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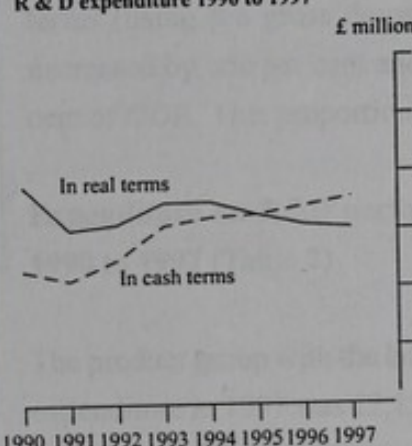
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First Release

Business Enterprise Research and Development 1997

In 1997, in cash terms and compared to 1996:

R & D expenditure 1990 to 1997



● Total expenditure increased by two per cent to £9.6bn

● Civil expenditure increased by two per cent to £8.2bn

● Defence expenditure increased by four per cent to £1.3bn.

In 1997, in real terms (1995 prices) and compared to 1996:

● Total expenditure decreased by one per cent to £9.0bn

● Civil expenditure decreased by one per cent to £7.8bn

● Defence expenditure increased by one per cent to £1.3bn.

**Expenditure performed by Business Enterprise in cash & real terms
1993 to 1997**

	<i>£million</i>				<i>percentage change</i>	
	1993	1994	1995	1996r	1997	96-97
In cash terms						
Civil	7,710	7,770	7,863	8,065	8,209	+2
Defence	1,359	1,433	1,391	1,297	1,343	+4
Total	9,069	9,204	9,254	9,362	9,553	+2
In real terms (1995 prices)						
Civil	8,048	7,996	7,863	7,824	7,762	-1
Defence	1,419	1,475	1,391	1,258	1,270	+1
Total	9,466	9,472	9,254	9,082	9,033	-1

r = revised

Prepared by the Government Statistical Service

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UK Business Enterprise R&D 1997

Expenditure on R&D performed in UK businesses: cash and real terms; 1990 to 1997 (Table 1)

In 1997, £9.6 billion was spent on R&D performed within UK businesses - a rise of 2 per cent at current prices compared to the 1996 total. In real terms (using the gross domestic product (GDP) deflator), expenditure decreased by one per cent and in 1997 represented approximately 1.2 per cent of GDP. This proportion has declined from 1.5 per cent in 1990.

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Expenditure on R&D performed in UK businesses: product groups, 1990 to 1997 (Table 2)

The product group with the largest R&D expenditure was pharmaceuticals: expenditure in 1997 was £2,151 million, 23 per cent of all spending. Other major product groups were motor vehicles and parts accounting for £963 million (10 per cent) and aerospace £893 million (9 per cent).

Sources of funds for R&D performed in UK businesses: 1990 to 1997 (Tables 3 and 6)

Funding of R&D from businesses' "own funds" was £6,103 million in 1997 (64 per cent of the total). Funding of R&D in UK businesses from abroad was £1,856 million in 1997 (19 per cent of the total). Funding of R&D in UK businesses by the UK Government was £927 million in 1997 (10 per cent of the total). This proportion has declined from 17 per cent in 1990.

Employment on R&D performed in UK businesses: 1990 to 1997 (Table 4)

The number of staff employed on R&D decreased by 3 per cent between 1996 and 1997. The number of scientists and engineers employed on R&D remained fairly static between 1990 and 1997, whilst employment in other categories fell.

Expenditure on R&D performed within UK businesses: civil and defence, by broad product group, 1992 to 1997 (Table 5)

In real terms, civil R&D fell by one per cent in 1997 and defence R&D increased by one per cent. In 1997 chemical products accounted for 34 per cent of the total civil R&D expenditure. The second largest civil R&D broad product group was services, accounting for 26 per cent of total civil R&D expenditure. Defence R&D continued to be dominated by aerospace and electrical machinery product groups.

Regional breakdown for Business Enterprise expenditure on R&D in the UK, 1997 (Table 7)

The regions with the largest R&D expenditure were the South East and Eastern. Both accounted for 24 per cent of the total expenditure.

Expenditures on R&D for the U.S. business and
defense for broad product group, 1952 to 1977 (Table 4)

In total terms, civil R&D fell by one per cent in 1977 and defense R&D
increased by one per cent. In 1977 chemical products accounted for 10 per
cent of the total civil R&D expenditure. The second largest civil R&D
product group was electronic, accounting for 20 per cent of total civil
R&D expenditure. Defense R&D continued to be dominated by aerospace
and chemical weapons product groups.

Regional breakdown for business R&D expenditures on R&D in
the U.S., 1967 (Table 7)

The regions with the largest R&D expenditures were the South, West, and
East. Each accounted for 24 per cent of the total expenditures.

BACKGROUND NOTES

The 1997 Survey

Sample design

1. Between 1985 and 1993 there were four-yearly large scale surveys. The 1993 survey was the last large scale survey and since then ONS has moved to an annual small scale, stand alone sample survey based on a continually updated register of R&D performers.
2. Approximately 1,600 forms were sent out to businesses believed to be performing R&D. These 1,600 companies were selected using a stratified sample.
3. The 364 largest R&D spenders in 1997 were all sampled. These accounted for 86 per cent of the 1997 total R&D expenditure figure. Smaller R&D performers and others believed to be performing R&D were selected using various sampling fractions. Industry group and company employment were the stratification variables.
4. Completed forms were returned by 1,501 businesses, representing a response rate of 94 per cent.
5. Estimates were made for the R&D activity of unsampled and non-responding businesses.

Revisions to past data

6. 1996 data have been revised where necessary to take into account misclassification and updated population information.
7. GDP and GDP deflators used have been revised in line with the new European System of Accounts (ESA95) definitions. (See ONS National Accounts First Release dated 24 September 1998).

More detailed information

8. A more detailed analysis of the results of this survey, and description of methods used, will be published in Business Monitor MA14, due for release in January 1999. It will be available from ONS Direct Tel: 01633 812078.

BACKGROUND NOTES

The 1997 Survey

Sample design

1. Between 1985 and 1993 there were two yearly large-scale surveys. The 1993 survey was the last large-scale survey and since then the survey has moved to an annual small-scale, fixed sample survey based on a continuously updated register of U.S. companies.

2. Approximately 1,000 firms were sent out to businesses believed to be performing R&D. These 1,000 companies were selected using a stratified sample.

3. The 1997 large R&D expenditure in 1997 were all sampled. These represented the 50 per cent of the 1997 total R&D expenditure. Firms with R&D expenditures and others believed to be performing R&D were selected using various sampling frames. Industry group and company size were the main factors used.

4. Completed forms were returned by 1,501 businesses, representing a response rate of 50 per cent.

5. Follow-up was made for the R&D activity of companies and non-responding businesses.

Revisions to past data

6. 1996 data have been revised where necessary to take into account reclassification and revised population information.

7. GNP and GDP deflators used have been revised to line with the new Economic Report of Commerce (GDP deflator) (see O.S. National Accounts and Statistics dated 22 September 1997).

Please detailed information

8. A more detailed sample of the results of the survey and description of methods used, will be published in Business Monitor M1.14 that is released in January 1998. It will be available from ONS Direct Line 01532 553015.

Definitions

Research and Experimental Development (R&D)

9. R&D and related concepts follow internationally agreed standards defined by the Organisation for Economic Co-operation and Development (OECD) and published in the Frascati manual. R&D is defined as "creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of the stock of knowledge to devise new applications".

R&D performed in UK businesses

10. This refers to R&D performed in the UK within business enterprises. It excludes R&D funded by UK businesses that is performed overseas or in other sectors of the UK economy (such as higher education; government departments, agencies, and non-departmental public bodies; local authorities; and private non-profit organisations). Public corporations are counted as business enterprises.

Product Groups

11. The broad product groups consist of aggregations of the detailed product groups. "Services" includes R&D consultancy and other services in support of manufacturing industry.

Employment

12. Employment is calculated by respondents on the basis of "full-time equivalent" staff averaged over the year. The categories of employment used are:
 - **Scientists and Engineers:** professionals engaged in the conception or creation of new knowledge, products, methods and systems.
 - **Technicians:** qualified personnel who participate in R&D projects by performing scientific and technical tasks, normally under the supervision of professional scientists and engineers. They will usually have a scientific or engineering qualification.
 - **Administrative and Other:** other supporting staff, including skilled and unskilled craftsmen, secretarial and clerical staff participating in R&D projects or directly associated with such projects.

Definitions

Research and Experimental Development (R&D)

R&D and related concepts follow internationally agreed standards defined by the Organisation for Economic Co-operation and Development (OECD) and published in the Frascati manual. R&D is defined as 'creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture, and society and the use of the stock of knowledge to develop new applications'.

R&D performed in the business

This refers to R&D performed in the UK within business enterprises. It excludes R&D funded by UK businesses that is performed overseas or in other sectors of the UK economy (such as higher education, government departments, agencies and non-departmental public bodies, local authorities, and private non-profit organisations). Public corporations are regarded as business enterprises.

Product Groups

The broad product groupings are the divisions of the detailed product groups. 'Services' includes R&D consultancy and other services in support of manufacturing industry.

Employment

Employment is defined by reference to the term of 'full-time equivalent' and excludes part-time. Unemployment is employment less the total workforce.

A full-time equivalent (FTE) employee is defined as the number of hours worked by an employee divided by the number of hours worked by a full-time employee.

A full-time equivalent employee is defined as the number of hours worked by an employee divided by the number of hours worked by a full-time employee. This will usually be a whole number, but may be a fraction.

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Rounding of Figures

13. There may be discrepancies between totals and the sum of their independently rounded components.

General

14. For information on available aggregated data on Research and Development please contact Jane Morgan on 01633 813109, e-mail jane.morgan@ons.gov.uk.
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Summary of figures

12. There may be discrepancies between totals and the sum of their independently rounded components.

General

14. For information on available aggregated data on Research and Development please contact Jane Morgan on 01633 813104, email jane.morgan@ons.gov.uk.

15. Details of the policy for using the release of new data, including a description of the release categories featured on the front page of ONS releases, are available from the press office.

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1

		1990	1991	1992	1993	1994	1995	1996	1997
In cash terms	DLBX	8 318	8 135	8 489	9 069	9 204	9 254	9 362	9 553
In real terms (1995 prices)	DLBC	9 779	9 006	9 096	9 466	9 472	9 254	9 082	9 033
Current prices GDP	DLJIT	562 674	589 836	612 630	647 249	685 805	722 909	764 314	813 672
As a % of GDP		1.5	1.4	1.4	1.4	1.3	1.3	1.2	1.2

Source: Office for National Statistics

		1990	1991	1992	1993	1994	1995	1996	1997
GDP deflator used to convert cash terms to real terms	DLKK	85.1	90.3	93.3	95.8	97.2	100.0	103.1	105.8

2 EXPENDITURE ON R&D PERFORMED IN UK BUSINESSES: DETAILED PRODUCT GROUPS, 1990 TO 1997

										£million
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1 .. denotes disclosive figures.

Source: Office for National Statistics

£million

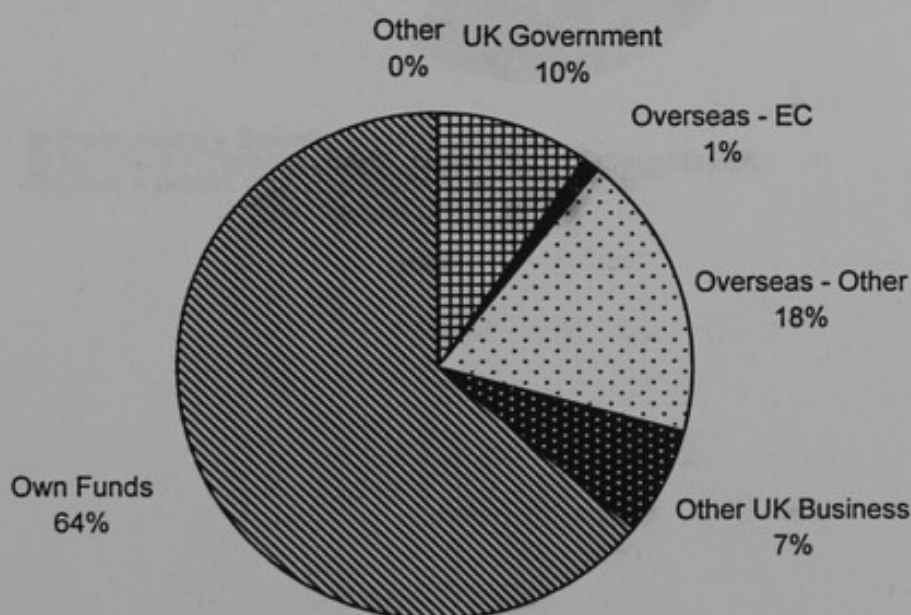
		1990	1991	1992	1993	1994	1995	1996	1997
£ MILLION									
TOTAL	DLBX	8 318	8 135	8 489	9 069	9 204	9 254	9 362	9 553
UK Government	DLDO	1 392	1 189	1 171	1 129	1 088	1 050	899	927
Overseas total of which:	DLHK	1 289	1 299	1 270	1 398	1 474	1 748	2 047	1 856
EC Programmes	DLDQ	-	-	-	104	83	99	140	117
All other funding from abroad	DLDS	-	-	-	1 294	1 390	1 649	1 908	1 739
Other UK Business	DLDU	478	498	565	613	583	731	723	667
Own funds	DLDW	5 160	5 149	5 483	5 903	6 040	5 723	5 688	6 103
Other	DLDY	-	-	-	26	19	3	5	1
		1990	1991	1992	1993	1994	1995	1996	1997
PERCENT									
TOTAL	DLDN	100	100	100	100	100	100	100	100
UK Government	DLDP	17	15	14	12	12	11	10	10
Overseas total of which:	DLHL	15	16	15	15	16	19	22	19
EC Programmes	DLDR	-	-	-	1	1	1	1	1
All other funding from abroad	DLDT	-	-	-	14	15	18	20	18
Other UK Business	DLDV	6	6	7	7	6	8	8	7
Own funds	DLDX	62	63	65	65	66	62	61	64
Other	DLDZ	-	-	-	-	-	-	-	-

1 From 1990 to 1992 source of funds for "other" was included with own funds.

2 - denotes nil, figures unavailable or too small to display.

Source: Office for National Statistics

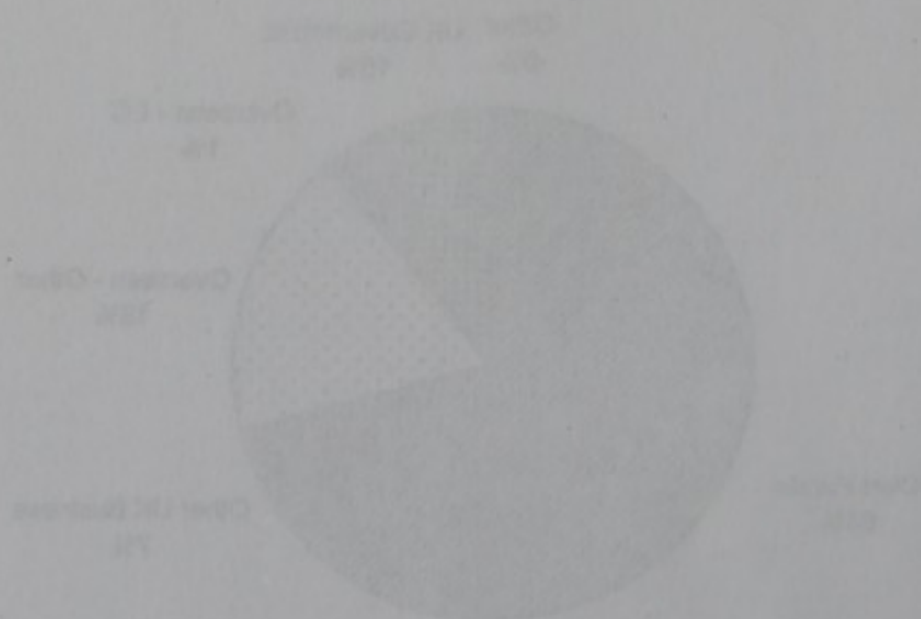
Sources of funds for business R&D, 1997



	1980	1981	1982	1983	1984	1985	1986	1987
TOTAL	1000	1000	1000	1000	1000	1000	1000	1000
Government	100	100	100	100	100	100	100	100
Private Industry	100	100	100	100	100	100	100	100
Financial Institutions	100	100	100	100	100	100	100	100
Other Sources	100	100	100	100	100	100	100	100
Government	100	100	100	100	100	100	100	100
Private Industry	100	100	100	100	100	100	100	100
Financial Institutions	100	100	100	100	100	100	100	100
Other Sources	100	100	100	100	100	100	100	100

1 - Government grants for R&D performed within UK businesses
2 - Private industry grants for R&D performed within UK businesses

Sources of funds for business R&D, 1987



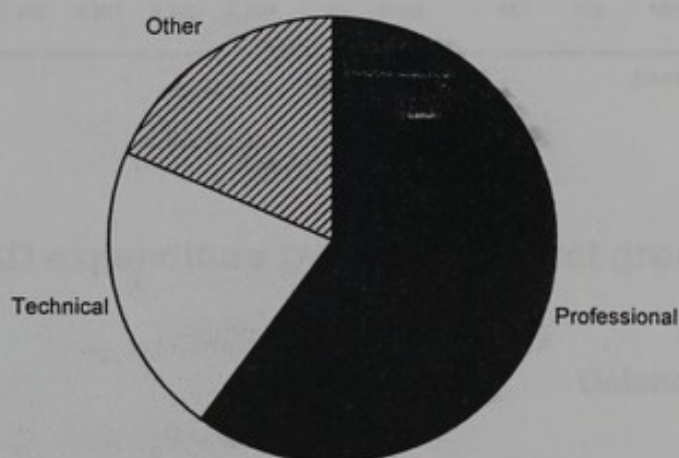
EMPLOYMENT ON R&D PERFORMED WITHIN UK BUSINESSES: 1990 TO 1997

Full time equivalent in thousands

		1990	1991	1992	1993	1994	1995	1996	1997
TOTAL	DLEI	171	159	159	164	157	146	143	139
Scientists and engineers	DLEJ	83	80	82	86	83	83	83	84
Technicians, laboratory assistants and draughtsmen	DLEK	43	38	38	40	40	33	33	30
Administrative, clerical industrial and other staff	DLEL	45	41	39	37	34	30	27	26
As % of total employment									
Scientists and engineers	DLEM	48	50	51	52	53	57	58	60
Technicians, laboratory assistants and draughtsmen	DLEN	25	24	24	24	25	23	23	22
Administrative, clerical industrial and other staff	DLEO	27	26	25	23	22	20	19	19

Source: Office for National Statistics

Employment on business R&D, 1997

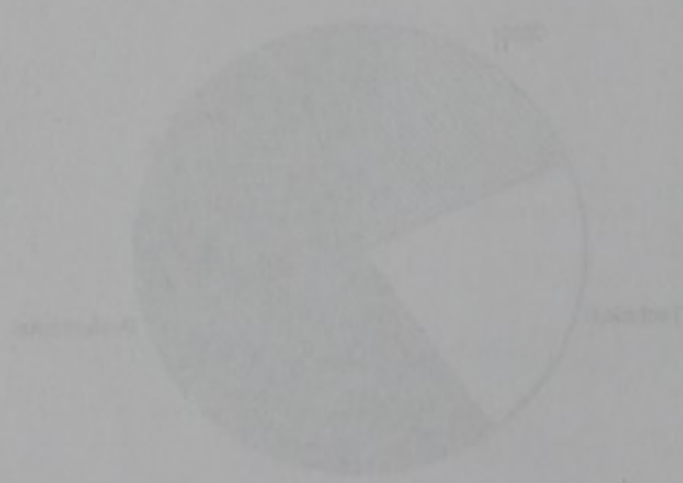


- Professional = Scientists and engineers
- Technical = Technicians, lab assistants and draughtsmen
- ▨ Other = Admin, clerical, industrial and other staff

Year	1960	1961	1962	1963	1964	1965	1966	1967
Total	171	155	158	154	157	162	165	168
Construction	85	80	82	80	83	85	88	90
Maintenance	45	42	43	42	44	46	48	50
Transportation	41	33	33	32	30	31	29	28
Other	0	0	0	0	0	0	0	0
Highway	45	42	43	42	44	46	48	50
Waterway	0	0	0	0	0	0	0	0
Airway	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0

Source: Bureau of Economic Analysis

Employment on road - 1960-1967



Source: Bureau of Economic Analysis

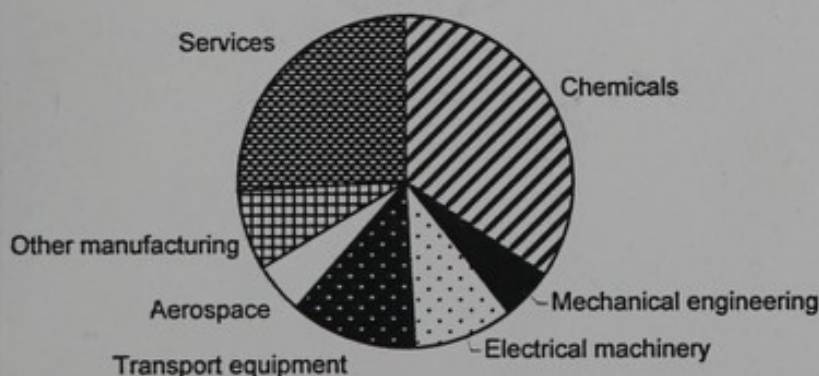
		Civil						Defence						
		1992	1993	1994	1995	1996	1997		1992	1993	1994	1995	1996	1997
In cash terms														
TOTAL	DLBV	7 092	7 710	7 770	7 863	8 065	8 209	DLBW	1 397	1 359	1 433	1 391	1 297	1 343
Manufacturing	DLEP	5 050	5 550	5 534	5 603	5 787	6 094	DLEX	1 254	1 193	1 314	1 291	1 205	1 234
Chemicals	DLEQ	2 238	2 473	2 590	2 511	2 477	2 829	DLEY	20	26	10	3	2	2
Mechanical engineering	DLER	325	398	405	395	395	407	DLEZ	236	246	335	266	210	232
Electrical machinery	DLES	885	999	827	823	896	803	DLFA	357	377	379	423	417	377
Transport equipment	DLET	574	622	661	823	987	994	DLFB	64	59	14	10	10	11
Aerospace	DLEU	403	374	380	413	359	412	DLFC	493	412	481	473	453	481
Other manufacturing	DLEV	625	684	671	639	673	648	DLFD	84	73	95	116	113	131
Services	DLEW	2 042	2 160	2 236	2 260	2 277	2 115	DLFE	143	166	120	99	92	109

		Civil						Defence						
		1992	1993	1994	1995	1996	1997		1992	1993	1994	1995	1996	1997
In real terms (1995 prices)														
TOTAL	DLBA	7 599	8 048	7 996	7 863	7 824	7 762	DLBB	1 497	1 419	1 475	1 391	1 258	1 270
Manufacturing	DLBD	5 411	5 793	5 695	5 603	5 614	5 762	DLBL	1 344	1 245	1 352	1 291	1 169	1 167
Chemicals	DLBE	2 398	2 581	2 665	2 511	2 403	2 675	DLBM	21	27	10	3	2	2
Mechanical engineering	DLBF	348	415	417	395	383	385	DLBN	253	257	345	266	204	219
Electrical machinery	DLBG	948	1 043	851	823	869	759	DLBO	383	394	390	423	405	356
Transport equipment	DLBH	615	649	680	823	958	940	DLBP	69	62	14	10	10	10
Aerospace	DLBI	432	390	391	413	348	390	DLBQ	528	430	495	473	439	455
Other manufacturing	DLBJ	670	714	691	639	653	613	DLBR	90	76	98	116	110	124
Services	DLBK	2 188	2 255	2 301	2 260	2 209	2 000	DLBS	153	173	123	99	89	103

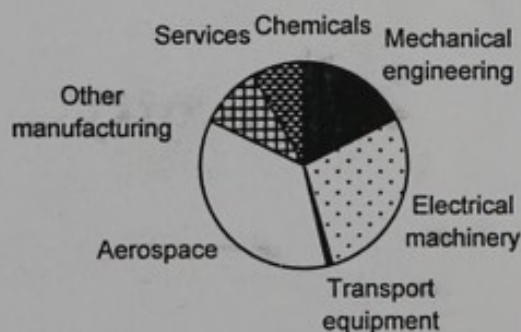
Source: Office for National Statistics

Civil and defence R&D expenditure by broad product groups, 1997

Civil



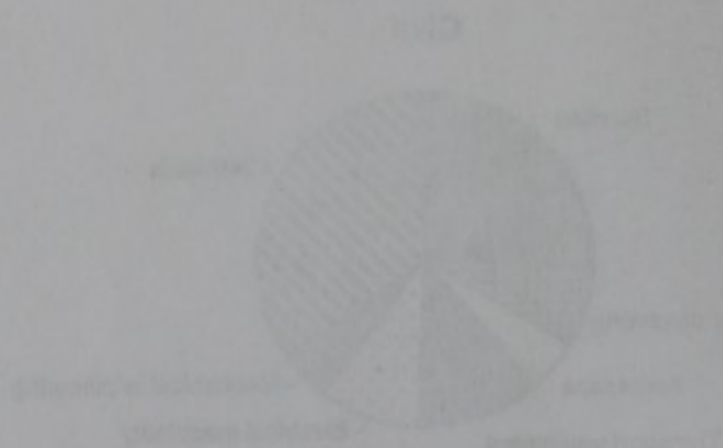
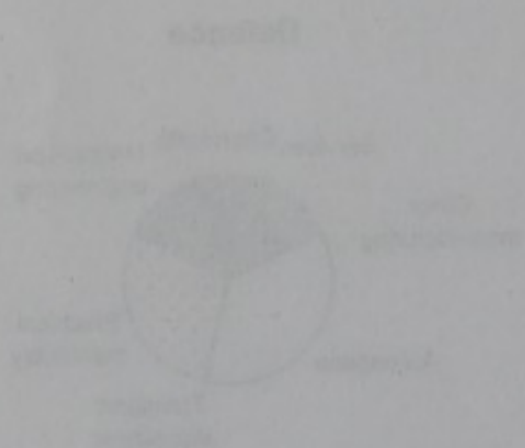
Defence



Product Group	1957									
	1	2	3	4	5	6	7	8	9	10
1. General	100	100	100	100	100	100	100	100	100	100
2. General	100	100	100	100	100	100	100	100	100	100
3. General	100	100	100	100	100	100	100	100	100	100
4. General	100	100	100	100	100	100	100	100	100	100
5. General	100	100	100	100	100	100	100	100	100	100
6. General	100	100	100	100	100	100	100	100	100	100
7. General	100	100	100	100	100	100	100	100	100	100
8. General	100	100	100	100	100	100	100	100	100	100
9. General	100	100	100	100	100	100	100	100	100	100
10. General	100	100	100	100	100	100	100	100	100	100

Product Group	1957									
	1	2	3	4	5	6	7	8	9	10
1. General	100	100	100	100	100	100	100	100	100	100
2. General	100	100	100	100	100	100	100	100	100	100
3. General	100	100	100	100	100	100	100	100	100	100
4. General	100	100	100	100	100	100	100	100	100	100
5. General	100	100	100	100	100	100	100	100	100	100
6. General	100	100	100	100	100	100	100	100	100	100
7. General	100	100	100	100	100	100	100	100	100	100
8. General	100	100	100	100	100	100	100	100	100	100
9. General	100	100	100	100	100	100	100	100	100	100
10. General	100	100	100	100	100	100	100	100	100	100

Civil and defense 1957: a report by broad product groups, 1957



SOURCES OF FUNDS FOR CIVIL AND DEFENCE R&D IN UK BUSINESSES: 1992 TO 1997

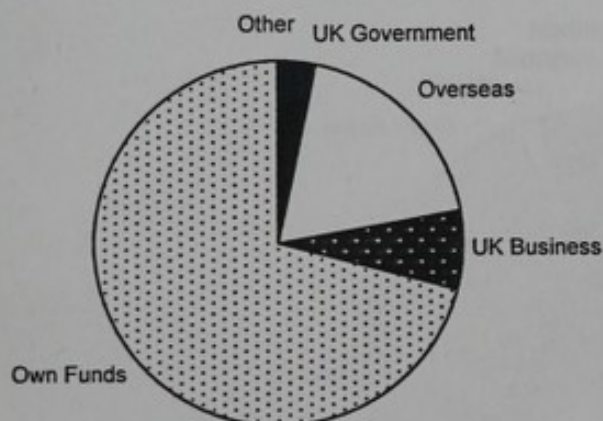
£million

		Civil						Defence					
		1992	1993	1994	1995	1996	1997	1992	1993	1994	1995	1996	1997
UK Government	DLFG	478	390	363	321	253	280	DLFN	693	739	726	729	646
Overseas total	DLHS	981	1 103	1 135	1 419	1 755	1 543	DLIF	289	295	338	329	292
of which:													
EC Programmes	DLFH	—	104	83	99	140	117	DLFO	—	—	—	—	—
All other funding from abroad	DLFI	—	999	1 052	1 320	1 615	1 426	DLFP	—	295	338	329	292
Other UK Business	DLFJ	430	537	505	672	655	580	DLFQ	135	76	78	59	68
Own	DLFK	5 203	5 660	5 749	5 449	5 397	5 805	DLFR	280	242	292	274	290
Other	DLFL	—	20	18	3	5	1	DLFS	—	6	—	—	—
TOTAL	DLBV	7 092	7 710	7 770	7 863	8 065	8 209	DLBW	1 397	1 359	1 433	1 391	1 343

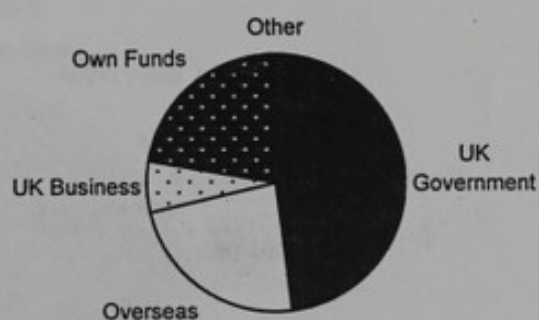
Source: Office for National Statistics

Source of funds, 1997

Civil

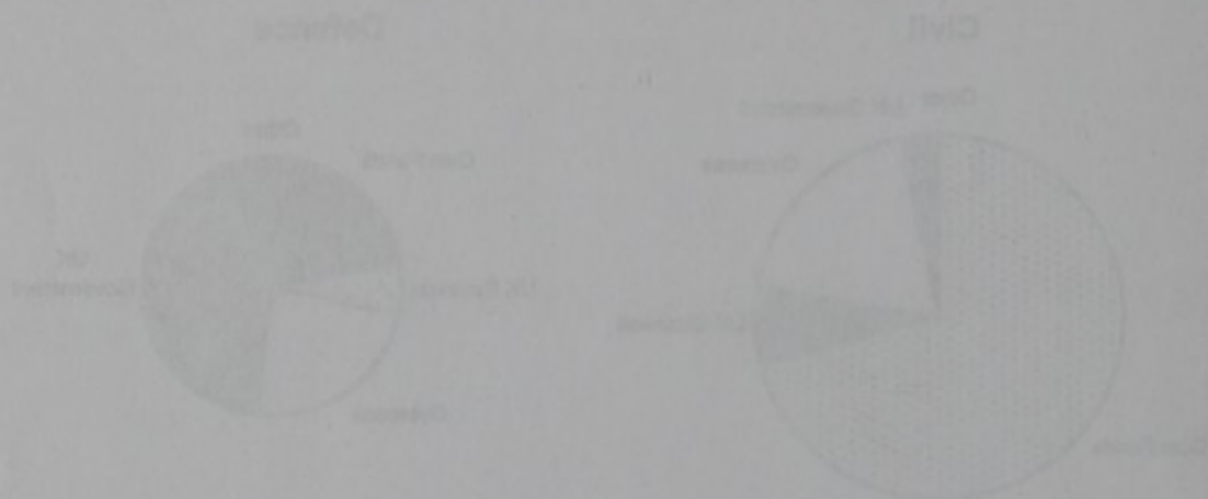


Defence



Source	Civil										Defense									
	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954
Government	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Private Industry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Academic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source of funds, 1937



7 GOVERNMENT OFFICES REGIONAL BREAKDOWN OF R&D PERFORMED WITHIN UK BUSINESSES: EXPENDITURE AND EMPLOYMENT, 1997

		Expenditure £million 1997		% of total 1997		Employment FTE in thousands 1997
United Kingdom	DLKX	9 553	DLDN	100	DLXI	139
England	DLKI	9 003		94.2	DLKJ	129
North East	DLJO	216		2.3	DLJE	4
North West and Merseyside						
North West	DLJT	999		10.5	DLKE	14
Merseyside	DMRG	188		2.0	DMRH	3
Yorkshire and Humber	DLJP	256		2.7	DLKA	6
East Midlands	DLJQ	679		7.1	DLKB	11
West Midlands	DLJN	647		6.8	DLJY	12
Eastern	DLJR	2 303		24.1	DLKC	28
London	DLKL	659		6.9	DLKM	9
South East	DLJS	2 296		24.0	DLKD	30
South West	DLJM	760		8.0	DLJX	12
Wales	DLJU	113		1.2	DLJF	2
Scotland	DLJV	356		3.7	DLKG	7
Northern Ireland	DLJW	81		0.8	DLKH	2

Source: Office for National Statistics

Regional breakdown for business R&D, 1997

