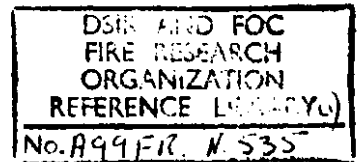


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DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

AND

FIRE OFFICES' COMMITTEE

JOINT FIRE RESEARCH ORGANIZATION

## FIRE RESEARCH NOTE

NO. 535

FIRE HAZARDS OF CARAVANS

by

J. E. GAUNT

This report has not been published and should be considered as confidential advance information. No reference should be made to it in any publication without the written consent of the Director of Fire Research.

January, 1964.

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### FIRE HAZARDS OF CARAVANS

Information additional to that in F.R. Note No. 535

60% of the fires in caravans in 1962 were caused by solid fuel stoves. No fatalities were involved but there were three non-fatal casualties.

The number of fires in caravans and the proportion due to solid fuel stoves in 1963 is not yet known but it is known that there were at least 11 fatalities in fires due to this cause and that all 11 deaths occurred during the first three months of the year when the weather conditions were extremely severe. It seems likely, therefore, that there was a corresponding increase in the number of fires due to solid fuel stoves at the beginning of 1963, caravans being particularly hazardous in extreme weather conditions.

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FIRE HAZARDS OF CARAVANS

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J. E. GAUNT

SUMMARY

From a study of fires in caravans in the United Kingdom in 1962, it appears that the chance of a fire occurring is at least 1.4 times that of a fire in an ordinary dwelling.

The main part of the report covers only caravans which were being used for residential purposes at the time of the fires. These amount to about 84% of the total of 842 caravan fires in 1962. About 60% of the fires were due to solid fuel space heating, mainly to heat from the stove pipe igniting some timber constructions of the caravan itself, in particular the airing cupboard which is situated directly round the pipe. About  $\frac{1}{3}$  of the caravan fires were due to heat from stove pipes and might well have been prevented had the insulation surrounding the stove pipe been better suited to extreme conditions.

Casualties were involved in 5.2% of the fires. The main known cause of non-fatal casualties appears to be escaping gas explosions and of fatal casualties - oil heaters and smoking in bed.

## FIRE HAZARDS OF CARAVANS

by

J. E. GAUNT

### INTRODUCTION

The following study is based on reports received from local fire brigades (all fires attended in 1962 and a 1 in 2 sample of those attended in 1961). The absolute number of caravan fires is therefore likely to be in excess of the number reported, but it must be remembered that the limited space within the caravan and the necessarily heavy concentration of highly combustible materials - wall panelling, cabinets, closets, shelves and furnishings - lend themselves to the rapid spread of fire from one article to another so that once a fire has started it is likely to spread and the brigade is likely to be called. A detailed analysis has been made of reports of fires in caravans in 1962 which were actually being lived in at the time of the fires and comparisons have been made, where possible, with fires occurring in ordinary dwellings in 1962 and with fires in caravans in 1961. Care has been taken to ensure that the caravans included in this survey were in fact caravans and not converted buses or similar forms of accommodation.

### FREQUENCY OF FIRES IN CARAVANS

Figure 1 shows that the number of fires in caravans is increasing at a rate averaging about 50 fires per year - from 156 in 1949 to 842 in 1962.

Figure 2 is a comparison of the numbers of fires per 1,000 caravans and per 1000 dwellings in use. Estimates of the total number of each in use throughout the period considered are given in Appendix III.

Figure 2 shows that the number of fires per 1,000 dwellings in use is increasing slowly at a steady rate of about 0.05 per year while the number of fires per 1,000 caravans in use has been decreasing more rapidly, at about 0.5 per year. The rate of decrease for caravans, therefore, has been about 10 times greater than the rate of increase for dwellings.

At the present time, however, (i.e. in 1962), figure 2 shows that the chance of a fire occurring in a caravan is 1.4 times the chance of a fire

occurring in a dwelling. Had fully residential caravans alone been considered the risk might have been even greater, but this comparison proved impossible owing to the lack of information on the type of vans involved in the fires.

As it is, 1.4 is likely to be an underestimate of the true value

because:-

(i) The rates are based on estimates of the total number of caravans in use given in Appendix III and these totals include caravans such as touring vans, vans used for static holiday purposes, etc., which are not in use for a great part of the year. How long each caravan is actually in use throughout the year is not known.

(ii) From 1959-1962 no account has been taken of the number of caravans going out of use.

(i) and (ii) may be compensated to some extent owing to the fact that the National Caravan Council figures do not include caravans manufactured by non-member manufacturers. This number is, however, likely to be small.

It seems reasonable to assume for the reasons given above that the chance of a fire occurring in a caravan is at least 1.4 times that of a fire occurring in a dwelling.

The following part of the survey deals only with caravans which were being used for residential purposes at the time of the fires. This involves 709 or 84.2% of the 842 caravan fires which occurred in 1962. These 709 fires include 14 in caravans used for static holiday purposes, 6 in circus or fairground caravans and 8 in gipsy caravans.

#### Age of Caravans Involved in Fires in 1962

Information regarding the date of construction of caravans involved in fires was available on reports received from some local fire brigades but not on reports from others; therefore, even though the "not stated and unknown" age group represents more than half the caravan fires, caravans falling into this group are thought to be "not stated" rather than "unknown",

and so the distribution of the dates of construction within this group is, in all probability, very similar to the distribution of the dates of construction actually recorded (and shown in Table I).

TABLE I  
Date of Construction

Date of Construction	No. of Caravans involved
Not stated and Unknown	483
£ 1950	12
1950	14
1951	3
1952	10
1953	4
1954	10
1955	18
1956	16
1957	15
1958	40
1959	28
1960	35
1961	12
1962	9
TOTAL	709

Figure 3 shows the numbers of fires per 1,000 caravans in use (estimated from the Board of Trade and National Caravan Council figures) against the date of construction. From the years 1955-62 there seems to be a definite age effect at the rate of about 0.2 fires per 1,000 caravans per year.

The lower estimated number of fires per 1,000 pre-1955 caravans in use may be explained by the fact that the figures for the numbers in use are not accurate for these years in so far as the older caravans are being discarded and/or are no longer used for residential purposes. It is assumed that

production less export figures give a reasonable indication of the number of caravans that are actually being used for residential purposes.

#### TIME AND MONTH OF OCCURRENCE

##### Month of occurrence

Reference to figure 4 shows that there were similar patterns in caravan fire incidence in 1961 and 1962 - in both cases about 70% of the fires occurring in the 6 month period October to March inclusive. Solid fuel space heating probably accounted for the majority of these fires - space heating being particularly important during the Winter months. A discussion of solid fuel space heating as a major cause of caravan fires is given in the next section.

##### Time of occurrence

Again, reference to figure 5 shows that there were similar patterns in the times of occurrence of caravan fires in 1961 and 1962, the majority of fires occurring in the 12 hour period 9 a.m.-9 p.m. The peak of the distribution is between 3 p.m. and 4 p.m. in both years.

#### CAUSES OF FIRES IN CARAVANS

Reference to Table 1A (Appendix I) shows that practically  $\frac{3}{4}$  of all caravan fires are due to the two single items - solid fuel space heating and completely unknown causes. Sixty per cent (to nearest 1%) of all fires are, in fact, attributed to the former and 15% to the latter. The remaining caravan fires are distributed more or less evenly among the other causes, listed in Table 1A. A comparison of the major causes of caravan fires in 1961 and 1962 is given in Table 2. Statistical tests show evidence of differences in the cause distribution for the two years at the 5% level of significance, the biggest contribution to the  $\chi^2$  Statistic being made by oil space heating. Fires due to oil heaters therefore dropped between 1961 and 1962 to a figure lower than that expected on the assumption that the two years formed one statistical population.

TABLE 2

Comparison of the Major Causes of Caravan  
Fires in 1961 and 1962

Cause	1961	1962	Total
Solid fuel space heating (including stove pipe)	362	422	784
Unknown	68	115	183
Oil space heating	40	33	73
Other	108	139	247
TOTAL	578	709	1,287

Fires due to solid fuel space heating in 1962

Of the fires due to solid fuel space heating, the majority are attributed to heat from the stove pipe. This in fact accounts for about  $\frac{1}{3}$  of all caravan fires.

It may be expected that, after a period of time, the timber surround to the stove pipe might become very dry and would readily ignite in the absence of adequate insulation. Why the stove pipes become exceptionally hot is not generally known, but on some reports additional relevant information was available.

There are records of overheating of flue pipes due to (i) excessive draught from a prevailing high wind, (ii) the smoke damper being left out (iii) the wrong type of fuel being burnt, (iv) the hot water tank having been allowed to boil dry and (v) an accumulation of soot in the flue.

There were also 2 cases in which flue pipes had become dislodged in a gale and had thus caused the stoves to overheat. On the majority of reports, however, there was criticism of the insulation of the stove pipes, i.e. of the lack of air space round the flue, and of the asbestos flue pipe and lining being in direct contact with the timber wall plate. In many instances the asbestos was said to be cracked. It appears, therefore, that had the insulation been designed to cater for more extreme conditions, the number of caravan fires would have been very much reduced.

About 8% of the solid fuel space heating fires were attributed to some fault



in the use of the material first ignited - clothes being aired too close to the stove, furniture placed too near, etc. The limited space within the caravan and the necessarily heavy concentration of furnishings etc., round the stove area probably accounts for most of these fires.

A further 7% of solid fuel space heating fires were due to defective structures. Whether these were manufacturer's faults could not be established as it was not known whether the stove and associated stove pipe was an amateur installation.

#### LPG cylinders in 1962

Of all caravan fires, 5.6% were due to LPG appliances and installations, the majority of these being cookers. Again additional information was provided by certain fire brigades. There were at least 10 cases of leaks from flexible pipes, 4 cases in which control taps were defective, 6 in which there were faulty valves and 3 in which unions were involved. There were also 4 cases recorded of flash backs from calor gas stoves and 1 in which the flame was extinguished by the draught made on closing the oven door but reignited on opening the door causing an explosion.

#### Electrical faults in 1962

Some 3.2% of caravan fires were due to electrical appliances and installations. Most of the electrical faults were due to faulty wiring producing a short circuit.

#### Source of energy in relation to the material first ignited in 1962

It can be seen from Table 2A (Appendix I) that more than 60% of the solid fuel space heating fires started in some structural timber of the caravan itself - the roof members, the timber surround of the flue pipe, the floor boards etc., and though they are not listed specifically in the Table, about half the fires due to heat from stove pipes involved airing cupboards. In such cases the material first ignited was the cupboard itself or the clothes and/or articles that had been placed inside.

TABLE 3

Source of energy in relation to damage in 1962

Source of Energy	Damage				Total
	Slight	Serious or partial destruction	Complete destruction	Not Stated	
Bonfire or camp fire	1	2	3	-	6
Naked light	2	5	-	-	7
Incandescent Lighting-LPG	3	-	-	1	4
Cooker - LPG	9	11	5	2	27
- other	-	3	-	1	4
Ring - LPG	1	1	-	2	4
Space heating - solid fuel	56	76	16	6	154
"    "    - stove pipe	98	147	18	5	268
"    "    - oil	11	17	3	2	33
"    "    - other	8	4	1	2	15
Wire and cable	1	6	-	1	8
Smoking materials	7	11	2	1	21
Matches, tapers, spills	8	8	2	3	21
Other - specified	8	10	2	2	22
Unknown	15	68	24	8	115
<b>TOTAL</b>	<b>228</b>	<b>369</b>	<b>76</b>	<b>36</b>	<b>709</b>

Although it is not always possible to make definite distinctions between the three damage groups shown in Table 3 it does not appear likely that there is any real difference between the damage caused by fires associated with different sources of energy. About  $\frac{1}{3}$  of the total falls into the "slight damage" group and about  $\frac{1}{9}$  into the "complete destruction" group. The exception to this general pattern occurs where the source of energy is unknown; considerably less than  $\frac{1}{3}$  of these fires are in the "slight damage" group and about twice as many as expected in the "complete destruction" group. This is not surprising as it is probable that the majority of fires falling into the unknown cause category are not discovered until the caravans are well alight. Among the fires caused by stove pipes there is a bias towards the "slight damage" group, but in the slow combustion stove fires the proportions are as expected.

## CASUALTIES

Of the 709 caravan fires in 1962 there were 37 (i.e. 5.2%) with casualties. These 37 fires involved 12 fatal and 40 non-fatal casualties.

In 1961 in an estimated\* 578 residential caravan fires, there were 2 fatal casualties and 30 non-fatal casualties.

The 1962 rate appears, therefore, to be slightly higher than that for 1961 - there being, on the average, 5.5 casualties per 100 fires in 1961 and 7.3 casualties per 100 fires in 1962. In 1962 more of the casualties were fatal.

### Casualties in relation to Source of Energy of Fires in 1962

From Table 4 it is seen that most of the fires involving casualties in 1962 were due either to explosions from escaping gas or to an unknown source. The former involved only non-fatal casualties (11 casualties in 9 fires); the latter involved 12 non-fatal and 4 fatal casualties in a total of 10 fires. Of the 12 fatal casualties 3 were in fires caused by smoking in bed, 5 in fires caused by paraffin heaters overturning and bursting into flame and the remaining 4 in fires of unknown cause. Thus, although the figures are small, the main known causes of fatal casualties do appear to be smoking in bed and paraffin heaters.

TABLE 4

Casualties in Relation to Source of Energy in 1962

CAUSE	No. of casualties involved		Carelessly discarded cigarette igniting - bedding	- other materials	Explosion from escaping gas	Paraffin heater or lamp overturned etc.	Heat from stove pipe igniting timber surround	Fat ignited while cooking	Electrical fault	Children playing with matches	Candle	Clothing blown onto slow combustion stove	Unknown	TOTAL
	Non-fatal	Fatal												
Total Incidents	3	2	3	2	9	5	2	2	1	1	1	1	10	37
	1	5	11	3	2	2	1	1	1	1	1	12	40	
		3	-	-	5	-	-	-	-	-	-	4	12	

\*Estimated from a 1 in 2 sample of reports

Fires started by smoking materials will tend to develop slowly but there can be considerable risk attached to the circumstances in which they occur (such as smoking in bed). Paraffin heater fires, however, are dangerous largely because of the rapidity of spread of fire. For example a fire caused by a paraffin heater occurred in the Darlington district in January, 1962 and involved 2 fatalities.

On the morning of the incident a mother had left her four children aged 4 years, 3 years, 1 year 10 months and 9 months, playing in the caravan whilst she went to collect some eggs from a farmhouse 100 yards away. The paraffin heater had been left 'ON' due to the inclement weather. Shortly after she arrived at the farmhouse the two elder children ran there crying that the caravan was on fire. The farmer and the mother of the children tried to gain entry to the caravan to rescue the two younger children, but their attempt was futile. Apparently the paraffin heater had been overturned by the children, and, being positioned near the centre of the caravan, had involved the whole of the contents within a matter of minutes.

Sex and age distribution of casualties and reasons for death in 1962

TABLE 5

Age Distribution of Casualties in 1962

Age in years	< 10	10-60	> 60	Unknown
Fatal Casualties	5	4	3	-
Non-fatal Casualties	9	23	6	2
Total Casualties	14	27	9	2

The age distribution of the casualties are given in Table 5.

Although the numbers involved are small, the ages of fatal casualties definitely suggest that the victims are most likely to be young children or

older people since the numbers at risk in the middle age group probably accounts for more than 70% of caravan inhabitants (ref.2). The risk for the two extreme-age groups does not appear to be so great in the case of non-fatal casualties as the majority of these incidents do fall into the middle age group.

Of the fatal casualties 9 were male and 3 female, and of the non-fatal casualties 25 were male and 15 female. The overall casualty rate, therefore, appears to be twice as high for males as for females. Quite the reverse picture was obtained in a survey of casualties in dwellings during 1956 (ref.5). Here the incidence rate of fatalities was about 3 times as high for females as for males. It was also higher for non-fatal casualties. The supposed reason for this higher incidence rate was that female apparel is lighter, more trailing and more flammable than that of men. In caravans it is possible that women dress more like men and are therefore not exposed to additional fire danger because of their clothing; other relevant factors may be differences in the age distributions and the absence from caravans of the open fire place.

Of the fires involving fatal casualties, 1 involved 2 men who were believed to have been asleep at the time of the fire and were poisoned by Carbon Monoxide fumes and burning.

On the remaining 7 occasions the victims were believed to have been trapped in the fires.

#### Casualties in Caravan Fires in relation to Casualties in Dwellings in 1962

Of the 16,255 fires in dwellings in a 1 in 2 sample of reports of fires in the United Kingdom in 1962, there were 1,085 which involved 253 fatal and 1,092 non-fatal casualties. This compares with the 709 fires in caravans, 37 of which involved 12 fatal and 40 non-fatal casualties. Statistical tests show no significant difference between the proportions of fires involving casualties in the two occupancies, but that the number of casualties in these fires is relatively higher in the caravans. This is particularly noticeable in the case of fatal casualties as can be seen in Table 6.

TABLE 6

Casualty Rates\* in Dwellings and Caravans in 1962

	Fatal Casualty rate	Non-fatal Casualty rate	Total Casualty rate
Dwellings	23.3	100.6	124.0
Caravans	32.4	108.1	140.5

\*Casualty rate is number of casualties per 100 casualty fires.

A comparison of the causes of fires involving casualties in dwellings and caravans is shown in Table 7.

TABLE 7

Comparison of Causes of Fires Involving Casualties  
in Dwellings and Caravans  
in 1962

Source of Energy	% Fires	
	Caravans	Dwellings
Naked lights	0.0	0.6
Cookers and rings - LPG	18.9	0.2
- other	0.0	15.6
Space heating - solid fuel (including stove pipe)	8.1	25.2
- oil	13.5	11.7
- other	2.7	7.8
Wire and cable	2.7	2.1
Smoking materials	13.5	10.1
Matches, tapers, spills	5.4	5.1
Other, specified	8.1	10.4
Unknown	27.0	11.2

The major causes of casualties are very different in the two cases, but it will be noticed that about  $\frac{1}{4}$  of the casualty fires in caravans are due to causes of unknown origin while  $\frac{1}{4}$  of those in dwellings are due to solid fuel space heating. LPG cookers and rings, oil heaters and smoking materials are next major causes of caravan casualties while cookers and rings other than

LPG, oil heaters and unknown sources are the next major causes of casualties in dwellings. It appears from the figures available that oil heater fires are more likely to cause fatalities in caravans than in dwellings. In dwellings in England and Wales, 1962, a 1 in 2 sample of reports contained 123 oil heater fires which involved 138 non-fatal and 21 fatal casualties, while in caravans 5 oil heater fires involved 3 non-fatal and 5 fatal casualties.

#### CONCLUSION

The chance of a fire occurring in a caravan appears to be at least 1.4 times that of a fire occurring in an ordinary dwelling.

Considering residential caravans only, practically  $\frac{3}{4}$  of the fires are caused by solid fuel space heating - in particular heat from the stove pipe which accounts for about  $\frac{1}{3}$  of the total - and unknown causes. Sixty per cent of the fires are in fact caused by solid fuel space heating and throughout the reports upon which this survey is based there is criticism of the insulation surrounding the stove pipe. In 1959 a British Standard Code of Practice made (ref.3) made recommendations on the installation of solid fuel stoves in caravans but whether this has been effective cannot, at this stage, be established. There is still room for concern about the stove pipes already installed in existing caravans.

Smoking in bed and oil heaters appear to be the chief known causes of fatalities.

#### References

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3. British Standard Code of Practice CP 340 (1959) General Series Installation of Solid Fuel Stoves in Caravans.
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5. WOOLFE, H. Deaths due to Fire in 1960, Joint Fire Research Organization F.R. Note No.500/1962.

TABLE IA

## Appendix I - Causes of Fires in Caravans in 1962

Source of Energy / Associated activity	Malicious Ignition	"Children playing with"	Careless disposal of hot substance or equipment	Waste heat	Incorrectly adjusted or overfilled	Overtumed, knocked over	Careless disposal or siting	Overheated	Flared up	Blow back, back fire	Sparks, brands	Fell out	Defective Structure	Defective appliance	Fault connected with material first ignited	Electrical fault	Other	Unknown	TOTAL
Bonfire and camp fire												5					1		6
Naked light						2	2								2			1	7
Incandescent lighting, LPG						1	1							1	1				4
Cooker, - LPG							1			4					19			3	27
" , - other											1				3				4
Ring - LPG							1							1	1		1		4
Space heating - solid fuel )				4			18	1		2	13	9	6		33		2	66	154
" - stove pipe )				239							2		23		3			1	268
" - oil					1	4	6	1	5						12		2	2	33
" - other						2	5								7		1		15
Wire and cable																8			8
Smoking materials			21																21
Matches, tapers, spills	1	10	7												3				21
Other, specified			5				1							1	4	5	4	2	22
Unknown	4														2		2	107	115
<b>TOTAL</b>	<b>5</b>	<b>10</b>	<b>33</b>	<b>243</b>	<b>1</b>	<b>9</b>	<b>35</b>	<b>2</b>	<b>5</b>	<b>6</b>	<b>16</b>	<b>14</b>	<b>29</b>	<b>3</b>	<b>90</b>	<b>13</b>	<b>13</b>	<b>182</b>	<b>709</b>



TABLE 2A

Source of Energy in Relation to Material First Ignited in 1962

Material Source of Energy	Clothing on person	Clothing not on person	Other made-up articles	Bedding	Curtains	Floor coverings	Other furniture and furnishings	Floor, skirting boards	Wall, partition lining	Ceiling, ceiling lining	Roof members, roof	Unspecified structure	Shelves and other internal fittings	Food-fat	Fuel	Paper, cardboard	Other	Unknown	TOTAL
Bonfire and camp fire				2								2					2		6
Naked light					3		2								1		1		7
Incandescent lighting - LPG				1						1					2				4
Cooker - LPG		1	2		2				2			2		10	6		2		27
- other						1								2	1				4
Ring - LPG									1						2			1	4
Space heating																			
- solid fuel)		14	6	8		7	8	9	9	1	1	36	29		5	4	9	8	154
- stove pipe)		53	22	1					10	9	58	52	48			8	1	6	268
- oil		1	1	3			5		1				1		17			4	33
- other			1	5		2	3								2		1	1	15
Wire and cable												3			1		4		8
Smoking materials		2	1	8			3						1			4		2	21
Matches, tapers, spills	1	2	1		4		3					2	2		3		1	2	21
Other - specified		1		3	1	1	3					2	2		4	1	2	2	22
Unknown	1				1		1					4			6		1	101	115
TOTAL	2	74	34	31	11	11	28	9	23	11	59	103	83	12	50	17	24	127	709

## APPENDIX II

### Special Survey on Caravan Fires by Worcester and County Fire Brigade 1962

Additional information received by Worcester and County Fire Brigade covers 14 caravan fires in all - 12 of these (i.e. 86 per cent) being due to the overheating of the slow combustion stove.

Of these solid fuel space heating fires, 3 were in caravans constructed in 1960 and 1961 - the remaining 9 were not given definite dates of construction but were stated to be certainly prior to 1960. In 1959 a British Standard Code of Practice was adopted in the installation of solid fuel stoves in caravans, so the 3 fires in caravans constructed in 1960 and 1961 were studied in more detail. Whether or not the standard was conformed to in these cases is not known.

In two of these three instances the caravan was constructed in 1961 and in both cases amateur alterations had been made to the stove area prior to the fire. In the first case alterations were made 2 weeks earlier but no information is given as to what these alterations were. The caravan was used as a permanent dwelling and was a permanent dwelling type of van; damage was severe when conducted heat from the stove pipe ignited the airing cupboard round it. The stove itself was burning coal at the time and is described as having been protected on 3 sides with asbestos cement sheeting extending through the airing cupboard. There was no air space between the asbestos and the timbers but there was a 3 in. air space round the stove. There was no floor ventilation and no protection to the single metal pipe up to the water jacket. In the airing cupboard the pipe was protected with a 9 in. diameter metal mesh but the facing timbers on the false front and the airing cupboard were not protected.

Damage was again severe to the other 1961 caravan, when heat from the stove pipe ignited the roof timbers. This caravan was also a permanent dwelling type of van and lived in as such. Coke was being burnt in the stove of which the fire bricks had been changed by the occupier as the original ones burnt out. The flue construction consisted of a metal flue pipe with an outer

asbestos pipe. The recess of the stove was lined with metal and there was a 4 in. clearway all round.

The third fire was in a 1960 permanent type van also used as a permanent dwelling. The stove, which was installed when bought, was used to burn coal. Damage was severe when heat from the stove pipe ignited the timber surround. The structural timber of this caravan was protected by asbestos cement sheeting around the stove which extended through the airing cupboard to roof level. The double flue pipe was also of asbestos.

APPENDIX III

Estimates of Numbers in Use

(i) Caravans in U.K.

Year	Est. total in use at end of year		Est. average number for year in use
1948	18,000	(a)	
1949	23,000	(a)	20,500
1950	33,000	(a)	28,000
1951	48,000	(a)	40,500
1952	60,000	(a)	54,000
1953	73,000	(a)	66,500
1954	88,000	(a)	80,500
1955	114,000	(a)	101,000
1956	124,000	(a)	119,000
1957	150,000	(a)	137,000
1958	180,000	(a)	165,000
1959	216,166	(b)	198,083
1960	259,318	(b)	237,742
1961	291,405	(b)	275,362
1962	324,044	(b)	307,725

(ii) Dwellings in G.B.

1948	13.1 million	(c)	1951 and 1961 figures were based on Census data
1954	14.5 million	(c)	
1960	16.0 million	(c)	
1962	16.7 million	(c)	

(a) Estimates by the National Caravan Council

(b) See (iii) below

(c) Estimates by the Ministry of Housing and Local Government

(iii) Because of the difficulty experienced in obtaining figures for the total number of caravans in use it was decided to use the National Caravan Council estimates until 1958 - their figure for that year being in agreement with Sir Arton Wilson's findings in the early part of 1959 (ref.1 ). Crude estimates for the following years were then made by simply adding figures for industry production less exports to the 1958 total, and taking no account of the number of caravans going out of use. In addition, since the estimates for the years 1949-1962 are estimates of the total numbers in use at the end of the years, differences between consecutive years were used to obtain estimates of the average total number in use within the year. This type of correction was not considered necessary in the case of dwellings where numbers of the order of  $10^6$  are involved.

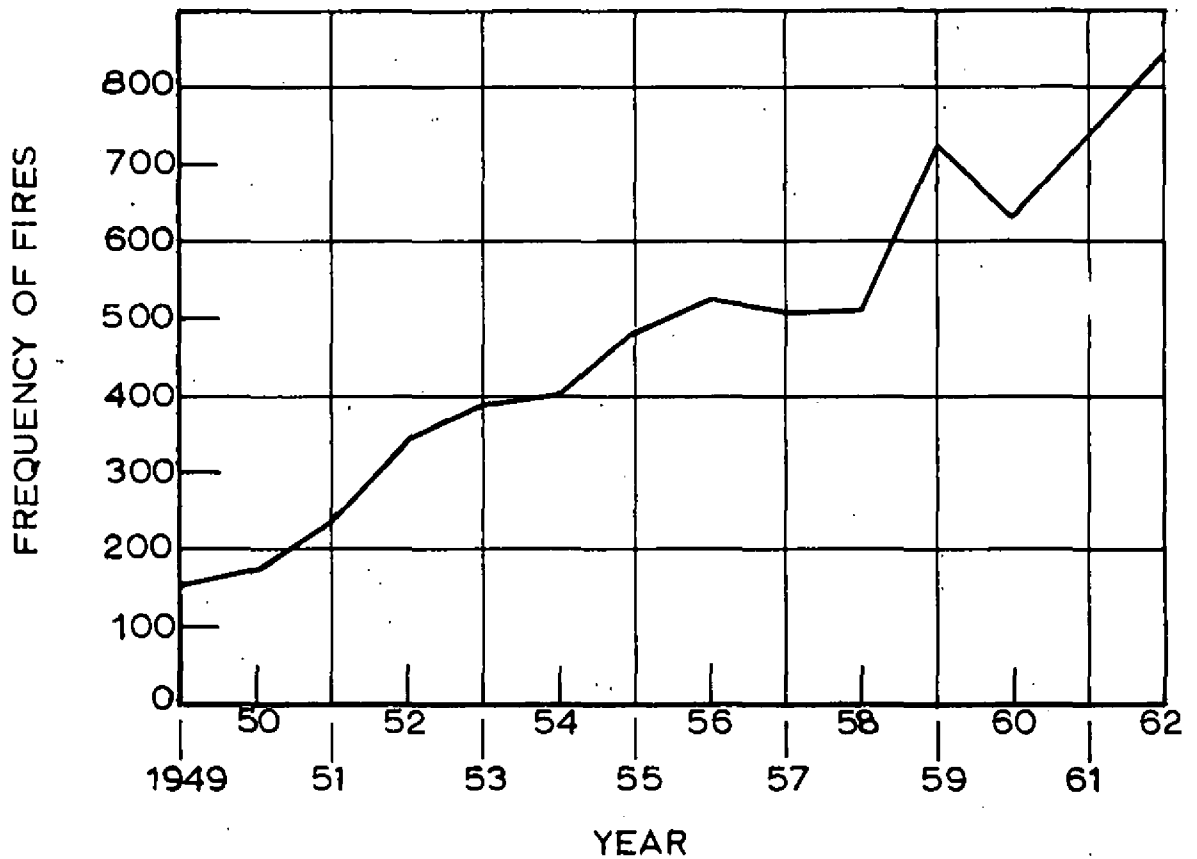
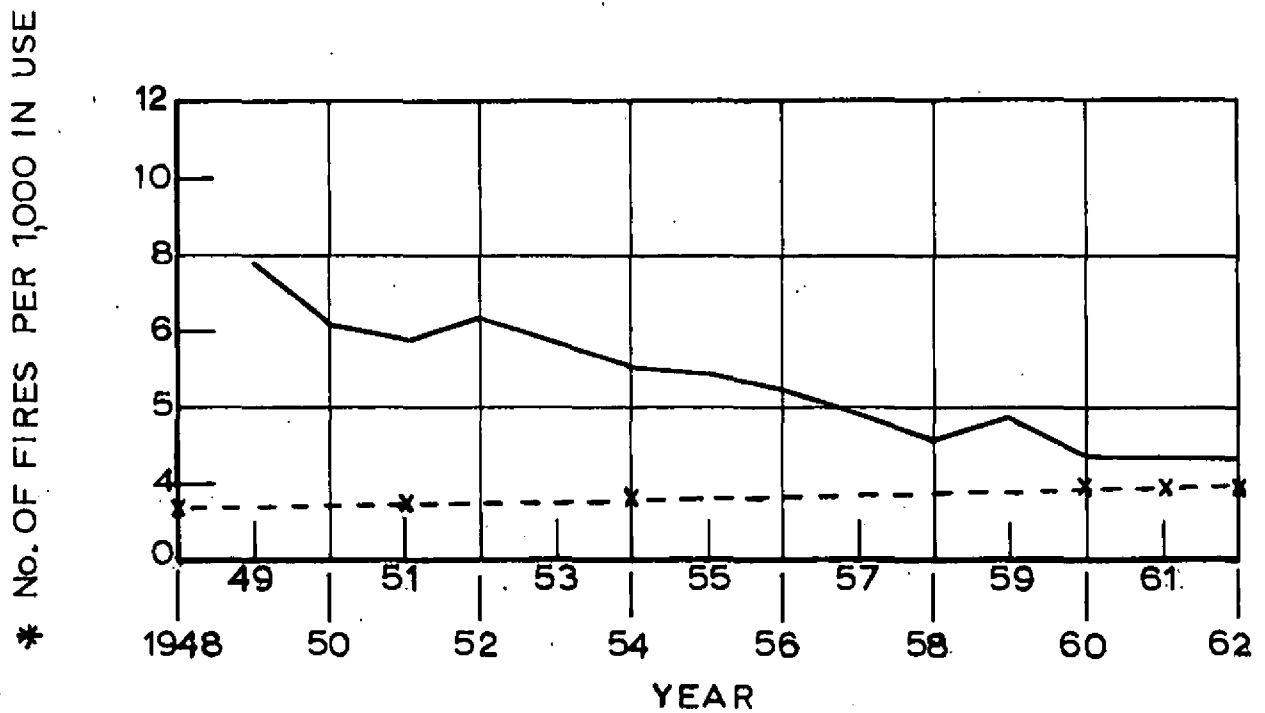


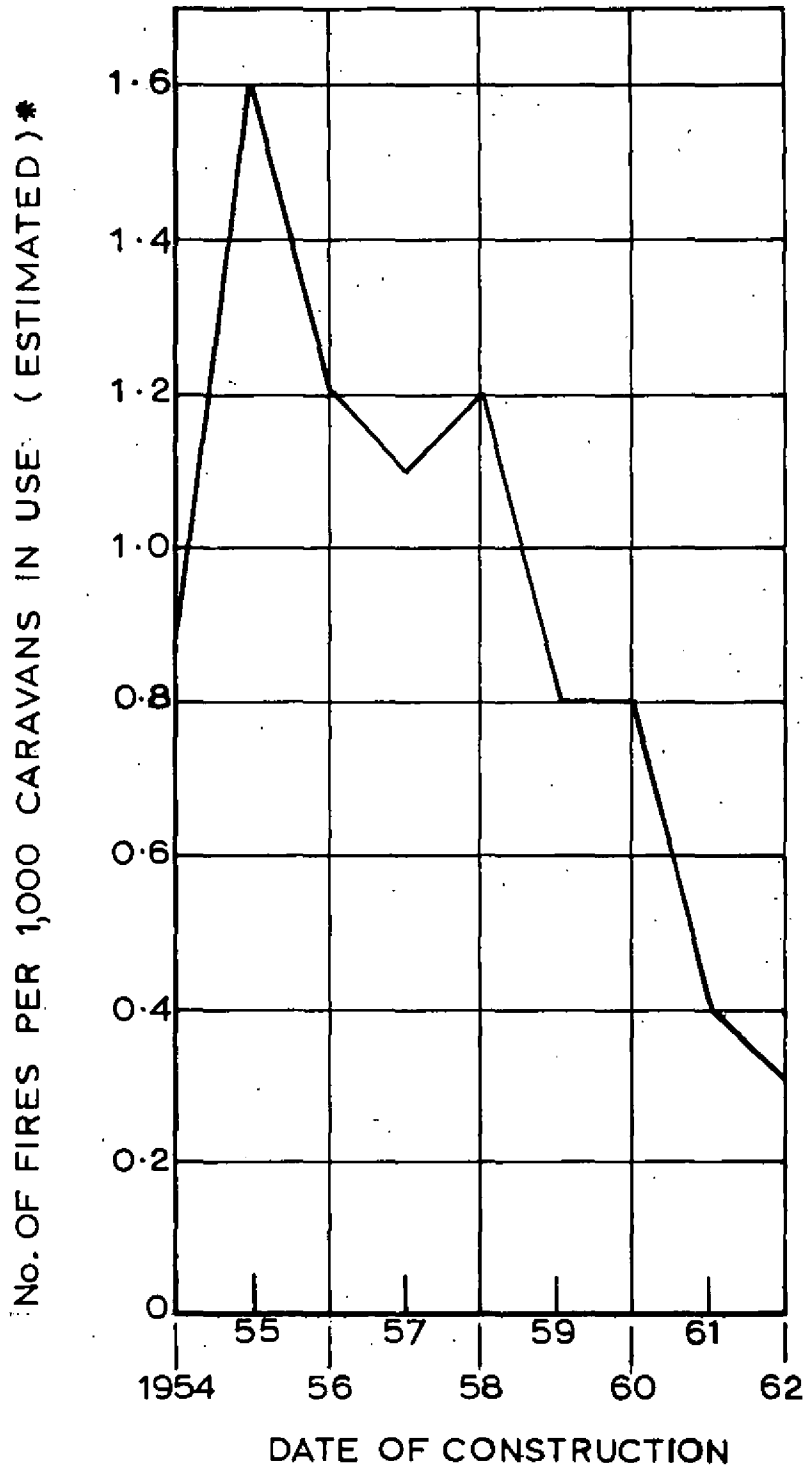
FIG.1. TOTAL NUMBER OF FIRES IN CARAVANS IN THE UNITED KINGDOM



\* See appendix III for estimates of numbers in use

———— Caravans  
 - - - - Dwellings

FIG.2. NUMBER OF FIRES PER 1,000 IN USE—CARAVANS AND DWELLINGS



\*Estimated from industry production less export figures (from Board of Trade and National Caravan Council estimates)

FIG.3. AGE EFFECT IN CARAVANS — FIRES 1962.

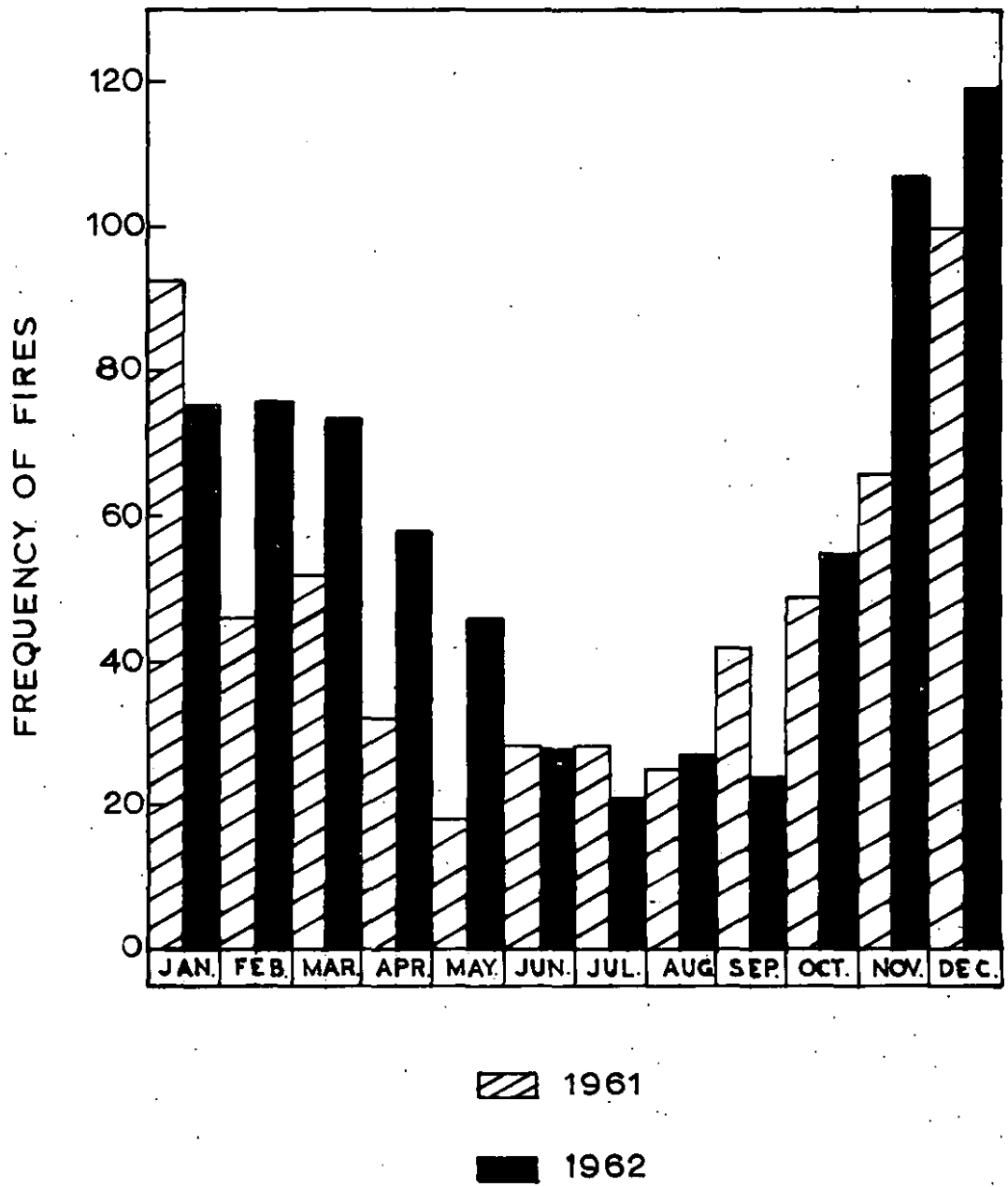


FIG.4. FIRES IN CARAVANS BY MONTH IN 1961 AND 1962



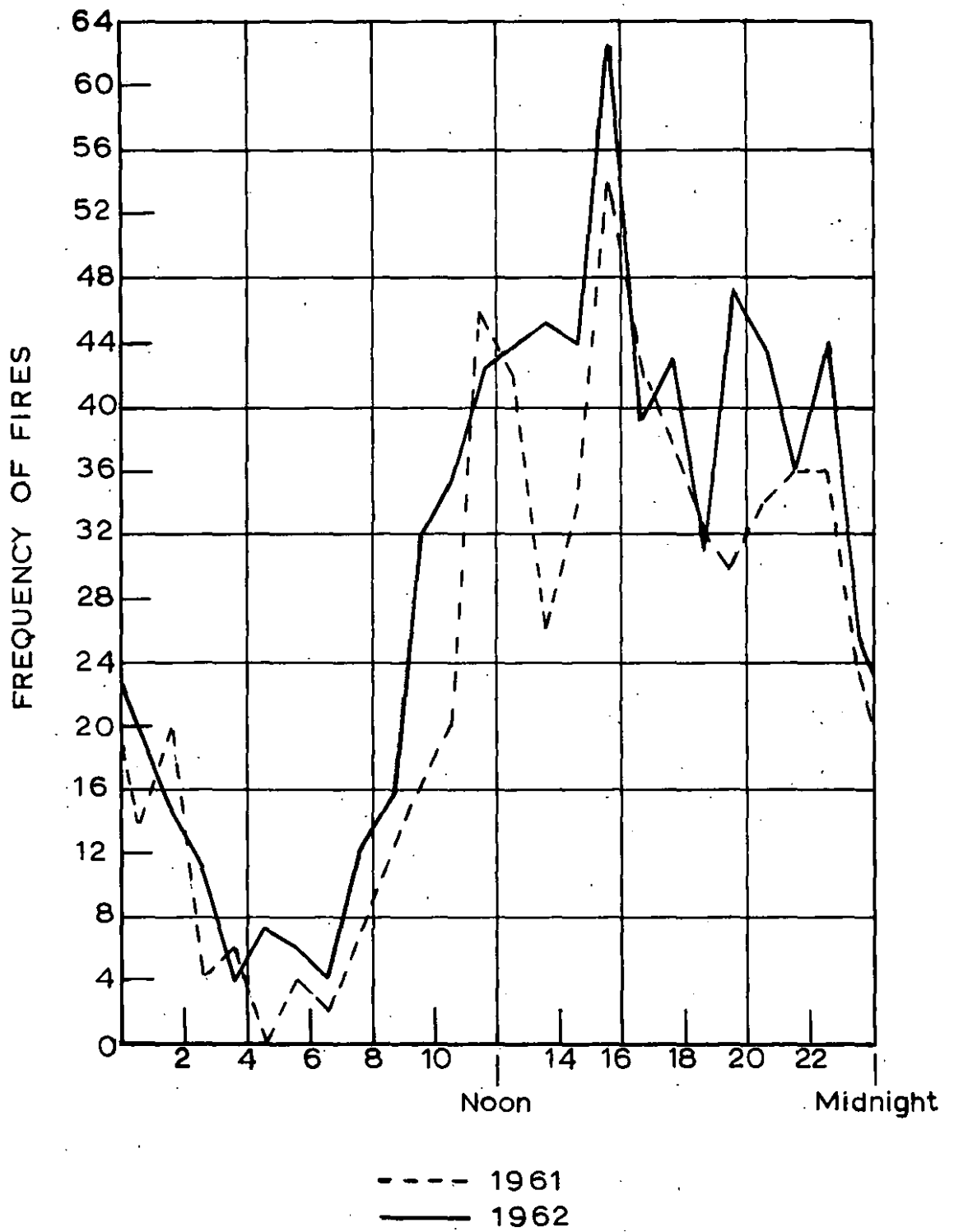


FIG.5. TIME OF DISCOVERY IN 1961 AND 1962