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FIRES IN ROAD VEHICLES 1968

by

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SUMMARY

Fires in road vehicles increased from 10716 in 1963 to 15188 in 1968, the year on which this report is based. About half of the fires (6892 in 1968) were in cars. This is a rate of 0.64 fires per thousand licenses. Lorry fires numbered 3900 in 1968, and, like cars, had been increasing steadily over the previous five years. Fires in motor cycles decreased to a level of 1348 in 1968 (1.02 per thousand licenses). Fires in tankers and buses, although small in number approximately doubled in the five years 1964 - 1968. This coincides with the greater use of rear-engined vehicles, but there is no evidence to suggest that these vehicles are a greater fire risk. It appears that the numbers of tanker and bus fires in which liquids other than petrol and diesel fuel oil were ignited initially would be sufficient to explain this increase. The fire incidence rate for goods vehicles is estimated to be about 3.16 per thousand licenses and that for buses is as high as 5.27.

Car fires are most frequent during the later part of the day and lorries between 0900 and 1500. This may be related to the mileages covered. Sixty seven per cent of motor cycle fires occur after 1500.

The most important sources of ignition in road vehicle fires are wire and cable (4752 fires), engine (4264 fires) and mechanical heat and sparks (1044 fires). This last cause and 'ashes and soot' were major causes of lorry fires. An increasingly frequent source of ignition is malicious ignition, having risen from 68 fires in 1963 to 436 in 1968.

In 4112 fires petrol was ignited and insulation accounted for 4020 fires.

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Road vehicle fires do not usually spread and about 27 per cent are extinguished before the arrival of the fire brigade. The figure for cars is 33 per cent and for buses 28 per cent. For lorries the percentage successfully quelled is only 17. First aid fire-fighting by removal or disconnection, smothering or buckets of water generally appears to be more successful than using extinguishers.

Three coaches needed to be evacuated during the year. There were 31 fatal fire casualties in vehicles and an estimated 212 non-fatal casualties. The overall casualty rate for vehicles was 16.0 fire casualties per thousand fires - this rate was substantially higher for tankers (34.1) and motor cycles (27.4)

KEY WORDS: Casualties, cause, crash, extinguishing, fire statistics, incendiarism, spread, vehicle.

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INTRODUCTION

New developments in design and materials used in vehicles have prompted questions about the fire hazard in road vehicles. Increasing numbers of vehicles on the road have given rise to a general upward trend in road vehicle fires, a trend which is more serious with some types of vehicles than others. This analysis is based mainly on 1968 statistics[1]; at the same time it makes comparison with 1963 figures. No account is taken of vehicles that catch fire in buildings, e.g. garages. The figures for 1963 and 1968 are both estimated from one-in-four samples of reports.

ANNUAL INCIDENCE OF FIRES AND LICENSES

The annual incidence of road vehicle fires attended by fire brigades in the period 1950 to 1968 is shown in Fig.1. and sub-divided by type of vehicle, for the period 1963 - 1968 in Table 1.

Table 1:Fires in Road Vehicles 1963-1968

Type of vehicle	1963	1964	1965	1966	1967	1968
TOTAL	10716	11890	11969	13193	14017	15188
Internal combustion engine	10624	11690	11788	13024	13913	15060
Cars	4048	4374	4664	5636	6293	6892
Lorries	2880	3160	3241	3337	3556	3900
Vans, shooting brakes, landrovers	1320	1504	1437	1595	1871	2040
Motor cycles, scooters	1760	2056	1785	1742	1411	1348
Coaches, omnibuses	256	190	239	307	330	416
Tankers	132	110	186	193	242	264
Mobile canteens and shops	156	150	162	142	128	132
Other	72	146	74	72	82	68
Electric and other	92	200	181	169	104	128

It is difficult to make a complete comparison with the numbers of licenses, because the classification used for the fires does not completely agree with that used for licenses in the Annual Abstract of Statistics[2]. It is possible, however, to make comparisons in the case of cars, motor cycles and omnibuses, and this has been done in Tables 2a, 2b and 2c and Fig.2. The tables also give information in relation to vehicle - kilometres based on a Road Research Laboratory Report[3].

Table 2a:Fires in cars related to licenses and vehicle-kilometres, 1962-1969

	1962	1963	1964	1965	1966	1967	1968
Fires in cars	4012	4048	4374	4664	5636	6293	6892
Licenses(thousands)	6560	7380	8252	8922	9522	10312	10825
Fires per million licenses	612	549	530	523	592	610	637
Vehicle-kilometres travelled by cars(millions)	83744	91436	105685	115811	126509	137065	145496
Fires per million vehicle-kilometres	0.048	0.044	0.041	0.040	0.045	0.046	0.047

Table 2b: Fires in motor cycles and motor scooters in relation to licenses and vehicle-kilometres, 1962-1968

	1962	1963	1964	1965	1966	1967	1968
Fires in motor cycles and motor scooters	1788	1760	2056	1785	1742	1411	1348
Licenses(thousands)	1869	1849	1838	1711	1501	1446	1328
Fires per million licenses	957	952	1119	1043	1161	976	1015
Vehicle-kilometres travelled by motor cycles,etc. (millions)	8654	7566	7545	6668	5969	5165	4703
Fires per million vehicle-kilometres	0.207	0.233	0.272	0.268	0.292	0.273	0.287

Table:2c Fires in coaches,omibuses and minibuses in relation to licenses and vehicle-kilometres, 1962-1968

	1962	1963	1964	1965	1966	1967	1968
Fires in coaches,etc.	226	256	190	239	307	330	416
Licenses (thousands)	79	82	82	82	79	79	79
Fires per million licenses	2861	3122	2317	2915	3886	4117	5266
Vehicle-kilometres(travelled by coaches,etc (millions)	3977	3948	3950	3914	3888	3793	3817
Fires per million vehicle-kilometres	0.057	0.065	0.048	0.061	0.079	0.087	0.109

Fires in cars appear to have increased at a faster rate than licenses in the last three years considered. Motor cycles have a higher fire risk than cars in relation to the numbers at risk, but the fire rate per million licenses for motor cycles remained roughly constant. For buses, the fire rate almost doubled in the seven year period.

When the fire frequencies are related to the estimated vehicle-kilometres travelled, it can be seen that cars had a constant rate (0.047 fires per million kilometres) during the period 1962-1968, but for motor cycles the rate increased by about 40 per cent and for buses by about 100 per cent in the same period.

AGE OF VEHICLES

The ages of vehicles involved in fires are frequently omitted from fire reports. Where they are given however they are recorded for statistical purposes and the ages of cars involved in fires in 1968 are shown in Table 3. Little can be deduced from the table, but there is no indication that age is an important factor in the occurrence of fire.

Table 3: Age of cars involved in fires 1968

Date of manufacture	No.of fires
TOTAL	6892
1944 and before	32
1945 - 1949	24
1950 - 1954	236
1955 - 1959	932
1960	464
1961	420
1962	300
1963	360
1964	464
1965	404
1966	416
1967	336
1968	268
Not stated	2236

LOCATION OF VEHICLES INVOLVED IN FIRES

As already indicated, this report is concerned with vehicle fires in the open and fires in buildings have not been included in the analyses. Table 4 shows the locations of cars at the time at which they were involved in fires during 1968, most being on roads.

Table 4: Location of cars involved in fires, 1968

Location of fire	No.of fires
TOTAL	6892
Roads or streets	5520
Motorways	116
Field, open land	364
Car park	280
Garden	220
Garage, forecourt	184
Yard(miscellaneous)	104
Other(specified)	24
Unknown or not stated	80

MONTH, DAY OF WEEK AND TIME OF DAY OF FIRES

The number of fires in road vehicles varied slightly from month to month during the year, but no statistical significance can be attached to this variation. The only exceptional figure noted was in the 1963 statistics which showed that there was a marked peak in the number of car fires in December (492 against a mean of 332 for the other 11 months of that year). Motor cycle fires are more common in the summer than other times of year. (This is probably related to usage). There is no significant variation between days of week for any class of vehicle.

The type of vehicle is related to time of call in Table 5 and the proportions of fires at the different hours of the day for various types of vehicle (on a moving-average basis) are shown in Fig.3.

Table 5: Type of vehicle in relation to time of call, 1968

Time of call	TOTAL	Type of vehicle						
		Cars	Lorries	Vans, etc	Motor cycles	Coaches omnibuses	Tankers	Other
TOTAL	15188	6892	3900	2040	1348	416	264	328
Midnight-02.59	1160	668	272	124	64	12	16	4
03.00-05.59	456	172	196	72	4	4	-	8
06.00-08.59	1276	456	356	208	92	60	44	60
09.00-11.59	2240	828	828	316	88	64	64	52
12.00-14.59	2452	952	784	380	192	52	36	56
15.00-17.59	2584	1176	644	320	256	80	56	52
18.00-20.59	2724	1452	432	320	344	96	20	60
21.00-23.59	2284	1188	384	292	308	48	28	36
Not stated, unknown	12	-	4	8	-	-	-	-

From the table it can be seen that fires in lorries are most frequent during the hours 0900-1500 and that car and motor cycle fires are most prominent during the later part of the day; this is reflected by the general pattern of accident statistics[4]. It has also been shown[5] that on motorways fires are most likely during the hours 0600-1200, and that this is probably connected with the fact that lorries, which are a greater risk on motorways than other roads, do a substantial proportion of their mileage during these hours.

There is some slight evidence that the fire pattern according to the time of day has been changing particularly for cars (which account for about half of the fires in road vehicles); it does not however appear to be the case with lorries, motor cycles or buses. Relavent comparisons are shown in Tables 6a and 6b.

Table 6a:Time of call to fires in road vehicles, 1963 and 1968

Year	TOTAL	Time of call								
		Mid-night -0259	0300-0559	0600-0859	0900-1159	1200-1459	1500-1759	1800-2059	2100-2359	Not stated
1963	10712	836 (7.8%)	304 (2.8%)	852 (7.9%)	1516 (14.2%)	1464 (13.7%)	1884 (17.6%)	1972 (18.4%)	1884 (17.6%)	-
1968	15188	1160 (7.6%)	456 (3.0%)	1276 (8.4%)	2240 (14.7%)	2452 (16.2%)	2584 (17.0%)	2724 (17.9%)	2284 (15.1%)	12 (0.1%)

Table 6b:Time of call to fires in cars, 1963 and 1968

Year	TOTAL	Time of call							
		Mid-night -0259	0300-0559	0600-0859	0900-1159	1200-1459	1500-1759	1800-2059	2100-2359
1963	4048	412 (10.2%)	96 (2.4%)	196 (4.8%)	360 (8.9%)	428 (10.6%)	728 (18.0%)	916 (22.6%)	912 (22.5%)
1968	6892	668 (9.7%)	172 (2.5%)	456 (6.6%)	828 (12.0%)	952 (13.8%)	1176 (17.1%)	1452 (21.1%)	1188 (17.2%)

It can be seen from Table 6a that, for all vehicles, the proportion of fires in the period 1200-1500 increased, whereas in the period 2100-midnight although there was an increase in numbers between 1963 and 1968, they decreased as a proportion of the whole. Table 6b shows the same to be true for car fires. It is possible that these changes have come about as a result of a change in the usage pattern, but there is no evidence available to verify this.

CAUSES OF FIRES AND MATERIALS IGNITED

The type of vehicle is related to the source of ignition in Table 7a (for the year 1963) and Table 7b (for the year 1968)

Table 7a:Type of vehicle in relation to the source of ignition, 1963

Source of ignition of fire	TOTAL	Type of vehicle: Cars	Lorries	Vans etc.	Motor cycles Motor scooters	Coaches omnibuses	Tankers	Other
TOTAL	10716	4048	2880	1320	1760	256	132	320
ELECTRICAL								
Wire and cable	3092	1600	500	456	316	88	16	116
Supply apparatus*	328	108	68	20	104	12	4	12
Others	60	36	-	16	4	-	-	4
OIL(including petrol)								
Engine	2844	876	480	324	1016	76	40	32
Other	128	76	8	20	4	-	-	20
Mechanical heat or sparks	784	112	500	28	28	48	64	4
Smoking materials	772	264	316	132	20	12	-	28
Crash or collison	420	248	44	60	64	-	-	4
Ashes and soot	528	4	516	8	-	-	-	-
Malicious ignition	68	44	16	-	8	-	-	-
Children with fire	204	100	32	52	12	-	-	8
Matches,taper,naked light	184	88	24	28	40	-	-	4
Spontaneous combustion	16	-	12	-	-	-	-	4
Rubbish burning	68	8	40	8	8	-	-	4
OTHER KNOWN CAUSES	264	32	124	32	24	4	4	44
UNKNOWN	956	452	200	136	112	16	4	36

*To be comparable with Table 7b, this row must be added into 'OIL-engine'.

Table 7b: Type of vehicle in relation to the source of ignition, 1968

Source of ignition of fire	TOTAL	Type of vehicle						
		Cars	Lorries	Vans.etc	Motor cycles Motor scooters	Coaches omnibuses	Tankers	Other
TOTAL	15188	6892	3900	2040	1348	416	264	328
ELECTRICAL								
Wire and cable	4752	2680	748	796	252	156	36	84
Other	112	36	-	4	8	-	-	64*
OIL(Including Petrol)								
Engine	4264	1980	724	584	728	128	68	52
Other	64	16	20	8	4	-	4	12
Mechanical heat or spraks	1044	104	708	28	4	92	104	4
Smoking materials	732	300	264	128	12	8	4	16
Crash or collision	644	460	36	36	96	-	8	8
Ashes and soot	528	4	520	-	-	-	-	4
Malicious ignition	452	228	80	92	32	8	8	4
Children with fire	436	172	160	72	12	4	4	12
Matches,taper,naked light	92	28	24	16	16	4	-	4
Spontaneous combustion	68	-	64	-	-	-	-	4
Rubbish burning	64	4	56	-	-	-	4	-
OTHER KNOWN CAUSES	316	100	136	28	4	-	8	40
UNKNOWN	1620	780	360	248	180	16	16	20

*Electrically operated vehicles

From these two tables it can be seen that the largest single known causes of fires in road vehicles are electrical wire and cable, engine, mechanical heat or sparks, smoking materials and crash or collision.

Considering only the 1968 data, 38.9 per cent of car fires were attributed to wire and cable and 28.7 per cent to the engine. Both of these causes were also prominent in lorry fires, accounting for 19.2 per cent and 18.6 per cent of the fires respectively. Two other important causes of lorry fires were ashes and soot, and mechanical heat and sparks. The latter was shown to be a serious hazard to lorries on motorways[5]. Faults connected with the engine accounted for over half of the fires in motor cycles and motor scooters. The cause distribution for fires in vans, etc.

was similar to that for cars. Although fires in tankers were not very numerous, they doubled in frequency between 1963 and 1968. Table 7b illustrates the very serious problem of tyre friction, which accounted for nearly 40 per cent of fires in tankers in 1968. It was also an important source of ignition in bus fires, and ranked third behind wire and cable (37.5 per cent) and engine (30.8 per cent).

Comparison of Tables 7a and 7b reveals a changing pattern in the distribution of sources of ignition. In particular, malicious ignition, thought to be a generally under-estimated cause of fires[6] rose from 68 incidents in 1963 to 452 in 1968, a six-fold increase. Fires attributed to the activities of children and unknown causes both increased faster than the overall incidence.

There was a significant change in the source of ignition distribution between 1963 and 1968 for all types of vehicles, but this did not apply to tankers, and coaches and omnibuses although these two types of vehicle had the sharpest overall increase. In cars, malicious ignition incidents showed a five-fold increase and fires attributed to the engine doubled. However, fires attributed to smoking materials remained nearly constant. Overall, lorry fires increased from 2880 to 3900, and those due to the activities of children and malicious ignition both increased sharply, although neither of these became a major cause of lorry fires. The four major causes of lorry fires previously quoted. (i.e. wire and cable, engine, mechanical heat and ashes and soot) did not increase faster than the overall rate.

For motor cycles and scooters not only did the overall frequency decrease but there was also a decrease in the proportion of engine fires from 66 per cent in 1963 to 54 per cent in 1968. On the adverse side, arson was an increasing source of ignition, although not a major cause. The cause trends with vans appear to be similar to those in cars.

Although fires in tankers and buses show the most serious increase overall, it is difficult at this stage to pin point the reason for the increase. The materials ignited are related to the type of vehicle in Table 8a (for 1963) and Table 8b (for 1968).

Table 8a :Type of vehicle in relation to the material ignited first, 1963

Materials ignited first	TOTAL	Type of vehicle						
		Cars	Lorries	Vans, etc	Motor cycles motor scooters	Coaches omnibuses	Tankers	Other
TOTAL	10716	4048	2880	1320	1760	256	132	320
Petrol,lighter fuel	3048	1044	88	412	1488	-	4	12
Insulation-confined to or material to which fire first spread unknown	2876	1520	576	404	112	112	36	116
Upholstery	436	308	52	60	8	8	-	-
Rubber, tyres	340	20	276	8	4	12	12	8
Paper,packaging,wrapping	644	100	424	48	32	8	-	32
Diesel oil,fuel oil	156	-	100	4	0	28	24	-
Textiles	148	96	32	8	4	-	4	4
Lagging	40	24	-	12	-	4	-	-
Floor covering	76	48	4	20	-	4	-	-
Structure and fittings	152	24	72	32	-	12	-	12
Agricultural and Forestry produce	52	-	36	12	-	-	-	4
Gases	36	-	-	16	-	-	-	20
Carbonaceous minerals and dericatives(solid)	28	-	20	-	-	-	4	4
Oils and liquids not elsewhere specified	380	80	212	24	-	32	16	16
Other (specified)	832	324	288	104	8	20	32	56
Unspecified waste	524	16	476	24	-	-	-	8
Unknown	948	444	224	132	104	16	-	28

Table 8b:Type of vehicle in relation to the material ignited first,1968

Material ignited first	TOTAL	Type of vehicle						
		Cars	Lorries	Vans etc	Motor cycles motor scooters	Coaches omnibuses	Tankers	Other
TOTAL	15188	6892	3900	2040	1348	416	264	328
Petrol,lighter fuel	4112	2300	88	608	1020	36	16	44
Insulation-confined to or material to which fire first spread unknown	4020	2312	708	608	96	144	36	116
Upholstery	592	388	68	116	4	4	-	12
Rubber,tyres	372	24	296	16	-	16	20	-
Paper,packaging, wrapping	360	36	256	44	8	-	4	12
Diesel oil,fuel oil	352	4	220	44	-	48	32	4
Textiles	328	108	132	56	8	4	8	12
Lagging	240	156	28	32	-	4	16	4
Floor covering	136	116	4	16	-	-	-	-
Structure and fittings	88	16	36	4	-	12	-	20
Agricultural and forestry produce	72	4	52	8	-	-	4	4
Gases	52	8	16	12	-	-	-	16
Carbonaceous minerals and derivatives(solid)	48	-	48	-	-	-	-	-
Oils and liquids not elsewhere specified	716	152	320	76	16	72	68	12
Other (specified)	944	264	484	72	8	40	32	44
Unspecified waste	828	60	708	36	8	4	-	12
Unknown	1928	944	436	292	180	32	28	16

From Table 8b it can be seen that in two-thirds of the car fires petrol or insulation was ignited. In the case of motor cycles, nearly 83 per cent of fires resulted from the ignition of petrol or insulation; for vans the percentage was about 60. With commercial and public service vehicles ignition of oils and liquids was quite frequent, and over a third of the time in buses involved insulation. About one-quarter of tanker fires resulted from the ignition of oils and liquids other than fuel oil and petrol. In buses and tankers these incidents increased sharply between 1963 and 1968. Incidents involving diesel oil and fuel oil increased in buses and tankers at about the same rate as the overall increase in vehicle fires.

EXTENT OF FIRES

The extent of fire is related to the type of vehicle in Table 9 and to the source of ignition in Table 10.

Table 9:Type of vehicle in relation to extent of fire, 1968

Type of vehicle	TOTAL	Confined to vehicle	Not confined to vehicle
TOTAL	15188	14932	256
Cars	6892	6800	92
Lorries	3900	3856	44
Vans,shooting brakes,landrovers	2040	2004	36
Motor cycles,motor scooters	1348	1300	48
Coaches,omnibuses	416	396	20
Tankers	264	256	8
Other	328	320	8

Table 10:Source of ignition in relation to the extent of fire, 1968

Source of ignition of fire	TOTAL	Confined to vehicle	Not confined to vehicle
TOTAL	15188	14932	256
ELECTRICAL			
Wire and cable	4752	4736	16
Other	112	112	-
OIL(including petrol)			
Engine	4264	4224	40
Other	64	64	-
Mechanical heat or spraks	1044	1040	4
Smoking materials	732	708	24
Crash or collision	644	596	48
Ashes and soot	528	528	-
Malicious ignition	452	420	32
Children with fire	436	408	28
Matches,taper,naked light	92	88	4
Spontaneous combustion	68	68	-
Rubbish burning	64	64	-
OTHER KNOWN CAUSES	316	312	4
UNKNOWN	1620	1564	56

Tables 9 and 10 show that only 1.7 per cent of vehicle fires spread beyond the vehicle of origin, comparing very favourably with the 7.7 per cent of all outdoor fires that spread beyond the hazard of origin[1]. Tanker, bus and motor cycle fires are shown to be the most likely to spread. It is not surprising that crash fires are more likely to spread than other fires. Malicious ignition fires are known to have a high chance of spreading in buildings[7] and fires due to this cause in road vehicles are shown to be more likely to spread than those from other causes apart from crashes.

METHOD OF EXTINCTION OF FIRES

A significant factor related to the size of fires in road vehicles is the proportion tackled before the brigade arrives. Nearly 27 per cent of road vehicle fires are extinguished before the arrival of the fire brigade compared with 19.5 per cent of all outdoor fires. The methods of extinction used are shown in Table 11 and the success of fire firefighting before the arrival of the fire brigade is related to type of vehicle in Table 12.

Table 11: Method of extinction of fires in road vehicles, 1968

Method of extinction	TOTAL	Extinguished before arrival of public fire brigade	Extinguished by public fire brigade
TOTAL	15188	4088	11100
Small means:			
Extinguishers	2948	1432	1516
Removal, disconnection etc.	872	448	424
Water from buckets, immersion	636	596	40
Smothering	340	320	20
Allowed to burn out	308	296	12
Sand, earth etc	184	180	4
Beating	128	124	4
Water from stirrup or hand pumps	40	-	40
Other small non-chemical means	560	544	16
Combination of above	72	72	-
Water from garden hose	64	48	16
Hose reel jet using original supply in tank	7636	24	7612
Hose reel jet using more water than that in tank	164	-	164
Jets from pumps and hydrants	1220	4	1216
Other	16	-	16

Table 12:Fire fighting activity in relation to the type of vehicle, 1968

Type of vehicle	TOTAL	Fire fighting activity		
		Tackled before arrival of public fire brigade		Not tackled before arrival of fire brigade
		Successfully	Unsuccessfully	
TOTAL	15188	4088	2904	8196
Cars	6892	2252	1204	3436
Lorries	3900	648	856	2396
Vans, shooting brakes landrovers	2040	576	332	1132
Motor cycles, motor scooters	1348	376	216	756
Coaches, omnibuses	416	116	132	168
Tankers	264	56	88	120
Other	328	64	76	188

It is likely that fires in cars, vans and motor cycles will be discovered fairly promptly and this will have some bearing on the size of the fire. There is no legal requirement for the provision of extinguishers in private cars, or goods vehicles but there is in public service vehicles. There were, as Table 11 shows, 1432 fires successfully tackled with extinguishers before the brigade arrived. Of these, 712 were cars, 244 lorries, 112 motor cycles, 240 vans, 40 tankers, 64 coaches and omnibuses and 20 others. Slightly under one half of the vehicle fires fought with extinguishers before the arrival of the brigade were dealt with successfully. They were less likely to be successful in the larger vehicles, possibly because of delay in discovery of fires in these types of vehicle, e.g. a driver cannot see his back wheels from his cab and may not smell burning because of the length of the vehicle and his possible distance from the seat of the fire.

From Table 12 it can be seen that about half of the fires in cars were tackled before the brigade arrived and of these 65 per cent were successfully extinguished. In buses, as many as 60 per cent were tackled before the arrival of the brigade but the chance of a successful extinction amongst those tackled was only 47 per cent. Only just over 38 per cent of lorry fires were tackled before the arrival of the fire brigade and only 43 per cent of those were successfully put out.

Some methods of extinction used before the arrival of the fire brigade were more successful than others, and there was variation in the chance of success according to the type of vehicle. In cars 3456 were tackled, 1384

with extinguishers, but only 712 (just over 50 per cent) were successfully extinguished. Methods such as 'removal' (including disconnection of batteries, etc.), smothering or buckets of water were more successful. Seventy seven per cent of the car fires tackled by 'removal' were successfully extinguished and about two-thirds of those where smothering or buckets were used did not need brigade assistance.

Of those fires in lorries that were tackled by 'removal', 47.5 per cent were put out. Only about one third of those in which extinguishers were used were extinguished. The same is true for fires in tankers tackled by extinguishers. The use of water from buckets appears to be the most successful type of first-aid fire fighting in motor-cycle incidents.

The percentages of fires in cars, lorries, motor cycles and coaches and omnibuses extinguished before the arrival of the fire brigade in 1963 and 1968 are shown in Table 13.

Table 13: Fires in cars, lorries, motor cycles, coaches extinguished before the arrival of the fire brigade, 1963 and 1968

Type of vehicle		TOTAL	Extinguished before arrival of fire brigade	Extinguished by fire brigade	Percentage extinguished before arrival of fire brigade
Cars	1963	4048	1144	2904	28.3
	1968	6892	2252	4640	32.7
Lorries	1963	2880	496	2384	17.2
	1968	3900	648	3252	16.6
Motor cycles	1963	1760	608	1152	34.5
	1968	1348	376	972	27.9
Coaches and omnibuses	1963	256	56	200	21.9
	1968	416	116	300	27.9

It can be seen that in 1963, 28 per cent of the fires in cars were extinguished before the arrival of the fire brigade, by 1968 this figure had risen to 33 per cent. It is not possible to relate this rise to numbers of cars using extinguishers as no data are available.

It can also be seen that the proportion of lorry fires extinguished before the arrival of the fire brigade remained constant - for motor cycles it decreased from 34½ per cent in 1963 to 28 per cent in 1968. For coaches and omnibuses(which are legally bound to carry fire fighting equipment), the figure increased from 22 per cent in 1963 to 28 per cent in 1968, but because of the small numbers involved this increase does not represent a statistically significant improvement.

CASUALTIES, RESCUES AND ESCAPES

Since this survey is based on frequencies estimated from a 1 in 4 sample, information on casualties, rescues and escapes is somewhat limited. It is known that three coaches were evacuated in 1968[8]. Table 14 gives details of persons sustaining injuries due to fire or smoke in road vehicle fires; persons suffering crash injuries are not included.

Table:14 Casualties in relation to type of vehicle (fire and smoke injuries only)-1968

Type of vehicle	No.of fires involving casualties (estimated)	Casualties	
		Non-fatal (estimated)	Fatal
TOTAL	212	212	31
Cars	104	104	18
Lorries	36	36	4
Motor cycles,motor scooters	32	32	5
Vans,shooting brakes,landrovers	20	20	3
Tankers	8	8	1
Coaches,omnibuses	8	8	-
Other	4	4	-

If these figures are related to fire incidence, it can be shown that the casualty rate per thousand fires is higher for tankers than any other type of vehicle. The figures in the table were obtained from the 1 in 4 sample for non-fatal casualties and from all reports of fatal casualties. The estimated casualty rates are given in Table 15.

Table 15:Fire casualty rates per thousand fires according to type of vehicle

Type of vehicle	Fire casualties (fatal and non-fatal) per thousand fires
Overall rate	16.0
Tankers	34.1
Motor cycles,motor scooters	27.4
Coaches,omnibuses	19.2
Cars	17.7
Vans,shooting brakes,landrovers	11.3
Lorries	10.3
Others	12.2

It can be seen from the Table that motor cycle fires appear to present a greater life hazard than cars and that lorry fires are the least dangerous to life. This is not an unexpected conclusion when considering the relative sizes of vehicles. A person on a motor cycle which is on fire is far more likely to become involved than a passenger in a car or a lorry.

DISCUSSION AND CONCLUSIONS

The last detailed analysis of road vehicle fires was based on fires between 1948 and 1953[9] and it appears that, although road vehicle fires increased from 10716 in 1963 to 15188 in 1968, the situation is better than at the time of the earlier survey in relation to the number of licenses. Car fires occur at 0.64 per thousand licenses (lower than in 1948) and motor cycle fires at 1.02 per thousand licenses (about the same as in 1948). Fires in coaches and omnibuses increased from 2.86 per thousand licenses in 1963 to 5.27 per thousand licenses in 1968. This roughly coincides with the increased usage of rear engined vehicles although it is not clear from the statistics that these influenced the fire situation. A major part of the increase was in incidents involving the ignition of liquids other than petrol, diesel oil and fuel oil. It is difficult to give a true comparison for goods vehicles since it is not known how many vans are in fact goods vehicles. If half of the vans were goods vehicles, then the 1968 rate for goods vehicles would be 3.16 per thousand licenses.

During the period under review the annual frequency of car fires increased by 70 per cent. Incidents involving lorries increased by 35 per cent and motor cycle fires decreased by 23 per cent. The worst increases appear to be in the categories 'tankers' and 'coaches, omnibuses', which although a small proportion of the total, doubled in the period under review.

Car fires occur most frequently in the later part of the day, whereas lorry fires are most numerous in the hours 0900-1500. It is likely that these peaks correspond with the hours when the vehicles do a major proportion of their mileage. It appears that during the period under review car fires tended to become more frequent during the day and less during the late evening. This may be attributable to the effect of legislation on drinking introduced in 1967. Motor cycle fires appear to be most likely to occur after 1500, 67 per cent of the fires were during those hours.

The most important sources of ignition in road vehicle fires are wire and cable and engines. Other important known causes are mechanical heat and sparks (of which over two-thirds are in lorries), smoking materials, crash or collision, ashes and soot(mainly in lorries) and malicious ignition (this cause increased six-fold between 1963 and 1968.)

The materials most frequently ignited first are petrol, insulation, and upholstery. The number of fires involving diesel oil or fuel oil more than doubled between 1963 and 1968. Incidents in which liquids other than petrol, diesel or fuel oil was ignited also nearly doubled, rising from 380 in 1963 to 716 in 1968. It was the sharp rise in these incidents which largely accounted for the increase in tanker and bus fires. This rise could be partly due to an increase in the amount of flammable liquids transported by road.

Fires in road vehicles are less likely to spread than other outdoor fires. The types of vehicles with the greater chance of spread are tankers, buses and motor cycles. The causes most likely to give rise to fire spread are crash and malicious ignition.

About 27 per cent of road vehicle fires are extinguished before the arrival of the fire brigade; this compares favourably with other outdoor fires. It appears that car fires are more likely to be successfully put out if tackled before the arrival of the fire brigade than those in other vehicles. It appears that water from buckets or 'removal' is more likely to give a successful extinction than an extinguisher; about 50 per cent of those fires tackled by extinguishers are successfully put out, whereas the figure for 'removal' (or disconnection of battery, etc). is 77 per cent and for water from buckets 67 per cent. During the period under review the proportion of car fires successfully extinguished rose from 28 per cent to 33 per cent, for buses it rose from 22 per cent to 28 per cent (not statistically significant because of the small numbers involved) and for lorries it was constant at about 17 per cent. For motor cycles the proportion of successful extinctions dropped from 34½ per cent to 28 per cent.

There were three reported incidents of coaches being evacuated in the year. There were 31 fatal casualties (fire and smoke injuries) and an estimated 212 non fatal casualties. The fire casualty rates for tankers and motor cycles (34.1 and 27.4 per thousand fires respectively) are higher than the overall average rate of 16.0 fire casualties (fatal and non-fatal) per thousand vehicle fires.

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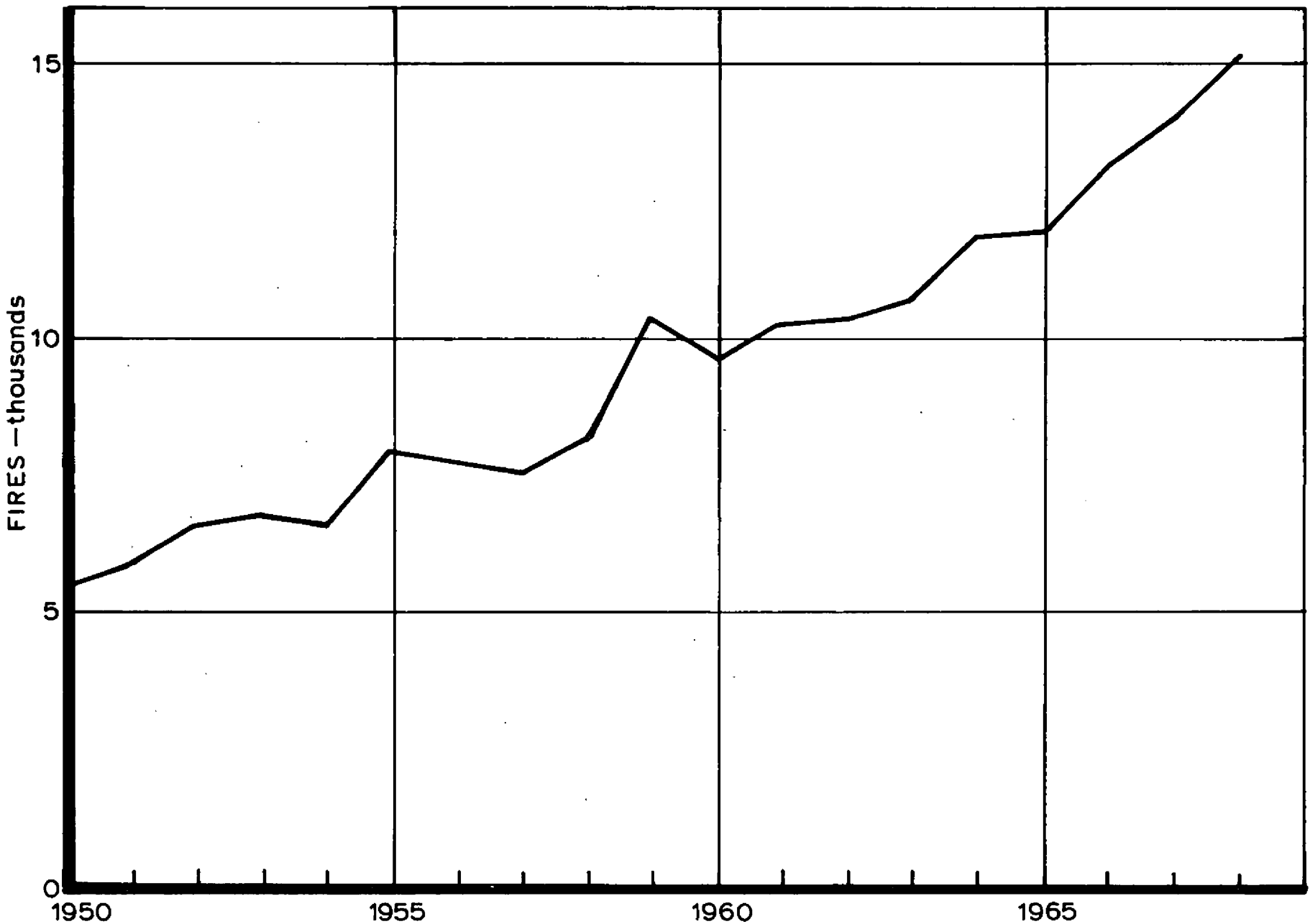

FIG.1 ANNUAL INCIDENCE OF FIRES IN ROAD VEHICLES

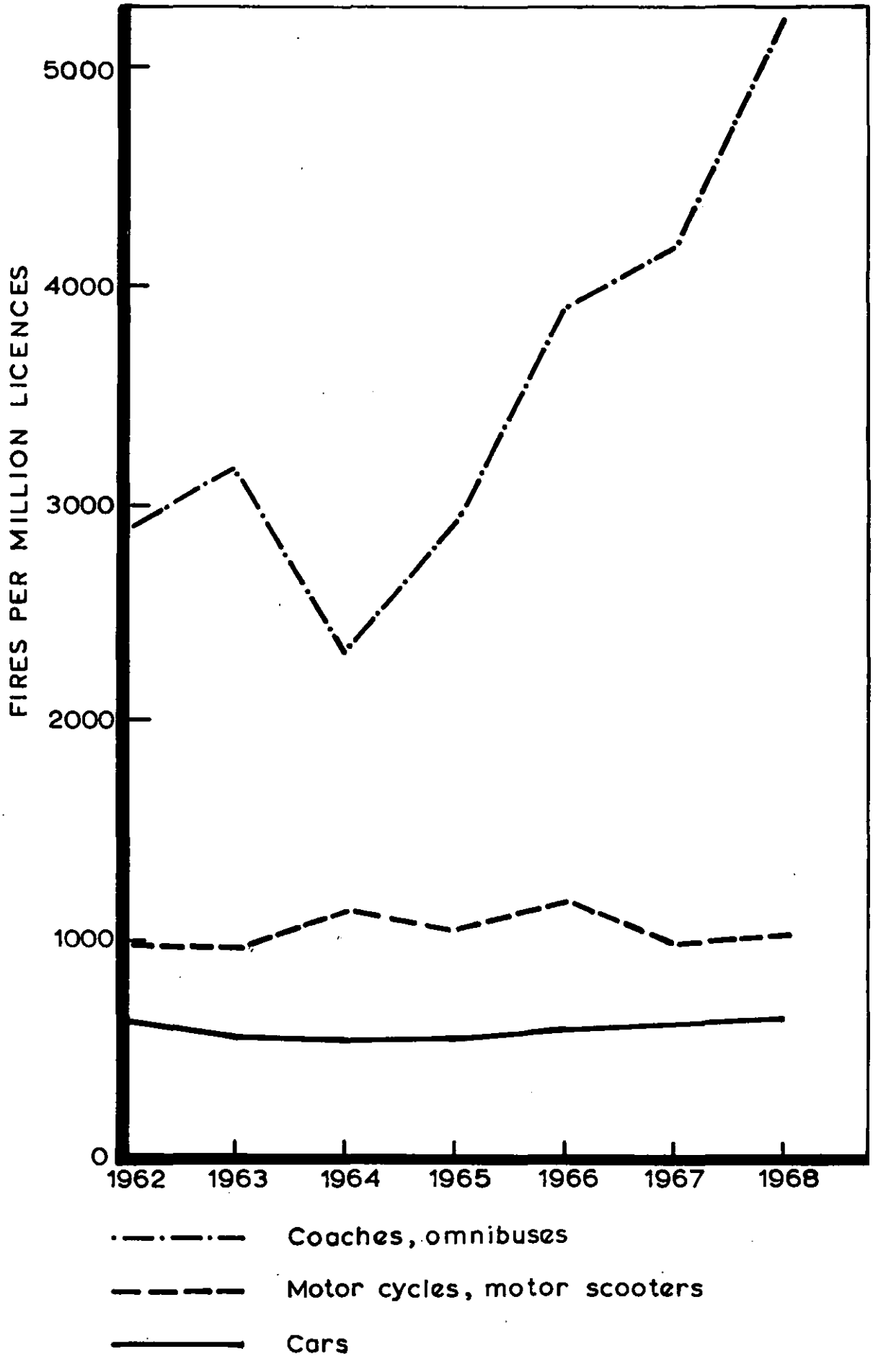

FIG. 2 FIRES PER MILLION LICENCES FOR CARS, MOTOR CYCLES AND BUSES, 1962-1968

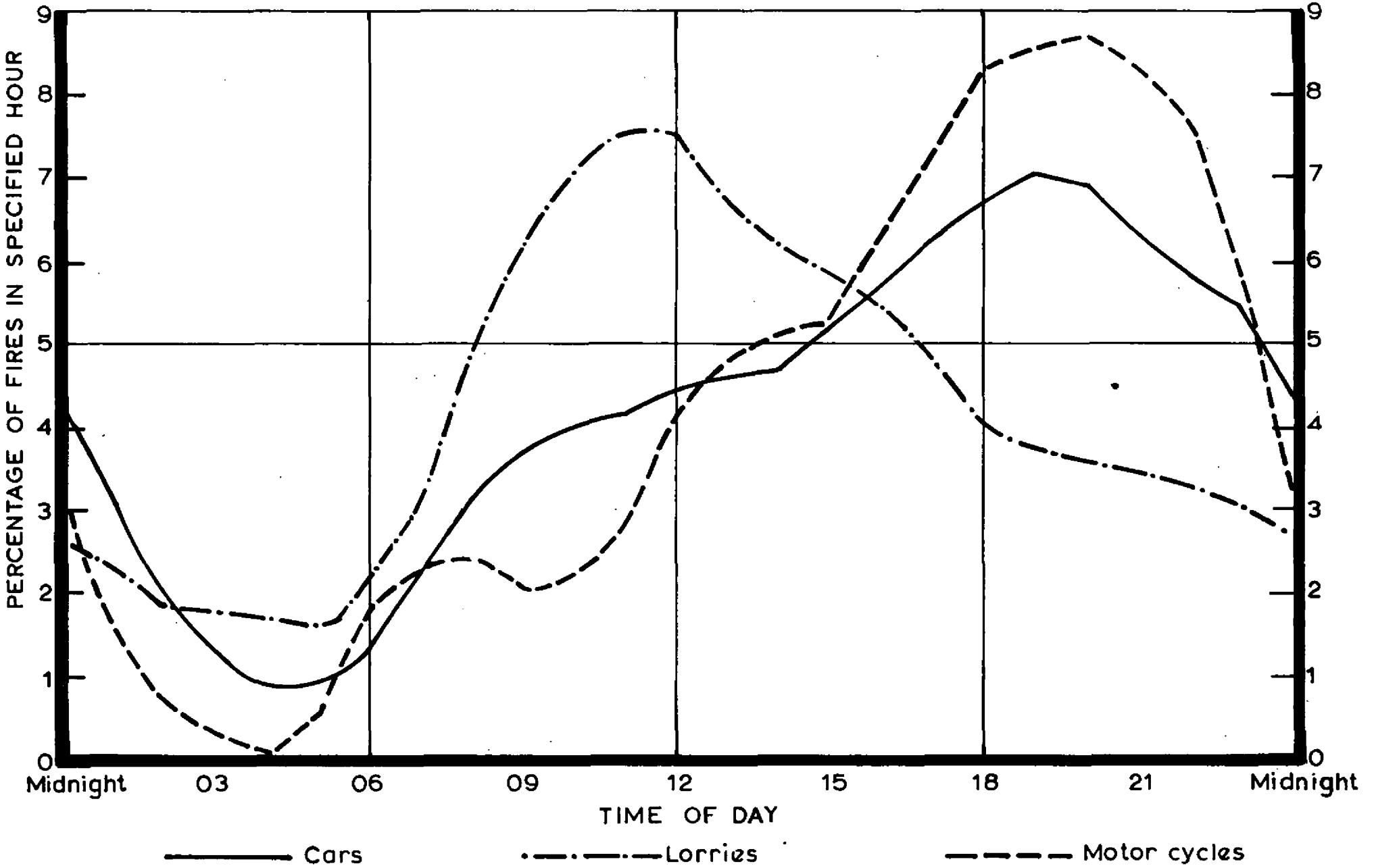

FIG.3 PROPORTIONS OF FIRES DURING EACH HOUR FOR CARS, LORRIES AND MOTOR CYCLES (on a "three hour moving average" basis)