3 The market for the calibration and servicing of exhaust gas analysers

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The product

The EGA

3.1. The function of an EGA is to measure the composition of the exhaust gases produced by a petrol-engined vehicle. Although there are a number of models of EGA they all work on the same principle. A sample of the exhaust gases is collected by a probe inserted into the tailpiece of the vehicle's exhaust pipe. The sample is drawn by a pump through filters, which remove water droplets and particulate matter, and across an infra-red detector (the `gas bench') which measures the gas content. The measurements are translated into an electronic display on the front of the EGA and, on some models, may be printed out to give a permanent record.

3.2. The emissions from a vehicle include CO, CO_2 (carbon dioxide), HC and O_2 (oxygen). An EGA will measure the volume of these components present in the emission. The simplest machines will measure only two components-CO and HC. Others will measure three gases or four gases and the most sophisticated will also calculate lambda, a ratio indicating whether combustion in the engine is as complete as possible (lambda = 1) or whether the mixture of air and fuel entering the engine is too rich or too lean.

3.3. The gas bench is at the `heart' of an EGA. It measures the extent to which infra-red light of a given wavelength is absorbed by the gas mixture and this provides the basic data from which the EGA calculates the volume of a particular gas in the mixture. The gas bench can account for as much as 60 per cent of the production cost of an EGA. We understand that there are only three manufacturers in the world, none in the UK and the largest being Andros of the USA.

3.4. An EGA can be a stand-alone machine, performing only the gas analysis function, or it can form part of a more comprehensive engine diagnostic unit which a garage would use to diagnose faults and to tune and adjust various components. Prior to the introduction of the MOT emission test most EGAs in the UK were used for diagnostic purposes to assist the tuning of the engine rather than to measure the pollution it produced.

3.5. The exhaust emissions check was introduced to the MOT test on 1 November 1991 and involves using an EGA approved by the VI to measure the volume of CO and HC present in the emissions. To gain pattern approval an EGA model has to meet the requirements of the OIML R 99 standard (see paragraph 2.5). Approval to either Class II or the more accurate Class I is acceptable.

3.6. Pattern approval is obtained after testing against the OIML standard at a laboratory accredited by NAMAS for the purpose. There are currently two such laboratories, one operated by SIRA and one by GEC Avionics Ltd. Any suitably equipped organization can apply to become an accredited laboratory by fulfilling the criteria set down by NAMAS (see paragraph 7.32 for details and Appendix 3.1 for NAMAS's charges). Pattern approval can also be obtained from nationally accredited laboratories in other West European countries.

3.7. The VI recognized in 1991 that some MOT stations might have EGA models already installed that were not OIML approved but were capable of carrying out the new test. As a concession, the VI approved such existing equipment for use provided it was installed before 1 November 1991 if the model had some form of recognized approval from another European country (eg PTB approval in Germany). A complete list of approved EGAs is at Appendix 3.2.

3.8. The VI has indicated that all of the equipment currently approved will remain acceptable until cars now required to be fitted with catalytic converters first come within the scope of the MOT test in 1996. From 1 January 1996 a more stringent test for such cars must be introduced to meet EC requirements (see Appendix 2.1). EGAs will then need to meet a higher specification, which has yet to be determined. It is expected, however, that equipment will have to be of Class I standard and capable of measuring four gases plus lambda.

Calibration

3.9. It is a statutory requirement that each EGA used for MOT purposes should be calibrated periodically against a calibration gas of known composition. Normally calibration is required every three months and must be carried out by an engineer from a laboratory accredited by NAMAS for the purpose. In the case of OIML Class I models with an approved automatic gas calibration facility (known as a `self-gassing' facility) every alternate calibration can be carried out by the MOT station itself. Exceptions have been made in respect of Class I Bosch models, where the intermediate calibration can be dispensed with, and Class I Bear models, where calibration by a NAMAS-approved engineer is required only once a year provided monthly calibration checks are carried out by the MOT station.

3.10. As with pattern approval, any suitable organization can apply to become a NAMAS-accredited laboratory through which engineers may seek NAMAS approval to calibrate EGAs. NAMAS has accredited four laboratories to date. Three-Sun, Tecalemit and Hermann-are operated by suppliers of EGAs for their own staff. The other, SIRA, is independent. Most suppliers use SIRA for approval of engineers. Currently 253 engineers from 32 firms (listed in Appendix 3.3) are NAMAS-approved through SIRA and 60 through the other three laboratories (42 from Sun, 13 from Tecalemit and 5 from Hermann).

3.11. Approval of an engineer involves an assessment by the NAMAS-accredited laboratory. The engineer must also have a calibration manual for the EGA to be calibrated (see paragraphs 7.60 and 7.61). The successful applicant is recommended to NAMAS for approval to calibrate a particular model and to become an `authorized signatory' of calibration certificates on behalf of the laboratory. We were told that the level of skill required to become a calibration engineer is at about Ordinary National Certificate or Diploma (ONC/OND) level.

3.12. Calibration is required periodically so that the EGA continues to give readings within acceptable error limits since over time the readings tend to `drift' from the true composition of the gas mixture. The EGA must be calibrated to within 3 per cent of the actual values of both CO and HC in a calibration gas mixture of known composition (in a cylinder of gas certified by a NAMAS- accredited laboratory). After calibration a certificate is issued to the EGA user for three (or six) months from the date of the test and a white calibration label (the seal) is fixed to the EGA. Any EGA that fails the test is tagged with a red label and may not be used for MOT tests until it has been repaired and recalibrated to the required standard.

3.13. The calibration procedure for a particular model is set out in detail in the calibration manual drawn up by the accredited laboratory. To comply with the VI's requirements (see Appendix 2.2) the procedure includes the following tasks for the engineer:

- measure and record the ambient temperature and pressure (using instruments calibrated by a NAMAS-approved procedure);
- before carrying out any adjustments, use the EGA to take initial readings of the composition of the certified calibration gas and record the results;
- check the condition of the hoses, filters, electrical connections, etc;
- carry out a gas calibration (using the certified calibration gas) and adjust the EGA to bring it within the calibration limit (after making any necessary correction for ambient pressure);
- complete and affix calibration seals; and
- complete and issue a calibration certificate of a type approved for the purpose by NAMAS and the VI.

Servicing

3.14. The calibration procedure involves some routine servicing (eg filter replacement) but no maintenance or repair. In this chapter we use the term `servicing' to denote maintenance or repair going beyond this routine activity.

3.15. Servicing is not a statutory requirement but it is particularly important that EGAs used for MOT purposes are adequately maintained. Most MOT stations have only one EGA (see Appendix 3.4) and they have to suspend MOT testing, and suffer the consequential loss of income, for any period when their EGA is out of action.

3.16. If the calibration seal is broken during servicing (ie if the machine's casing has to be removed) then the EGA has to be recalibrated by an approved engineer. It is thus unlikely that repairs will be carried out by an organization that does not have engineers approved for carrying out calibrations.

Consumables

3.17. External filters and hoses need to be changed regularly, the frequency depending on the level of use of the EGA and any accidental damage. These parts can be replaced by the user without disturbing the calibration seal.

Demand

The user group

3.18. There were 17,749 MOT stations in March 1993 dealing with petrol engined vehicles other than motor cycles and therefore using an approved EGA.

3.19. We carried out a survey of some 800 MOT stations to obtain up-to-date information on their experience of calibration and service arrangements for EGAs (Appendix 3.4). The results indicated that garages offering MOT tests vary considerably in size from small independent outlets specializing in MOT tests to large motor dealers whose main business is the sale of new cars under franchise arrangements. The survey also indicated that over 75 per cent of outlets offering MOT tests are single site operators. Only 8 per cent of survey respondents said that they had more than one EGA.

3.20. Although the average number of MOT tests per station carried out by respondents in 1992 was 1,277 (some 25 per week) the majority carried out fewer than 1,000 tests.

Purchasing decisions

3.21. MOT stations are generally experienced purchasers and users of garage equipment. Some 80 per cent of franchised dealers and 60 per cent of independents in the survey used diagnostic equipment other than an EGA in their workshops.

3.22. We were told that awareness of products and their servicing arrangements was likely to be high, given local information networks, the trade press, and advice of trade associations. Some 9,000 MOT stations are members of the Retail Motor Industry Federation Limited (RMIF).

3.23. Although the fixed MOT test fee, currently £24, suggests that operators of MOT stations have a particular incentive to keep costs down and are likely to be discerning customers, most garages obtain income from servicing vehicles as well as from the test fee. Service may be purchased prior to the test to ensure success, or may be required prior to a retest. The DOT recently reported that some 40 per cent of cars and light goods vehicles fail the annual MOT test at their first attempt.

3.24. We asked MOT stations in the survey about the factors that influenced their choice of EGA. Price appears to be the most important with 73 per cent saying that they were influenced by this (44 per cent greatly). 63 per cent said that they were influenced by the service arrangements (34 per cent greatly) and 52 per cent by the calibration arrangements (24 per cent greatly). 69 per cent of respondents also said that their experience of calibration and servicing of a piece of equipment influenced their decision whether or not to purchase other equipment from the same manufacturer (45 per cent greatly).

Supply of EGAs

Main suppliers of EGAs

3.25. The main UK manufacturers are Sun, FKI Crypton Limited (FKI Crypton), V L Churchill Ltd (Churchill) and Richard Oliver Limited (Oliver).

3.26. Sun (a subsidiary of Sun Electric Corporation of the USA) has manufactured garage equipment, including EGAs and other electronic equipment, for many years. Its plant at King's Lynn produces EGAs for the whole of Europe and these are then sold through fellow subsidiaries in the other countries.

3.27. FKI Crypton has also manufactured garage equipment, including electronic diagnostic equipment, for many years at its plant in Bridgwater, Somerset.

3.28. Churchill is an established manufacturer of garage equipment at its Daventry plant but had not manufactured electronic diagnostic equipment until 1991 when it entered the EGA market with its Autogas 4 model. Previously it had imported electronic diagnostic equipment made by Allen in the USA.

3.29. Oliver has many years' experience as a manufacturer of gas analysis equipment used in research and development of all types of engines, including aircraft engines. It had not supplied the garage trade until it developed its Gas Check 2000 EGA to meet the demand by MOT stations in 1991. Since Oliver had no established distribution channel to the garage trade it reached agreement with the Garage Equipment Maintenance Co Ltd (GEMCO) for that company to act as sole distributor for the Gas Check 2000 and provider of calibration and servicing.

3.30. Other established suppliers of engine diagnostic equipment to the UK garage trade, such as Bear Automotive (UK) Ltd (Bear) and Robert Bosch Limited (Bosch), import from their overseas production plants.

3.31. In addition to Churchill and Oliver some 13 other suppliers entered the market for EGAs in 1991. They tended to be suppliers or distributors of other garage equipment but obtained their EGAs, usually on an exclusive basis, from manufacturers in the UK or overseas. Most of these manufacturers already had experience of selling stand-alone EGAs elsewhere in Europe and either developed new models for the UK market or modified existing ones. The largest importer of such models is H Young (Operations) Limited which, trading as Kamasa Tools (Kamasa), imports EGAs manufactured by Protech in Italy.

Installed base

3.32. We estimate that the total number of EGAs being used for MOT purposes at the end of 1992 was 19,400 (see Table 3.1). This exceeds the number of MOT stations because, according to our survey, some 8 per cent of MOT stations have more than one EGA and, in addition, some suppliers of servicing keep a number of machines in stock to loan out to those whose EGAs are being repaired.

3.33. A further 7,446 EGAs were purchased for uses other than the MOT test. Suppliers estimated that, while most were part of more comprehensive diagnostic equipment, sales of stand-alone EGAs had increased because garages wished to test for exhaust emissions as part of pre- or post-MOT servicing of vehicles. Thus of the total installed base of EGAs in 1992 only 72 per cent are used for MOT purposes.

3.34. Table 3.1 shows that some 75 per cent of the installed base used for MOT purposes at the end of 1992 consisted of models approved to the OIML standards (44 per cent Class I and 31 per cent Class II). The remaining 25 per cent were approved by the VI for use in the MOT test as being installed before November 1991.

TABLE 3.1 **Installed base by classification of EGA, 1992**

Classification	*Installed base 1992**
OIML Class I	8,622
OIML Class II	5,939
Other VI approved	4,839
Total MOT approved	19,400
Non-MOT total	7,446
Total number of EGAs	26,846

Source: MMC estimates from information provided by companies.

*Installed base at 31 December 1992.

Sales of EGAs

3.35. Over 80 per cent of EGAs that had been installed for MOT use by the end of 1992 were acquired in 1991 when the VI's requirements for exhaust emission testing became known (see Table 3.2). Most of this surge in demand was for stand-alone models. Sales declined markedly in 1992, once the VI's deadline for the introduction of EGAs had passed, to some 13 per cent of their 1991 level. Table 3.3 gives corresponding figures for the supply of all EGAs (ie including those not used for MOT purposes).

TABLE 3.2 **Supply of EGAs for MOT use in the UK,* 1989 to 1992**

	1989†	*1990†*	*1991*	*1992*
Installed base at year end (units)	1,208	2,451	17,149	19,400
EGA sales (units)	1,092	1,243	15,628	1,953
EGA sales (£m)	5.9	5.2	29.0	3.9

Source: MMC estimates from information provided by suppliers and others.

*Some companies had difficulty providing detailed figures for EGAs supplied solely for MOT purposes. EGAs may have been purchased by garages wishing to offer non-MOT work that requires accurate emission testing such as pre-MOT checks, engine maintenance, diagnostics and tuning.

†Figures for 1989 and 1990 relate to machines originally purchased for other purposes but subsequently used for MOT tests.

TABLE 3.3 **Supply of all EGAs in the UK, 1989 to 1992**

	1989	*1990*	*1991*	*1992*
Installed base at year end (units)	5,607	7,357	23,105	26,846
EGA sales (units)	3,636	2,684	17,167	3,050
EGA sales (£m)	11.3	11.0	34.4	8.2

Source: MMC estimates from information provided by suppliers.

3.36. In addition to the sales of EGAs, there is an after-market for their calibration and servicing and the supply of consumables such as external filters. We estimate from information provided by the larger suppliers that this after-market is worth about £8 million to £10 million a year.

Replacement sales of EGAs

3.37. The suppliers estimate that EGAs have an economic life of from five to ten years depending on the level of use. The high level of sales of new EGAs in 1991 means that a replacement market has yet to develop to any significant extent. Currently only EGAs satisfying the OIML Class I or II standard are approved for installation for MOT use so that users have less choice of EGA than in 1991 when other machines could be purchased provided they were installed before 1 November (see paragraph 3.39).

3.38. The pattern of replacement sales may be affected by the proposed tightening of the exhaust emission test in 1996 (see paragraph 3.8) which will probably require the use of EGAs certified to OIML Class I. The figures in Table 3.1 suggest that some 55 per cent of the current installed base of EGAs (comprising 30 per cent OIML Class II, and 25 per cent approved for installation prior to 1 November 1991) would have to be replaced to meet such a change. Furthermore some of the Class I machines will also need to be upgraded or replaced since not all of them measure four gases plus lambda.

Shares of individual suppliers

3.39. The VI circular to MOT stations lists 35 makes of EGAs that are approved for MOT use (Appendix 3.2). The most recent list we have obtained from SIRA suggests there are some 25 makes and 65 models of EGA in use in MOT stations. Currently, prospective purchasers of EGAs for MOT purposes have some 25 makes and 35 approved models (ie OIML Classes I and II) to choose from.

3.40. Table 3.4 shows the estimated market shares of the 11 suppliers that have a market share of 3 per cent or more. The four largest suppliers, Sun, FKI Crypton, Churchill and GEMCO, accounted for some 63 per cent of the installed base at the end of 1992.

TABLE 3.4 **Shares of installed base of EGAs for MOT use, December 1992**

Supplier	*Units*	*Share %*
Sun	4,615	24
FKI Crypton	3,177	16
Churchill (parent SPX)	2,699	14
Oliver	1,770	9
Kamasa	1,005	5
Tecalemit	920	5
Bear (parent SPX)	855	4
Bosch	756	4
Souriau	738	4
Sykes-Pickavant	578	3
Analize	500	3
Others	1,787	9
Total	19,400	100

Source: MMC estimate from data provided by companies.

3.41. The current suppliers of EGAs comprise those long-established in the UK market and new entrants attracted by the surge in demand in 1991. Table 3.5 shows the pattern of sales from 1989 to 1992 and the extent of market entry in 1991. Almost half the EGAs supplied for MOT use in 1991 were from new entrants. Apart from Churchill, which entered the market with an OIML Class I machine, most new entrants tended to concentrate on OIML Class II EGAs.

TABLE 3.5 **Shares of individual suppliers (MOT units sold), 1989 to 1992**

	*1989**		*1990**		*1991*		*1992*	
Supplier	*Units*	*%*	*Units*	*%*	*Units*	*%*	*Units*	*%*
Sun	344	32	339	27	3,582	24	350	18
FKI Crypton	136	12	355	29	2,845	19	487	26
Churchill (parent SPX)	-	-	50†	4	2,612	17	37	2
Oliver	-	-	-	-	1,600	11	170	9
Kamasa	-	-	-	-	825	5	180	10
Tecalemit	-	-	-	-	731	5	189	10
Bear (parent SPX)	79	7	66	5	572	4	138	7
Bosch	236	22	100	8	297	2	74	4
Souriau	202	18	104	8	394	3	38	2
Sykes-Pickavant	-	-	-	-	908	6	188	10
Analize	-	-	-	-	460	3	40	2
Others	95	9	229	18	802	5	62	3
Total	1,092	100	1,243	100	15,628	100	1,953	100

Source: MMC estimates from data provided by companies.

*Sales of EGAs in 1989 and 1990 were originally made for uses other than the MOT.
†This figure represents Allen EGAs imported from the USA.
Note: Percentages do not necessarily total to 100 because of rounding.

TABLE 3.6 **Shares of individual suppliers (value of MOT units sold), 1989 to 1992**

	*1989**		*1990**		*1991*		*1992*	
Supplier	*£m*	*%*	*£m*	*%*	*£m*	*%*	*£m*	*%*
Sun	3.0	51	2.5	49	10.2	35	1.4	35
FKI Crypton	1.1	19	0.7	15	3.8	13	0.7	19
Churchill (parent SPX)	-	-	0.5	9	5.4	19	0.1	3
Oliver	-	-	-	-	2.3	8	0.3	7
Kamasa†	-	-	-	-	-	-	-	-
Tecalemit	-	-	-	-	1.1	4	0.3	7
Bear (parent SPX)	0.6	11	0.7	13	2.0	7	0.4	10
Bosch	0.4	6	0.3	6	1.1	4	0.3	7
Souriau	0.5	9	0.3	6	0.7	2	0.1	3
Sykes-Pickavant	-	-	-	-	1.1	4	0.3	7
Analize	-	-	-	-	0.9	3	0.1	3
Others†	0.3	4	0.2	2	0.4	1	0.0	0
Total	5.9	100	5.2	100	29.0	100	3.9	100

Source: MMC estimates from data provided by companies.

*Sales of EGAs in 1989 and 1990 were originally made for uses other than the MOT.

†Kamasa did not supply figures for value of sales.

Notes:

1. In many cases the specifications of equipment from particular suppliers will have changed over the period and hence the unit values are not comparable.
2. Columns do not necessarily add to the total because of rounding.

3.42. There is some badging of equipment whereby the same model is sold under different brand names. Those supplied by Tecalemit are manufactured by Omitec, whose machines were also supplied under the Triton and Camic labels. Servitron (sold by Analize) and Tecnotest (sold by Sykes-Pickavant Ltd) are supplied by the same Italian manufacturer.

3.43. EGA suppliers are generally long-standing suppliers of other garage equipment (eg FKI Crypton, Sun and Tecalemit) and sales of EGAs generally represent less than 10 per cent of their annual turnover.

Change in pattern of supply

3.44. Prior to the MOT requirement EGAs had been supplied mainly as modules of more comprehensive engine diagnostic equipment. From 1991 all suppliers faced a new demand for stand-alone models. This led to fundamental changes on the supply side of the market. The existing EGA suppliers in the UK such as Sun, FKI Crypton, Bear and Bosch had suitable stand-alone products but most did not qualify for OIML status and gained VI approval only for sale prior to 1 November 1991 (eg FKI Crypton's 267 and 270 models). These companies have had to replace or upgrade their non-OIML models to remain in the market. Most of them chose to replace their existing models with OIML Class I EGAs (eg Sun MGA 1200, FKI Crypton 290, Bosch 831, Bear 42-400).

3.45. The main importers of EGAs were Kamasa, Bear, Bosch and Souriau (UK) Ltd (Souriau). Altogether some 27 per cent of the installed base in 1992 was imported (see Table 3.7).

TABLE 3.7 **Imports of EGAs for MOT use: share of installed base, December 1992**

Supplier	*Installed base units*	*Imported EGAs units*	*Imports' share of installed base* %*
Sun	4,615	440	2.3
FKI Crypton	3,177	0	0.0
Churchill (parent SPX)	2,699	147†	0.8
Oliver	1,770	0	0.0
Kamasa	1,005	1,005	5.2
Tecalemit	920	0	0.0
Bear (parent SPX)	855	855	4.4
Bosch	756	756	3.9
Souriau	738	738	3.8
Sykes-Pickavant	578	289	1.5
Analize	500	500	2.6
Others	1,787	413	2.1
Total	19,400	5,143	26.5

Source: MMC estimates from data provided by companies.

*Column does not sum to the total because of rounding.
†Allen EGAs imported from the USA.

Distribution of EGAs

Channels of distribution

3.46. Most EGA suppliers already supplied garage equipment to the motor trade before 1991 and had established distribution arrangements. In some cases these consist of a mixture of national and regional distributors and agents, normally operating on a non-exclusive basis.

3.47. There are, however, wide variations in the extent to which distributors are used. At one extreme, Sun, Bear and Hermann do not use distributors but sell directly to the end user. They say that this allows more flexibility in pricing and discounting and a closer relationship with customers. Bosch and Souriau also have some direct sales. At the other extreme, Sykes-Pickavant Ltd distributes EGAs through its 1,500 national and regional outlets for its general garage equipment.

3.48. As noted in paragraph 3.29, Oliver has an exclusive distribution agreement with GEMCO. Similarly Kamasa has an exclusive agreement with Lucas Service UK Ltd (Lucas) for the distribution, calibration and servicing of the Protech EGAs it imports.

Main customers

3.49. The main customer base is made up of individual MOT stations. There are relatively few large accounts (such as Halfords, Associated Tyre Services, BT and franchised car dealer groups) and these tend to buy from more than one supplier. The larger suppliers have some national accounts or special arrangements with such customers. Some 85 per cent of MOT stations in the survey had purchased their EGAs outright. Most of the remainder were leased.

Warranties

3.50. All EGAs are supplied under warranty, usually covering parts and labour for one year, although Sun extended the warranty for its MGA 1200 model to two years in 1992.

3.51. The warranties of Sun, FKI Crypton, Bear, Kamasa and Horiba impose two main conditions not generally applied by other manufacturers:

- any calibration and servicing required during the warranty period must be carried out by them or their authorized supplier; and

- authorized spare parts must be used.

3.52. An EGA under normal use requires frequent changes of the external filter. Most EGAs have two filters: a coarse filter, which is washable and reusable, to separate the water and larger particles, and a fine filter which needs to be replaced regularly. EGA manufacturers and suppliers do not produce filters. Filters are manufactured by four companies (Finite Inc, Headline Filters Ltd, Balston Inc, and Porous Media Inc) that operate world-wide. They manufacture filters for EGA manufacturers or other suppliers to specification. Users can obtain filters from their EGA supplier or from an independent supplier such as Prosol (see paragraphs 6.79 and 6.80). The exhaust probes also require replacement from time to time.

3.53. As noted in paragraph 3.51, the warranty conditions for some EGAs specify that only authorized spare parts may be used during the warranty period and this could affect users' freedom to obtain consumables from other sources. However, in our survey some 70 per cent of MOT stations said that they were not obliged under the terms of supply of the EGA to obtain spare parts from the EGA supplier. Moreover 44 per cent said they were aware that identical parts were available elsewhere.

Prices

3.54. EGAs approved for MOT use in the UK have been supplied only since mid-1991 so the evidence of price changes over time is limited. EGAs are typically offered at list prices from which discounts are available. The prices quoted by the main suppliers on their best-selling models in the years 1991 to 1993 are set out in Table 3.8. List prices are generally higher for OIML Class I models reflecting their higher quality (including longer calibration interval and suitability for more stringent tests should they be introduced). With a few exceptions list prices have remained constant over the three years.

TABLE 3.8 **EGA list prices, 1991 to 1993**

£

Supplier	*Model*	*1991*	*1992*	*1993*
OIML Class I				
Sun	MGA 1200	2,995	2,990	2,990
FKI Crypton	290	4,250	4,250	4,250
Churchill	Autogas 4	-	2,640	2,640
Bosch	831	5,500	4,400	5,300
Sykes-Pickavant	T488	-	4,950	4,950
OIML Class II				
FKI Crypton	282	2,280	2,150	2,150
Oliver/Gemco	Gascheck 2000	2,100	2,100	2,100
Kamasa/Lucas	PR2000	2,495	2,495	2,495
Tecalemit	TD2044	-	2,350	2,350
Sykes-Pickavant	T481	-	3,950	3,950
Analize	Servitron 173	1,790	1,790	1,790

Source: MMC from data supplied by companies.

3.55. Discounts offered by suppliers are typically 30 per cent or more for distributors and very large direct accounts and 10 to 15 per cent for smaller customers.

Competition for sales of EGAs

3.56. Most sales for MOT use took place in 1991, with some 40 per cent in the fourth quarter according to our survey. There was keen competition between suppliers hoping to take advantage of the once-and-for-all surge in demand from MOT stations. Models of EGA that were approved by the VI if purchased prior to 1 November 1991 would have had no market once the deadline had passed.

3.57. Competition was based mainly on price, although availability, quality and after-sales service were also important. Substantial discounting took place as the November 1991 deadline approached so that OIML Class II EGAs were reduced to £1,200 to £1,500 and OIML Class I to £1,700 to £3,000. The prices of the EGAs supplied by Bear and Bosch remained well above this level.

3.58. The RMIF, which has some 9,000 members amongst MOT station operators, negotiated a special discount with Churchill for members that purchased the Autogas 4 model. The RMIF told us that this special discount led to a downward pressure on prices generally since an MOT station which was an RMIF member could purchase an OIML Class I EGA for little more than a Class II model.

Calibration

3.59. Prior to the introduction of the MOT requirements, all the EGA suppliers made arrangements to ensure that a calibration service was available for operators of their EGAs throughout Great Britain. Engineers were recruited, trained and NAMAS-approved to provide such a service. The procedure for gaining approval is set out in paragraphs 3.10 and 3.11.

Calibration arrangements

3.60. Table 3.9 provides a summary of the main suppliers and their calibration arrangements. These arrangements have changed little since their introduction. They take two main forms.

3.61. The *larger suppliers* (Sun, FKI Crypton, Churchill, GEMCO and Kamasa) tend to use their own engineers to carry out calibrations or to appoint a sole agent for the purpose. Thus FKI Crypton has appointed its sister company FKI Transervice Limited (FKI Transervice) and Kamasa has appointed Lucas. The *smaller suppliers* achieve national coverage by appointing a number of agents operating in broadly contiguous geographical areas. These agents are often single engineers (eg Almac in Scotland and Automotive Test Equipment (ATE)) and may act as calibrator for more than one supplier (see Table 3.9). Typically the supplier provides training, and arranges for the engineer's NAMAS approval for the calibration of its machine. This involves the release of the calibration manual to the agent. The supplier and agent may or may not have a formal contract.

3.62. While GEMCO's own engineers carry out most calibrations it has helped two distributor/agents (ATE and Everquip) to achieve NAMAS approval to calibrate the Oliver EGA that it sells.

3.63. Calibration by engineers independent of the EGA suppliers is rare though Kaltek UK and its associates (Kaltek) calibrate a number of Sun EGAs. Kaltek has been able to obtain NAMAS approval without the release of Sun's calibration manual since the founder of Kaltek, an ex-employee of Sun, had sufficient knowledge to be able to write his own manual. Servtec engineers approved to calibrate Omitec EGAs are also able to calibrate the identical EGAs supplied under the Tecalemit `badge' without separate approval.

TABLE 3.9 **EGA suppliers* and their calibration arrangements**

Supply of EGAs			*Suppliers of calibration services*		
Supplier	*Manufactured by*	*Distributor*	*Main supplier*	*Agent*	*Independent*
Sun	Sun	Sun	Sun		Kaltek UK CES† Celtech UK† Celtech South†
FKI Crypton	FKI Crypton	FKI Crypton (direct and indirect)‡	FKI Transervice		
Churchill	Churchill Allen (USA)	Churchill (direct and indirect)	Churchill		
GEMCO	Oliver	GEMCO (direct and indirect)	GEMCO	ATE Everquip	
Kamasa	Protech (Italy)	Lucas Brown Bros (Dana)	Lucas		
Tecalemit	Omitec	Tecalemit	Tecalemit		Servtec Almac ATE
Bear	Bear (USA)	Bear (direct)	Bear		
Bosch	Bosch (Ger)	Bosch		TAE Hermann CES Gen Diag Celtech UK ADE Angstrom	
Souriau	Souriau (France)	Souriau (direct and indirect)	Souriau§	ATE QTech Gabriel Corry	
Sykes-Pickavant	Sykes-Pickavant Tecnotest (Italy) Sensors Inc (USA) Motortest (Ger)	Sykes-Pickavant (indirect)	Sykes-Pickavant	Multiquip	
Analize	Servitron (Italy)	Analize (direct and indirect)	Analize	Transtec Euro-Tec Electrons¶ Gott¶ TES¶ Hilliers¶ Lambda¶	
Servtec	Omitec	Servtec	Servtec	ATE Almac	

Source: MMC from information provided by companies.

*Suppliers whose EGAs account for more than 1 per cent of the supply of calibration services.
†Associates of Kaltek UK.
‡Indirect sales are those made via other national or regional distributors or agents.
§Tecalemit took over the calibration and servicing operation of Souriau in July 1993.
¶NAMAS approval in the name of Analize.

Shares of calibration services

3.64. The number of EGAs calibrated by each calibration company (including any agents) is given in Table 3.10. The numbers broadly reflect the installed base of each EGA supplier. This is to be expected given that most calibrations are carried out by the EGA supplier or his agent. Only some 3 per cent of EGAs are calibrated by an independent calibrator.

TABLE 3.10 **Supply of calibration/servicing,* 1992**

Company name	*EGAs calibrated number*	*Share %†*
Sun	4,215	23
FKI Transervice	3,341	18
Churchill (parent SPX)	2,699	15
GEMCO	1,476	8
Lucas	1,005	5
Bear (parent SPX)	855	5
Bosch	756	4
Souriau	738	4
Tecalemit	702	4
Kaltek	606	3
Sykes-Pickavant	579	3
Analize	500	3
Servtec	200	1
Others	834	5
Total	18,506	100

Source: MMC from data supplied by companies.

*Servicing of an EGA is generally carried out by the same company that calibrates it (see paragraph 3.76).
†Percentages do not total to 100 because of rounding.

Calibration contract arrangements

3.65. MOT stations are required by the VI to have a calibration contract. Our survey found that some 40 per cent of contracts were for calibration only, while 60 per cent were for calibration and servicing combined. The payment methods are shown in Table 3.11.

TABLE 3.11 **Calibration contract arrangements**

	%
Annual contract: payment in advance	46
Annual contract: quarterly payments	20
Payment per calibration	32
Free calibration under warranty or offer	2

Source: MMC survey of MOT stations.

Calibration prices

3.66. The prices charged per calibration in 1992 were typically between £60 and £80 and varied little between suppliers (see Table 3.12). Some discounts are available on an individual basis for large customers with a chain of MOT stations, or for customers that have other items of garage equipment calibrated or serviced at the same time or that are located close to an engineer. Discounts have also been available in the form of free calibrations. Over half of the respondents to the survey of MOT stations had received at least one free calibration.

TABLE 3.12 **Prices for calibration services, 1992**

Company	*Annual contract £/cal*	*Single calibration £/cal*	*Discount available Yes/no*
Sun	60	65	No
FKI Transervice	62.50	*	Yes
Churchill	65	*	No
GEMCO	55	65	Yes
Lucas	62.50	69	No
Bear	*	60	No
Bosch	†	†	No
Souriau	†	†	Yes
Tecalemit	*	67	Yes
Kaltek	50	55	Yes
Sykes-Pickavant	71.25	81	Yes
Analize	69	69	No

Source: MMC from information supplied by the companies.

*The service is not offered by the company.
†The information is not available to the MMC.

3.67. Our survey found that 90 per cent of users were satisfied with the calibration service they received both in terms of price and quality. Nearly 80 per cent of those questioned said that calibration charges had remained unchanged since the EGA was purchased. However, we were told that a few suppliers (eg GEMCO, Souriau and Tecalemit) had raised their prices in the last year.

Uniform prices

3.68. With few exceptions each supplier of calibration services charges its customers the same price irrespective of the location of the MOT station. This means that the charge for any particular MOT station is not directly related to the costs of supplying calibration at that station. Hence there is a cross-subsidy from customers in low-cost areas (eg densely-populated areas) to those in high-cost areas (eg lightly-populated or remote areas). This is shown by the analysis in paragraphs 4.21 and 4.22 of financial information provided by three companies.

3.69. The suppliers' explanations for their adoption of uniform pricing are similar. First, the system is simple to operate since it reduces administration costs and allows standardized promotion and marketing. Sun is typical when it claims that the cost of developing and administering a cost-based charging system would probably outweigh the benefits to any party of eliminating the cross-subsidy. Second, since MOT stations are limited by the VI in the price they can charge for the MOT test it is in some sense `fair' to charge each MOT station the same price for the calibration service.

3.70. Analysis of the costs of providing these services would be difficult because the service is new; start-up costs may have had a disproportionate effect; and some suppliers had established national service networks for other garage equipment so that costs may be shared. Furthermore there are unlikely to be substantial economies of scale in the provision of calibration services. While there are some overhead costs for a national operator (eg training facilities, administration and co-ordination centre) the service is mainly supplied locally.

Barriers to entry as a supplier of calibration services

3.71. The main barrier to entry is the EGA suppliers' refusals to allow third parties access to the calibration manual which is required to obtain NAMAS approval as a calibration engineer. A few suppliers have said that they would refuse to supply a calibration manual if asked (Sun, FKI Crypton, Churchill[1] and Kamasa). Analize and Bear claim that they have insufficient numbers of EGAs to warrant further calibrators. Others (GEMCO, Bosch, Tecalemit and Sykes-Pickavant) have said that they may be willing to supply manuals on a chargeable basis. There is a particular incentive for market entry where there is a large installed base of EGAs. Generally suppliers with the larger installed bases have received requests for manuals from potential third party calibrators.

3.72. A further barrier is present in the case of some EGA models, that is an electronic key or password programmed into the EGA which has to be known to the engineer. Sun has such a password for some of its models and in the case of Churchill's Autogas 4 a special cartridge (containing the calibration software) must be plugged into the EGA. FKI Crypton said that an engineer could write his own manual by carrying out `reverse engineering' on an EGA where no password or cartridge is required.

3.73. Fees required for laboratory accreditation, engineer approval and auditing may act as a further barrier to entry for those who would only operate on a small scale (see Appendix 3.1 and paragraph 7.64).

Servicing

3.74. As noted in paragraph 3.15, although there is no statutory requirement for servicing, it is extremely important to the MOT station to have access to an on-demand repair and maintenance service because of the necessity for a working EGA for the conduct of MOT tests. Most servicing is carried out on site and may involve the repair of a fault discovered at the time of calibration or a call-out of the engineer at other times because the machine has ceased to function properly. The alternative is for the MOT station to be provided with a replacement machine while its own EGA is returned to the supplier's factory for repair. Churchill alone among the major suppliers operates such a system.

3.75. During the warranty period (normally a year) the supplier of any servicing is likely to be the EGA supplier. With the exception of Sun's MGA 1200, warranty periods are now ended for most EGAs purchased in 1991 but as yet requirements for servicing have remained low because most EGAs are in the early years of their life.

3.76. The supplier of servicing of an EGA is in almost all cases the same as the supplier of calibration services. This is because of the requirement that when the seals fitted at the time of calibration are broken-as is likely if the instrument is repaired-then the EGA has to be recalibrated. It is uneconomic for calibration and servicing to be supplied by different suppliers so that in practice any supplier of servicing must also be able to calibrate the EGA. In our survey of MOT stations, 95 per cent of respondents said that the company that supplied their calibration service also maintained the EGA(s). Thus the relative market shares of servicing are likely to be the same as those for calibration (see Table 3.10).

Service arrangements

3.77. Service contracts are voluntary and in our survey 55 per cent of MOT stations said that they had an annual service contract while 41 per cent had no service contract, preferring to pay on a call-out basis. (The other 4 per cent includes some with shorter contracts and some machines still under warranty.) Most annual contracts are for combined calibration and servicing. Sun is unusual in offering a choice of service only, calibration only, and combined contracts.

[1]But see paragraphs 8.86 and 8.87 for Churchill's current position.

3.78. Some 90 per cent of those surveyed said that they were satisfied with the maintenance service they received.

Spare parts availability

3.79. Spare parts are available from EGA manufacturers. They have told us that they are willing to supply spare parts to any creditworthy third party. As most EGAs are relatively new and servicing is carried out mainly by the EGA supplier there has been little demand for spare parts from third parties so far.

Servicing of other types of garage equipment

3.80. The suppliers told us that their service arrangements for other types of electronic garage equipment are similar to those for the servicing of EGAs. The only difference is that, other than for EGAs and smoke meters, there is no statutory requirement to have an independent calibration of the equipment traceable to the national measurement standards.

3.81. Fewer independent engineers are able to offer servicing of sophisticated electronic equipment, in part because of the specialized knowledge required to deal with computer components and software and partly because spare parts are increasingly expensive to keep in stock. Moreover modern equipment tends to be more reliable and require less servicing than earlier models, so reducing the incentive for independent operators to enter the market.

3.82. Sun, FKI Transervice and Churchill said that although they were aware that some servicing of their equipment is carried out by third parties, they could not quantify it.

3.83. The evidence from our survey shows that some 70 per cent of MOT stations consider it usual to have equipment serviced by the equipment supplier. However, independent service engineers say that they service most types of equipment.

3.84. Suppliers refuse or are reluctant to supply independents with manuals for electronic equipment such as engine diagnostic equipment but service engineers that formerly worked for suppliers appear to be able to obtain manuals or operate without them (using their own knowledge acquired in previous employment or through reverse engineering). Some suppliers acknowledge the existence of independent servicers by making spare parts available. Sun, FKI Transervice and Churchill, for example, say that they sell spare parts to anyone who is creditworthy.

Market definition

3.85. Our inquiry concerns the calibration and servicing of EGAs rather than the supply of the EGAs themselves. We therefore have to identify the market forces acting on suppliers of the secondary products (ie calibration and servicing). The notion of the `relevant market' provides a framework which can help to identify and assess market forces.

3.86. In this case there are a number of competing brands of the primary product (ie EGAs) each of which generates an after-market for calibration and servicing. A test that can be applied in order to define the relevant market is to consider whether a hypothetical sole supplier of calibration/servicing for a model of EGA (which is the *de facto* case for most models) would have the power to raise prices for calibration/servicing above a competitive level. If the answer is yes, then the calibration/servicing markets for each brand of EGA are distinct from one another and from the EGA market. Thus there would be *multiple markets* each limited to the calibration/servicing of a particular brand of EGA.

3.87. If the answer is no, there are two possibilities. There may be a *single market* in which all brands compete for the sale of EGAs *and* their subsequent calibration/servicing. In this case the price of calibration/servicing is constrained by competition for the sale of the EGA since purchasers will base their decisions not only on the price and quality of the EGA but also on the price and quality of the calibration/servicing that is available for it.

3.88. Alternatively there may be *dual markets*: one in which all brands of EGA compete for the original sale of the EGA and a separate market in which all suppliers compete for the calibration and servicing of EGAs regardless of brand. In this case the price charged by the hypothetical sole supplier of calibration/servicing for a particular brand is constrained by the ability of other calibration/servicing suppliers to switch to the model in question.

3.89. Since we know that in practice the NAMAS approval requirements and other restrictions make it difficult for calibrators to switch from one model to another, the dual market does not seem to be an acceptable description of the market. We are therefore left with two possibilities: multiple markets, where calibration/servicing of each brand constitutes a separate market, and a single market, where competition takes place between brands at the time of the sale of the EGA.

3.90. A judgment between these two possible market structures would take account of the following factors:

- the degree of competition between suppliers of EGAs;
- the extent to which the quality/features of EGA models and their calibration/servicing arrangements vary;
- the level of consumers' knowledge of available EGA models and calibration/servicing arrangements;
- the extent to which the reputation of suppliers influences purchasing decisions of MOT stations for new EGAs and other garage equipment;
- the proportion of the `whole-life' costs of owning an EGA which are accounted for by calibration/servicing costs;
- the degree to which users are satisfied with their calibration/servicing arrangements; and
- the level of profits from calibration/servicing activities.

3.91. We assess these factors on the basis of the evidence before us in Chapter 9 and reach a conclusion about the relevant market in which to consider the behaviour of the suppliers of calibration and servicing.