on all four stretches to monitor other police activity.

With the information on these two levels of patrol activity, and on traffic flow, the accident rate on the stretches a_1, b_1, (and also on other roads near these) will be compared with that on the control stretches for the periods covered by 2 and 3.

4. Testing of model, influence of change of tactics.

A. During February - April 1968, two experiments will be carried out -

(a) on stretch a_1 patrolling will be carried out without change of tactics, at an altered level suggested by the previous results (i.e. at one or three additional cars, or possibly with no patrol cars at all).

(b) on stretch b_1 where the level of patrolling should not be altered, a tactical experiment is suggested. This might involve (subject to further discussion).

(i) increased verbal cautions
(ii) two cars connected by radio and working together
(iii) restriction of the cars to shorter stretches of road to avoid overlapping
(iv) replacement of cars by motor cyclists working in pairs.

B. During May - July 1968 further tactical modifications will be investigated.

A patrol level will be adopted as in the first experiment, or as suggested by the results in order to have a perceptible effect, the modifications introduced could include -

(i) Changes in the form of decoration of police cars.
(ii) Widespread local publicity in press and T.V.
(iii) Labelling of some roads "Police Patrol Experiment in progress".

Recording will continue as in the earlier periods.

These proposals require 4 or 5 extra police cars on the A1 and A19 for one shift per day during the period November 1967 to July 1968 inclusive, preferable each with a crew of two. The creation of the Headquarters patrol may give flexibility and should imply that less than this number of truly additional cars will be needed. The patrol level will vary from the present figure about $1\frac{1}{2}$ cars/Stretch, to a maximum of 5 cars/stretch (and perhaps to a minimum of zero.)

5. Analysis of Results

The preliminary model will be reassessed and modified to incorporate the effect of tactical changes. The group will attempt to deduce optimal patrol levels and tactics and suggest further research.

ROAD TRAFFIC ACT, 1960

SECTION 77

(1) If in any case, owing to the presence of a motor vehicle on a road, an accident occurs whereby personal injury is caused to a person other than the driver of that motor vehicle or damage is caused to a vehicle other than that motor vehicle or a trailer drawn thereby or to an animal other than an animal in or on that motor vehicle or a trailer drawn thereby, the driver of the motor vehicle shall stop and, if required so to do by any person having reasonable grounds for so requiring, give his name and address, and also the name and address of the owner and the identification marks of the vehicle.

(2) If in the case of any such accident as aforesaid the driver of the motor vehicle for any reason does not give his name and address to any such person as aforesaid, he shall report the accident at a police station or to a police constable as soon as reasonably practicable, and in any case within twenty-four hours of the occurrence thereof.

(3) In this section "animal" means any horse, cattle, ass, mule sheep, pig, goat or dog.

(4) A person who fails to comply with this section shall be liable on summary conviction to a fine not exceeding twenty pounds, or in the case of a second or subsequent conviction to a fine not exceeding fifty pounds or to imprisonment for a term not exceeding three months.

DATA ON ONE-MAN/TWO-MEN CREW ACTIVITIES

A survey of the activities of 1 and 2 manned patrol cars was held between 1st February and 13th March, 1968.

1.- I N C I D E N T S:

Incidents dealt with by single crewed vehicles	112
Incidents dealt with by double crewed vehicles	226
Total number of incidents recorded	338

Number in crew	Number of Incidents		Number of Additional Constables Required
1	74	112	0
1	16		1
1	22		2+
2	*185	226	0
2	8		1
2	33		2+

(*Double crews reported that 70 (38%) of the 185 incidents they attended without assistance could have been dealt with by a single officer).

2. PROCESS, ACCIDENTS AND WORK GENERATED:

(ABSTRACT OF INFORMATION FROM MAIN DURHAM PATROLLING PROJECT)

INCIDENT	Crew 1	Crew 2
(RECORDED RETURNS):-	1,758	1,780
Accidents Reported	120	140
Traffic Offences Reported	560	652
Traffic Offenders Reported	354	439
Verbal Cautions (Traffic Offences)	886	1,031
Defective Vehicles Checked	69	93
Motorists Assisted	264	270
C.R.O. Checks	276	440

This abstract only records offences, etc., dealt with on Trunk Roads A.1 or A.19.

3. SINGLE CREWS (INCIDENTS):

Time	Crew	Number of Incidents	Assistance Required	Average Response Time *
06.00/22.00	1	61	0	-
06.00/22.00	1	14	1	8 Mins.
06.00/22.00	1	16	2+	4 Mins.
22.00/06.00	1	13	0	-
22.00/06.00	1	2	1	5 Mins.
22.00/06.00	1	6	2+	4 Mins.

*(N.B. The response time is a support response time and includes requests for specialist assistance).

(See Schedule 1 for individual incident and response time).

4. DOUBLE CREWS (INCIDENTS):

Time	Crew	Number of Incidents	Assistance Required	Average Response Time
06.00/22.00	2	106(*1)	0	-
06.00/22.00	2	3	1	-
06.00/22.00	2	16	2+	11 Mins.
22.00/06.00	2	79(*2)	0	-
22.00/06.00	2	5	1	17 Mins.
22.00/06.00	2	17	2+	7 Mins.

*1. (44 Could have been dealt with by a single crewed unit).

*2. (26 Could have been dealt with by a single crewed unit).

(See Schedule 2 for individual incident and response time).

5. COMPOSITION OF DOUBLE CREWS:

Patrol Officer	Divisional Officer	Probationer Undergoing Training
134	13	79

SCHEDULE 1.

6. SINGLE CREWED UNITS:

(A) Day (06.00/22.00 hours):

Single crewed units dealt with the following incidents without further assistance.

Accidents	31
Alarms	10
Fires	4
Disturbances	3
Complaint of Larceny	2
Vehicles Reported Stolen	2
Arrest (2) Larceny	1
Arrest (3) Breach of Peace	1
Road Blocked - Ice	1
Vehicle Stuck - Snow	1
Breaking Offence	1
Aged Man found Wandering	1
Search	1
Damage	1
Cattle Straying	1
TOTAL	61

(B) Assistance of one additional Constable was required at the following incidents.

	Response Time
Accident	5 Mins.
Accident	25 Mins.
Accident	15 Mins.
Accident	10 Mins.
Accident	5 Mins.
Accident	10 Mins.
Accident	10 Mins.
Accident	0 Mins.
Arrest - Road Safety Act	5 Mins.
Arrest - Shopbreaking	0 Mins.
Stolen Vehicle - Abandoned	30 Mins.
Larceny	5 Mins.
Domestic Dispute	4 Mins.
Person Missing from Home	0 Mins.
TOTAL	14 Incidents
Average Response Time	- 8 Minutes

(C) Assistance of 2 or more additional Constables was required at the following incidents.

Incident	Extra Numbers Required	Response Time
Accident	2	0
Accident	2	0
Accident	2	5 Mins.
Accident	2	0
Accident	3	3 Mins.
Accident	3	3 Mins.
Accident	4	0
Arrest - Shopbreaking	(circulation)	2 Mins.
Breaking Offence	2 (C.I.D.)	45 Mins.
Suspicious Person	2	10 Mins.
Housebreaking	3	10 Mins.
Breaking Offence	3	10 Mins.
Breaking Offence	2	10 Mins.
Alarm	3	0
Alarm	2	4 Mins.
Vehicle Examination	2	2 Hours

TOTAL: 16

Average Response Time excluding call for C.I.D. and Vehicle Examiner - 4 Minutes.

7. SINGLE CREWED UNITS - NIGHT (22.00/06.00):

(A) Single crewed units dealt with the following incidents without assistance.

Disturbances	6
Accidents	3
Breaking Offences	2
Alarm	1
Larceny	1
TOTAL	13

(B) Assistance of one additional Constable was required at the following incidents:

Incident	Response Time
Accident	5 Mins.
Arrest - Road Safety Act	5 Mins.

TOTAL: 2

(C) Assistance of 2 or more additional Constables was required at the following incidents.

Incident	Extra Numbers Required	Response Time
Intruder on Premises	2	5 Mins.
Arrest (2) - Shopbreaking	(circulation(	2 Mins.
Arrest - Larceny Vehicle	3	4 Mins.
Arrest - Larceny Metal	3	5 Mins.
Stolen Car Chase	2	5 Mins.
Accident	4	5 Mins.
TOTAL:	6	

Response Time - 4 Minutes

SCHEDULE 2.

8. DOUBLE CREWED UNITS:

(A) Day (06.00/22.00 hours):

Accidents	51
Alarms	15
Disturbances	9
Road Obstruction	3
Fires	3
Person Ill	2
Damage	2
Person Injured	2
Sudden Death	2
Suspicious Person	2
Larceny	2
Suspicious Vehicle Traced and Checked	1
Child locked in house	1
Assault	1
Malicious '999' Call	1
Complaint	1
Cattle Straying	1
Sheep Straying	1
Report of Body in Field	1
Report of Man with Gun	1
Person Missing from Home	1
Arrest - Larceny	1
Arrest - Road Safety Act.	1
Breaking Offence	1
	106

(B) The crews reported that the second member of the crew was not necessary for the following incidents.

Accidents	18
Alarms	9
Woman Ill	2
Damage	2
Disturbances	6
Complaint	1
Person Injured	1
Sudden Death	1
Report of Body in Field	1
Fire	1
Larceny	1
Suspicious Person	1
	44

(C). Assistance of one additional Constable was required at the following incidents.

Incident	Response Time
Larceny (Scientific Aids)	15 Mins.
Accident	0 Mins.
Accident	0 Mins.

(D) Assistance of two or more additional Constables was required at the following incidents.

Incident	Extra Numbers Required	Response Time
Accident	3	5 Mins.
Arrest After Chase	10	3 Mins.
Accident	2	5 Mins.
Accident	4	5 Mins.
Accident	3	0 Mins.
Alarm	2	10 Mins.
Accident	3	20 Mins.
Accident	2	5 Mins.
Accident	2	5 Mins.
Accident	5	5 Mins.
Larceny	5	10 Mins.
Suspicious Vehicle	2	To Search
Accident	2	2 Mins.
Stolen Vehicle Recovered	2	2 Mins.
Alarm	2	2 Mins.
Break In	2	45 Mins.

Average Response Time - 9 Minutes

9. DOUBLE CREWS - NIGHT (22.00/06.00 hours):

(A)

Accidents	15
Alarms	4
Disturbances	22
Breaking Offences	5
Assault	2
Road Obstruction	1
Unusual Noise in House	1
Missing Person	2
Intruder	3
Arrest - Larceny	4
Arrest - Larceny	2
Arrest - Road Safety Act	2
Arrest - Breach of the Peace	3
Damage	1
Suspicious Person	3
Suspicious Vehicle	2
Arrest - Simple Drunk	1
Cattle Straying	1
Person Ill	1
P.C. in difficulty	1
Man Sleeping Out	1
Man Interfering with Road Warning Lights	1
Person Ill	1
	79

(B) The following 26 of these 79 incidents could have been dealt with by one Constable.

Accidents	6
Disturbances	10
P.C. in difficulty	1
Person Ill	1
Breaking Offence	1
Suspicious Person	1
Road Obstruction	1
Alarm	1
Unusual Noise in House	1
Man Sleeping Out	1
Suspicious Vehicle	1
Man Interfering with Road Warning Lights	1
	26

(C) The following incidents were attended by double crewed vehicles and the assistance of one additional Constable was required.

Incident		Response Time
Arrest following Disturbance		2 Mins.
Breaking Offence		15 Mins.
Breaking Offence	(Sc. Aids)	30 Mins.
Accident		30 Mins.
Alarm		8 Mins.

(D) The following incidents were attended by double crewed vehicles and required the assistance of 2 or more additional Constables.

Incident	Extra Numbers Required	Response Time
Assault	2	10 Mins.
Intruders on Premises	2	5 Mins.
Intruders on Premises	2	0 Mins.
Fatal Rail Accident	3	20 Mins.
Larceny	4	1 Min.
Arrest (Drunk)	4	5 Mins.
Alarm	4	2 Mins.
Alarm	2	3 Mins.
Accident	2	20 Mins.
Accident	2	2 Mins.
Robbery	3	15 Mins.
Fatal Accident	3	15 Mins.
Larceny	6	5 Mins.
Larceny	4	3 Mins.
Shopbreaking	2	15 Mins.
Take Motor Vehicle Without Consent.	2	2 Mins.
Intruder on Premises	12	3 Mins.
	17	

Average Response Time - 7 Minutes.

SUMMARY TABLE:

Numbers of Policemen required for all Incidents

(Circulation omitted)

Numbers Required	Single Crews		Double Crews		Combined Figure	
	Day	Night	Day	Night	Day	Night
1	61	13	44	26	105	39
2	14	2	62	53	76	55
3	9	2	3	5	12	7
4	5	2	9	8	14	10
5	1	1	3	3	4	4
6	-	-	1	4	1	4
6+	-	-	3	2	3	2
TOTALS	90	20	125	101	215	121

COSTS OF PATROLLING

The average cost of a patrol vehicle per year is approximately £1,500 each with allocated personnel equivalent to 3 Police Constables, hence implying wages of approximately £4,500 per annum.

Police patrolling at the level in force at the beginning of this project was thus costing the Police not less than £480,000 per year.

Allowing for the full cost of hiring an additional Police Constable (the nominal rate adopted for Police purposes being 19s. 0d. per hour) at £2,074 per year, the cost of a marginal patrol car (3 equivalent Constables, plus depreciation and maintenance) is £7,700 per year. Thus the true cost of the patrol force is near £625,000 per year.

DURHAM UNIVERSITY/DURHAM CONSTABULARY

PROPOSED INVESTIGATION OF THE EFFECTS OF DIFFERENT METHODS OF USE OF POLICE MOTOR PATROLS ON DRIVER BEHAVIOUR

1. Design of Experiment

It is proposed that a special Motor Patrol unit is formed on a short term basis for this project. This unit will be used to patrol selected routes in the Sunderland area.

a) uniformly
b) in a pulsed manner

and measurements made of certain aspects of driver behaviour during both types of patrolling.

2. Selected Routes

The total route mileage to be studied is approximately 48 miles, comprising of four stretches of approximately 12 miles each:-

Route 1

Commencement of the A183 road, South Shields to it's junction with the A182 road at Shiney Row.

Route 2

A184 from the roadworks south of White Mare Pool to the A19, A19 from end of Dual Carriageway, South Shields to Ryhope Green.

Route 3

B1289 Washington Town Centre to Wheatsheaf Roundabout, Sunderland.
A690 centre of Houghton-le-Spring to Park Land Island.

Route 4

A19, Ryhope Green to junction of A179.

The traffic density on these routes is very nearly in the ratio 1:1:1:2 For that reason route 4 will be treated as a double route, by introducing "route 5", a dummy route equivalent to route 4, and thus giving an effective route mileage of 60 miles.

3. First Period, Uniform Patrolling

For a nine week period, from 17th March, the force will be used to patrol

the five routes as uniformly as possible from 8.30 a.m. to 5.30 p.m. Two shifts will be used:

Shift A 8.00 a.m. - 4.00 p.m.

Effective patrol 8.30 a.m. - 3.30 p.m., lunch 12 noon - 1.00 p.m.

Shift B 10.00 a.m. - 6.00 p.m.

Effective patrol 10.30 a.m. - 5.30 p.m., lunch 1.00 p.m. - 2.00 p.m.

Double Strength will be available 10.30 a.m. - 12 noon and 2.00 p.m. - 3.30 p.m.

4. Force Required

Men: 12 P.C.'s and supervisor (Sergeant or Inspector) giving 6 men per shift, allowing for sickness and administrative and clerical duties should give four drivers per shift.

Vehicles: 6 motor cars and 2 motor cycles (giving 3 motor cars and 1 motor cycle per shift).

Base: Sunderland, Mobile Police Station.

5. Patrol of Routes by Other Police Patrol Units

These routes should be patrolled by normal Divisional patrols during the period 5.30 p.m. to 8.30 a.m. No Police vehicles other than the University Patrol Group should patrol the routes except to respond to an emergency.

6. Effective Patrol Intensity, First Period

At four vehicles per shift, six hours patrol per vehicle per shift gives 48 patrol hours a day, giving approximately 9.6 patrol hours per route per day, or very closely one vehicle in each of the five stretches at any time. (Distribution as Table A). Officers will be allowed one hour away from their route for lunch, and if possible personnel should receive an allowance for meals out.

7. Second Period: Pulse Patrolling (nine weeks)

The same force, at the same intensity, would be used to give very intensive coverage of one of the five routes, selected on a random basis, in three day bursts (see Table B). Three out of four vehicles per shift would be used on this basis, the remaining strength giving low level uniform background cover. This allows for 36 patrol hours per nin-hour day on the selected 12 mile route, or four vehicles on the route at any one time. The pulse selection (Table B) has been carried out using a table of random numbers.

8. Instructions to Crews, re. R.T.A.

Each man will submit a daily report on distribution of time between various duties, and a special incident form for each incident dealt with.

Crews will be instructed to use cautions and reports for process for all cases of excessive speed, reckless, careless or dangerous driving, offences with respect to pedestrian crossings, etc.

9. Measurements of Driver Behaviour

The following parameters will be measured.

1) Route 3, A.690

Mean an variance of speed distribution in a derestricted zone (Heavy, light commercial and private motor cars separately).

2) Route 1, A.183

The same, in a 30 m.p.h. restricted zone.

3) Routes 4/5, A.19

Percentage of drivers overtaking in a narrow undulating stretch of road.

4) Route 2, A.19

Percentage of drivers giving precedence to pedestrians at a designated crossing.

Measurements will be made on eight occasions per week, each measurement comprising a $1\frac{1}{2}$ hour sample, so that each parameter will be measured twice per week. Sites have been chosen so that in as far as possible those carrying out the measurements will not be very noticeable.

The parameters will be analysed in terms of

a) Uniform patrolling

b) Pulsed patrolling

and

b_1) Pulse on b_2) Pulse off

Accident statistics will be kept, but are not expected to provide a statistically significant sample.

TABLE 'A'

Uniform patrol: assignment to routes (week 1)

Time	8.30/9.30	9.30/10.30	10.30/12	12/1	1/2	2/3.30	3.30/4.30	4.30/5.30	TOTAL (hours)
Route									
1	1	1	2	1	1	1	1	0	$9\frac{1}{2}$
2	1	1	1	0	1	2	1	1	$9\frac{1}{2}$
3	1	0	2	1	1	1	1	1	$9\frac{1}{2}$
4	0	1	1	1	0	2	1	1	$9\frac{1}{2}$
5	1	1	2	1	1	2	0	1	10
No. m. patrol	4	4	8	4	4	8	4	4	48 hours

Week 2: permute routes 2,3,4,5,1
Week 3: " " 3,4,5,1,2
Week 4: " " 4,5,1,2,3
Week 5: " " 5,1,2,3,4
Week 6: " " 1,2,3,4,5

etc.

TABLE 'B'

Pulse Pattern, Phase 2

Pulse No.	Route No. 1	2	3	4	5
1	ON				
2			ON		
3		ON			
4					ON
5		ON			
6		ON			
7			ON		
8			ON		
9					ON
10					ON
11			ON		
12				ON	
13		ON			
14					ON
15		ON			
16	ON				
17				ON	
18				ON	
19			ON		
20			ON		
21			ON		

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