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REPORT

drawn up on behalf of the Committee on Energy, Research
and Technology

on Technology transfer

Rapporteur: Mr Alman METTEN

PE 96.409/fin.

Or. EN

By letter of 18 September 1984, the Committee on Energy, Research and Technology requested authorization to draw up a report on the transfer of technology.

By letter of 14 January 1985, the committee was authorized to report on this subject. The Committee on Economic and Monetary Affairs and Industrial Policy and the Committee on External Economic Relations were asked for opinions.

On 22 November 1984, the Committee on Energy, Research and Technology appointed Mr A. METTEN rapporteur, as well as draftsman of the opinion to the Committee on External Economic Affairs on the restrictions proposed by the USA on the international transfer of technology and the adverse effects of these restrictions on industrial development in the European Community (Doc. 2-721/84), for which this report is considered also the opinion of the Committee on Energy, Research and Technology.

At its meetings of 22 January, 22 April and 15 May 1985, the Committee on Energy, Research and Technology considered the draft report. It adopted the motion for a resolution as a whole on 16 September 1985 unanimously.

The following took part in the vote: Mr PONIATOWSKI, Chairman; Messrs SÄLZER, ADAM, and SELIGMAN, Vice-Chairmen; Mr METTEN, rapporteur; Messrs BONACCINI (deputizing for Mr VALENZI), CROUX (deputizing for Mr ESTGEN), FORD (deputizing for Mrs LIZIN), KILBY, KOLOKOTRONIS, LINKOHR, MALLET, MÜNCH, RINSCHÉ, SPATH, STAES, TURNER, Mrs VIEHOFF.

The Committee on Economic and Monetary Affairs and the Committee on External Economic Relations have decided not to deliver an opinion.

The report was tabled on 24 September 1985.

The deadline for tabling amendments to this report will be indicated in the draft agenda for the part-session at which it will be debated.

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The Committee on Energy, Research and Technology hereby submits to the European Parliament the following motion for a resolution together with explanatory statement:

A .

MOTION FOR A RESOLUTION

on technology transfer

The European Parliament,

- having regard to the motion for a resolution by Mr LINKOHR on the restrictions imposed by the USA on the international transfer of technology and the adverse effects of these restrictions on industrial development in the European Community (Doc.2-721/84),
 - having regard to the report of the Committee on Energy, Research and Technology on the transfer of technology (Doc. A 2-99/85),
- A. whereas scientific and industrial progress is based on the free exchange of ideas, know-how and information,
- B. whereas there is considerable interlocking between science and industry in Western Europe and the USA as witnessed, among other things, by the large number of post-doctoral students and leading scientists of European origin in the USA and the fact that output by American companies in Western Europe exceeds total US exports, and in that a technical lead in any field obtained anywhere in the West is taken up by all industry in the West,
- C. whereas there has been growing concern in the USA since the mid-seventies that the availability of western technology to the Soviet Union will increase the defence capacity of the Soviet Union,
- D. whereas the USA is to an increasing extent keeping technology secret and imposing export controls and contractual restrictions on the disclosure of information and that, as a result, her West European allies are also experiencing difficulties or delay in obtaining American technology to their

commercial detriment in addition to the detriment they suffer from interference with their exports from and imports to the USA,

- E. whereas American legislation on export controls is broader in scope than similar legislation elsewhere and includes provisions on re-export from other countries,
- F. whereas a growing number of forms of technology are suitable both for civil and military applications,
- G. whereas, since the mid-seventies, the civil applications of new technologies have increasingly outstripped the military applications, that, accordingly, control over military technology can be ensured only by extending control over civil technologies and that this is a development that is in the process of being completed in the USA, among other things, in respect of the technologies included on the METAL list,
- H. whereas US Government policy is officially justified as aimed solely at preventing militarily critical technology from becoming available to the Eastern bloc and not all technology with military applications,
- I. whereas in practice, however, the USA is indeed endeavouring to prevent the Eastern bloc from acquiring any technology with military applications,
- J. whereas the USA benefits primarily from the sale of cereals to the Eastern bloc, the economic significance of European exports to the Eastern bloc is primarily industrial, and they are achieved as a result of competition among industrialised states,
- K. whereas the European NATO allies have, in the context of COCOM, agreed under American pressure to a significant extension of the lists of goods and know-how which may not be exported to the Eastern bloc and that these allies have undertaken to honour these embargo agreements,
- L. whereas, over and above these multilateral embargo agreements, the USA operates additional embargo lists on a unilateral basis and that Western Europe is thereby, in practice, also affected by a US embargo, particularly in respect of technological products which it is prepared, unlike the USA, to supply to the Eastern bloc,

- M. whereas under American domestic law the legal definition of exports is such that exports from the EEC are also subject to American legislation where they incorporate American components or technology resulting unjustifiably in a claim to extra-territoriality of American legislation,
- N. whereas this has drastic consequences for American multinationals in Western Europe which virtually without exception manufacture high-technology products and that these products are not eligible for export to the Eastern bloc,
- O. whereas, as a result of the extraterritorial operation of US export legislation, European multinationals, for which the USA is important either as a supplier of know-how or components or as an outlet for their products, avoid the Eastern European market where this clearly jeopardises both their supplies from America, and even more important, juridically, their proper freedom of sales there,
- P. whereas, according to a recent CIA estimate, 70% of the militarily useful technology acquired by the Soviet Union is acquired contrary to the above-mentioned US laws and that it has not been able to stop the transfer of new technology generally agreed to be deleterious to western defence,
- Q. whereas the foregoing factors have led rightly or wrongly to a common view in Europe that US provisions which exceed those agreed by COCOM are in part motivated by general national commercial considerations emanating from political rather than business circles,
1. Notes that the imposition of unilateral controls by the USA on the transfer of technology over and above the multilaterally agreed COCOM monitoring arrangements can only be assumed to be intended to restrict Western Europe's access to American technology on normal commercial terms and is contrary to good neighbourly national policy among allies;
 2. Notes that the economy of Western Europe suffers more damage from the statutory and contractual imposition of secrecy and from US legislation on export controls than does the military strength of the Eastern bloc, which is able to obtain the technology it wants by methods which contravene US law; western undertakings are, however, dependent on ways of acquiring technology in accordance with US law;
 3. Notes that, while it is true that the USA is most concerned about the consequences of Western technology unintentionally being made available to the Eastern bloc, it is predominantly Western Europe that has to bear the burden of the restrictive policy resulting from such concern;

4. Is of the opinion that the controls on the transfer of technology between COCOM members themselves and between COCOM members and third countries that undertake to respect the COCOM rules should be dismantled as swiftly as possible and that the efforts undertaken in COCOM should be aimed at ensuring proper observance of the controls agreed on under national legislation;
5. Takes the view that controls on the transfer of technology to the Eastern bloc be based solely on agreed technical criteria between the allies as to what is militarily critical technology; it is unilateral and especially indiscriminate proliferation of controls to alleged but not necessarily proven militarily useful technologies that has undermined their effectiveness and confidence in the system and has thus damaged Western unity and the West European economy;
6. Is of the opinion that nationals of, and legal persons in, Community Member States cannot be subject to foreign (non-EEC) legislation;
7. Recommends the governments of the Member States therefore to prepare after mutual consultations legislation to counteract this practice on the lines of the UK Protection of Trading Interests Act of 1980;
8. Takes the view that the best insurance against unilateral restrictions on the transfer of technology from the USA is a Western Europe that also has a great deal to offer the USA in terms of technology; an initial requirement here is a major joint research and development effort by the European Community;
9. Reiterates the need for greater cooperation in the framework of Community research and industrial policy with a view to improving European standards in the field of advanced technology, especially data processing, automation, biotechnology, air and space travel, new materials and telecommunications;
10. Requests the Council and Commission to bring their influence to bear on the USA with a view to achieving an unrestricted transfer of technology between the USA and the Community;
11. Requests the Commission to forward to Parliament and Council a proposal for the principles governing technology transfer to and from undertakings in the European Community;
12. Instructs its President to forward this resolution to the Commission, Council and parliaments of the Member States.

EXPLANATORY STATEMENT

THE IMPORTANCE OF UNRESTRICTED TECHNOLOGY

1. Scientific and industrial progress is based on the free exchange of concepts, know-how and information: the speed and efficiency of exchanges largely determines the pace of such progress, another important factor being the form which exchanges take.

2. Two major handicaps inhibit scientific exchanges within the European Community: firstly, the many languages in which scientific concepts, know-how and information are expressed, since ideas propagate more slowly than in monolingual countries, such as the United States and Japan; secondly, the relatively weak links between fundamental science and industry with regard to applications, as a result of which, in Europe, the route from initial discovery to commercial application is excessively long.

3. Technological development within the Community can be stimulated through specific action to tackle the abovementioned handicaps.

By means of a coordinated policy on translation and on scientific exchange, the Community can attempt to speed up the dissemination of concepts, know-how and information.

Shortening the route from initial discovery to commercial application is chiefly a matter for the Member States.

However, the Commission can play a crucial, stimulative role in this connection, e.g. through the ESPRIT programme, which is setting a precedent for the transfer of know-how, concepts and information, both between the Member States and between the scientific community and industry.

4. Scientific and industrial developments in Europe do not take place in isolation, however: there is considerable dovetailing with the United States in particular. Such interlocking occurs not only in science, which could almost be described as an homogeneous community, but in industry too.

Not only are many leading scientists in the US of European origin, but, in a number of important US university faculties(1), a majority of the postdoctoral students, who are responsible for the most significant research work in higher education, are also foreign (and, of these, most are European). This is indicative of US-European links in science.

The fact that US industrial undertakings in Europe produce more than the total US export is indicative of the economic bonds(2).

The unfettered exchange of scientific knowledge and technology between the US and Europe has boosted the pace of technological and industrial development on both continents.

In recent years, however, problems have gathered on the horizon.

CONCERN AT TECHNOLOGY TRANSFERS FROM WEST TO EAST

5. In recent years, there has been much greater concern at technology transfers to the Communist-bloc countries, particularly in the United States. Four trends have been perceived which prompt this concern(3):

- a. The US lead in a number of important areas of military technology is thought to be waning, despite the fact that the US has relied heavily on military superiority for its security. It is considered that the USSR's relative advances would be impossible without Western technology.
- b. The difference between military and scientific research is thought to be rapidly narrowing, with the result that scientists working to enhance the state of the art may find themselves more closely involved with military applications than is their intention. Moreover, some universities are, of necessity, more concerned with applied research.
- c. More and more new technologies lend themselves to both military and non-military applications (dual use). Commercial interests fund research in micro-electronics, industrial robotics, and cryptography (for computer-file protection) for exclusively non-military purposes. As a result, the US Administration has lost its monopoly over new areas of knowledge; and the traditional control instruments (official classification, and special conditions written into research contracts) are no longer adequate.
- d. As a result of détente in the seventies, there was a vast expansion in trading relations with Communist-bloc countries, and this extended to technology agreements.

Increased concern brought about changes: not only hardware and technical information with obvious national-security implications were subject to controls; this was also extended to technology transfers, which include scientific communications and visits by foreign scientists.

6. In fact, the specific arrangements implemented by the United States in order to restrict technology transfers to the Communist bloc are less than 10 years old(4).

For 20 years after World War II, the US restricted East-West trade in order to force the USSR to utilize resources in its civilian economy which could otherwise have been devoted to weapons programmes. To this end, the Export Control Act was promulgated in 1949, on the basis of which a fairly exhaustive list of restricted commodities of both military and economic significance was drawn up.

This Act was amended in 1962 in order to extend the scope of controls over economically significant commodities: export licences in respect of commodities considered to represent a significant addition to the military or economic potential of a hostile country were automatically withheld.

The thaw in the Cold War set in at the end of the sixties; this was also reflected in a revision of US export-control legislation. Under the 1969 Export Administration Act, the control regulations were reviewed and the list of restricted commodities was shortened by deleting products of purely economic significance or of marginal military importance. As a result, trade between the US and the USSR, which had traditionally lagged behind Europe's trade with the East, flourished. However, attainment of strategic parity by the USSR in the mid-seventies gave serious cause for concern in defence circles.

According to the US Department of Defence, one of the prime reasons for USSR attainment of parity was that Western technology had become too readily available. Technological superiority was - and still is - the basis for the military strength of the West, and of the United States in particular, vis-à-vis the Communist bloc; in terms of leadtime, it was waning, though still considerable.

7. As part of a further review of the Export Administration Act, it was decided in 1979 to concentrate controls on technology itself rather than on products derived from technology, with a view to restricting the availability of US technology in particular. The technologies concerned were entered on a Militarily Critical Technology List (MCTL)(5). This comprises:

- a. arrays of design and manufacturing know-how,
- b. keystone manufacturing, inspection and test equipment, and
- c. products accompanied by sophisticated operating, application and maintenance know-how

which are not already available to countries subject to export-control arrangements and which, if exported, would permit a significant enhancement of military facilities operated by such countries.

8. Though not yet incorporated into the US Department of Commerce's Commodities Control List (CCL), on the basis of which the Export Administration Act is implemented, the MCTL does play a major role as a source and reference document(6) during reviews of the CCL, the Munitions List and the CoCom lists. (See below.)

The influence of the Bucy report ('An Analysis of Export control of US Technology - A DoD Perspective') on changes in US policy on technology transfers has been crucial, and its conclusions have been incorporated into the 1979 Export Administration Act. In this report, a fundamental distinction is made between militarily critical and militarily applicable technology - a distinction disregarded by the Pentagon when drawing up the MCTL.

As a result, the MCTL has expanded into a 700-page opus, and even includes the materials required to implement the technologies concerned.

The Bucy report reaches the conclusion(7) that access to a technology which may result in evolutionary, or slow, advances need not be restricted, but that every effort should be made to maintain the United States' strategic leadtime through an export ban if a certain country would enjoy revolutionary, or very rapid, advances as a result of the availability of a particular technology. The reasoning behind this is that technological leadtime is extraordinarily brief: it quickly evaporates once there is greater awareness of fundamental concepts and know-how and they are applied on a larger scale; a country that has fallen behind can itself narrow the gap without recourse to formally agreed transfer arrangements, because it can benefit from the general spread of technology in addition to its own efforts(8).

TECHNOLOGY TRANSFERS WITHIN THE WEST: CONTROLS AND RESTRICTIONS

9. The US Export Administration Act defines technology as the information and know-how that can be applied to design, produce, utilize or reconstruct goods, including software and technical data, but not the goods as such(9).

To judge from the references to military-critical technologies in the Export Administration Act, however, this definition does indeed cover commodities too, i.e. 'keystone manufacturing, inspection and test equipment' and 'goods accompanied by sophisticated operating, applications, or maintenance know-how'(10).

In addition to the abovementioned products, the Military Critical Technologies List, called for in the 1979 Export Administration Act, also includes 'keystone equipment necessary for the effective application of a significant array of technical information and know-how'(11).

The MCTL, though lacking statutory status, is of fundamental importance as a source work and reference framework for all US export-control instruments(12). Thus we shall use the definition of technology contained in the MCTL, though this does not imply endorsement thereof.

Technology is therefore taken to mean both commodities and technical know-how.

10. The US restricts technology transfers at three levels. Classification is the most wide-ranging method(13); this applies to 'scientific, technological or economic matters relating to the national security' and to 'cryptography'. Only information 'owned by, produced by or for, or is under control of the United States' government may be classified. In 1982, government policy on classification was drastically tightened up(14). Restrictions must now be imposed in all cases, even where the need for classification can reasonably be doubted. In addition, the government has expanded the number of categories of potentially classifiable information; hitherto freely accessible information may now be classified.

The table below (1979 to 1983 inclusive) illustrates the scope of restrictions, as indicated in reports for the Department of Defence:

Source	Total	Classified(%)	Restricted(%)	Unrestricted(%)
Defence laboratories	61,694	12	44	44
Universities	23,119	1*	4	95
Industry	32,806	21	35	44
Non-profit-making organizations	<u>5,609</u>	<u>17</u>	<u>15</u>	<u>68</u>
TOTAL	123,228	13	33	54

* Research institutes linked to universities

Under the 1951 Invention Secrecy Act(15), patent applications by private individuals can be classified too, however, as has occurred more and more frequently in recent years.

11. Export-related legislation(16) forms the second level at which technology transfer is restricted: the 1976 Arms Export-Control Act and the 1979 Export Administration Act.

The export of defence-related articles and services is controlled via the Arms Export-Control Act and the related regulations, the International Traffic in Arms Regulations (ITAR). The US Munitions List specifies what commodities are controlled; this mainly catalogues military commodities, but also refers to technical data related to the 'design, production, manufacture, repair, overhaul, processing, engineering, development, operation, maintenance or reconstruction of implements of war on this list' and 'any technology that advances the state of the art or establishes a new art in any area of significant military applicability'(17).

Under this Act, the definition of exports is so broad as to include the disclosure of information by US citizens on visits abroad, as well as the disclosure of information to foreign visitors to the US. Prior export authorization is required in respect of all commodities and technical information on the Munitions List and in respect of all recipients(18). As far as most scientific communication is concerned, the only significant exception is information that has already been published and is freely accessible.

12. The 1979 Export Administration Act and the relevant regulations govern control arrangements in respect of goods and scientific information in the light of national security, foreign policy, and scarcity(19). The severity of export controls is dependent on the type of commodity - the characteristics of commodities for special consideration are given in the Commodity Control List (CCL) - the country of destination and the end use.

An export licence is required for all goods and commodities to be exported, and this applies equally to technical data.

Most exports are covered by a general licence, which is comparable to an exemption from compulsory application; other goods (and technical information) are covered by a validated licence, which must be formally applied for. The Department of Commerce, which implements the Export Administration Act,

receives approximately 140,000 export-licence applications every year(20), 90 percent of which are related to trade with non-Communist countries; and almost all are approved. Routine transactions are processed in about five weeks; others may take six months or longer. Trade with non-Communist countries under validated licences is worth approximately US\$ 30,000 m per year. The Commodity Control List specifies, in respect of more than 100,000 items, which countries may not receive exports without a validated licence.

13. The Export Administration Act is also extraterritorial in effect, since it specifically prohibits the unauthorised re-export, diversion and transiting of commodities or technical data. As long as goods or technical data of US origin are affected, it is illegal for any US or foreign citizen to export to a non-US-approved destination. In addition, the re-export ban also extends to:

1. products manufactured outside the US on the basis of technical data originating in the US;
2. products manufactured under licence from a US undertaking;
3. assembled or manufactured products containing one or more components of US origin(21).

Because of the system of export licences, application of the re-export clause is unavoidable. A US exporter issued with a general export licence must present a sworn Shipper's Export Declaration at the US customs office processing the shipment. This statement must not only specify the type and quantity of the commodities, but also contain the names and addresses of all parties involved in the transaction and indicate the final destination and the end consignee. In the case of validated licences, the end use of the product (or of the technical data) must be specified in addition to the country of final destination and the end consignee. Usually, therefore, not only the shipper's own declaration, but also the end-use declaration by the end purchaser or consignee must be presented(22). In general, consequently, exports from one country to another of commodities containing a component of US origin require prior authorization in writing from the relevant US authorities.

14. Export controls in respect of technical data are analogous to those pertaining to commodities(23). For exports of unpublished technical data to Communist-bloc countries, a validated licence is always required. In respect of freely available technical data, a GTDA licence is issued (GTDA = General, Technical Data Available All Destinations), while a GTDR licence (GTDR = General, Technical Data Under Restriction) is required for exports of information on most aspects of non-military, industrial process technology.

Information in the latter category may only be exported to non-Communist countries. In certain cases, a shipper will be asked to provide a written undertaking by the importer or the end user that the data will not be re-exported to destinations in the Communist bloc(24). The definition of 'release of technical data' under the Export Administration Act is very broad, and covers:

1. visual inspection by foreign nationals of US equipment and facilities;
2. oral exchange of information in the US or abroad;
3. application to situations abroad of personal knowledge or technical experience required in the US(25).

15. Curbs on the publication of research findings, written into research contracts(26), form the third level at which technology transfer is restricted. Although, formally, research institutes enter into voluntary agreements - there is no obligation to accept the conditions - they are unable to put up much resistance in practice: 75 percent of their resources are derived from Federal Government contracts, chiefly from the Pentagon. It is significant that this concerns non-classified research. In January 1985, the Department of Defence was further empowered to withhold publication of about 20 percent of the findings from the non-classified technological research commissioned by it(27).

IMPLICATIONS OF US CONTROLS FOR EUROPEAN INDUSTRY

16. US restrictive regulations affect European industry in three respects: through the extraterritorial nature of US export-related legislation, difficulties in obtaining US Government R & D contracts, and more restricted access by non-US citizens to US scientific communications. The extraterritoriality of US legislation is the most significant problem. One of the consequences of the extraterritoriality of US export-related legislation is that, according to US law, European undertakings must check on the status of intended transactions before they can act(28). A second consequence is that European undertakings must inquire whether the other parties involved in a transaction have complied with relevant US legislation and whether, for example, US-blacklisted undertakings or persons are involved.

These serious handicaps increase the burden on all but the very large undertakings. Generally, large undertakings will attempt to obtain the

requisite licences via their components or technology suppliers in the US, since they will have a better idea of how to approach the relevant US authorities, and will also be in a better position to obtain end-user declarations, estimate their worth and ensure that such declarations are forwarded. This also accounts for the fact that the Department of Commerce considers them to be more trustworthy trading partners than small undertakings.

In terms of sales and component supplies, the US market is important to many large enterprises; consequently, not to sell to the Communist bloc is a deliberate policy in the global strategy of many such undertakings. According to a spokesman for the Dutch concern Philips(29), they intentionally refrain from supplying the Communist bloc with sensitive products and gear themselves to perfectly harmless sectors. According to this spokesman, a major reason for Philips' attitude is its desire to avoid all difficulties with the US, where 28 percent of its turnover is generated.

Since the US domestic market for high-technology products is much larger than Europe's, exports are much more important for European undertakings in order to recover R & D expenditure in a fast-changing sales environment. Actions that hamper export sales may have very grave implications for small undertakings.

17. For historical and geographical reasons, moreover, Europe's trade with the East is much greater than the United States'; the composition is also different. In 1984, Western Europe's exports to Eastern Europe - industrial goods in the main - were worth US\$ 28,200 m(30). Of total West German exports, 25 percent of metalworking machinery, 40 percent of mining equipment, 10 percent of textile machinery and 20 percent of shoemaking and leather-working machinery went to the Communist bloc, thus illustrating the significance of Eastern Europe for certain branches of industry.

In 1984, US exports to the communist bloc amounted to only US\$ 5,000 m, however, and mainly concerned grain supplies. Thus, US restrictions on the (re-) export of commodities to the Communist bloc have much more serious implications for West European exports than for those of the United States itself.

It is therefore of much greater concern to Western Europe than to the US that US controls and restrictions on exports to the East should not be excessive. Such contrasting interests find an outlet in the Coordination Committee (CoCom), in which the US, its NATO allies (except for Spain and Iceland) and Japan lay down a joint policy on exports to the Communist bloc.

This intergovernmental forum, which was set up in 1949, long led a fairly restful existence, though, under US pressure, its activities have increased dramatically in recent years.

Not only has there been a substantial enlargement of the lists of jointly controlled commodities - according to press reports, hundreds of applications for export licences have been rejected that would have been granted in former years - but export-monitoring arrangements have been tightened up considerably too(31).

According to an official US source, a significant proportion of the essential equipment and materials included in the Department of Defence's Military Critical Technologies List (MCTL) was incorporated by CoCom into its lists as part of its latest review. This same source indicates that the know-how clusters contained in the MCTL are currently being sifted to serve as the basis for US technological-control proposals at future CoCom negotiations.

18. Although the reaction of the Federal Republic of Germany in particular, after the most recent review, was that sufficient progress had again been made, it was recently agreed that the review of the CoCom lists would no longer take place every three years but that one out of every three CoCom lists would be reviewed every year(32).

With regard to the European position, the statement by the Dutch State Secretary for Trade that the Dutch Government 'frequently lacks the technical knowledge to assess the precise significance to technology exports of CoCom's proposed embargoes'(33) is alarming.

Equally alarming for Europe is the fact that, despite the CoCom agreements, the US sees no reason to lift the unilateral restrictions on exports to CoCom states. On the contrary, it has even been stated that CoCom states should also be subject to controls and restrictions because US control lists are more comprehensive than CoCom's(34). The rules for implementing the CoCom agreement of June 1984 entered into force in the US on 31 December 1984. In the US, the broadly based Industry Coalition on Technology Transfer (ICOTT), which comprises virtually all employers' associations in the high-tech sector, opposes these rules. It is feared that application of these rules will cause a dramatic increase in the number of applications for licences by private individuals(35).

19. A major handicap for foreign undertakings wishing to obtain R & D contracts from the most important commissioning authority in this field, the Pentagon, is the classified nature of many of the projects involved(36). Subsidiaries of foreign undertakings are only considered for such contracts if they are effectively 'insulated' against foreign influence. 'Insulation' must mean that foreign shareholders are excluded from day-to-day management and are thus denied access to classified technical data.

In practice, virtually all R & D contracts are awarded to US undertakings. Gigantic sums are involved: almost US\$ 22,000 m in 1984.

In this respect, the Pentagon would appear to play the same role vis-à-vis industry as the trade and industry ministry (MITI) in Japan. The Pentagon's R & D budget for 1985 already amounts to US\$ 35,000 m, or 65 percent of total research-related expenditure by the Federal Government(37). In the United States, a much larger proportion of total R & D expenditure is borne by the government than in other major industrialized countries (55 percent in 1979). The role of the Pentagon vis-à-vis US industry:(38):

- (a) It helps to develop new products before a market for them emerges,
- (b) By defining its own standards, it makes a crucial contribution towards standardization of equipment, tools and instruments,
- (c) It enables manufacturers to cooperate on a reliable basis, thus helping them to circumvent anti-trust legislation,
- (d) Through its own procurement policy, it ensures proper coordination and distribution of responsibilities among manufacturers. By obtaining a major contract, an undertaking will be able to acquire so much expertise in the field concerned that it will be practically impossible for it to lose its lead over other enterprises. In very many fields, therefore, the Pentagon determines which undertakings develop and thrive in which areas. This distribution of responsibilities at an early stage helps to prevent undertakings from devoting an excessive level of their resources to duplicated projects and thus from wasting their efforts.
- (e) It bears the development risk in respect of research projects where the chances of a successful outcome are so slim that such a risk could not be borne by undertakings.
- (f) It offers a safe market and, moreover, guaranteed profits in respect of a substantial proportion of total production, thus permitting undertakings to be more competitive in the civilian marketplace too. Between 1982 and 1987 inclusive, the Pentagon will have spent US\$ 1,500 m on armaments,

with an ever greater emphasis on high-technology products; procurement will mainly be handled on a 'cost plus' basis, i.e. production costs plus an agreed profit margin.

- (g) It protects US manufacturers against fierce foreign competition. If necessary, the Pentagon calls for protectionist measures to prevent dependence on foreign suppliers in respect of products with significant defence-related applications. Recent instances of this have involved 64-K RAM chips and a civilian glass-fibre project, the suppliers concerned having been Japanese in both cases.

20. The only body in Europe that would be able to play a role comparable to that of the Pentagon in the US and MITI in Japan is the Commission. Although the Commission, as a civilian body, is less able to command major funding than the Pentagon, it is more able to implement an industrial policy: to conduct military R & D and a military procurement policy is a roundabout method of implementing an industrial policy; moreover, there has been a change in the relationship between civilian and military technological development since the mid-seventies(39). At the start of the seventies, projects were developed specifically for military applications before being seized upon by the commercial market. In the mid-seventies, the commercial sector took the lead in introducing new products, which the military would seize upon shortly afterwards. In the eighties, this trend has become much more pronounced, though there is clearly a limit to the rate at which new products can be launched by the commercial market. According to Lionel Olmer, US Assistant Secretary for International Trade, the defence sector requires six to seven years to incorporate a new technology such as very-high-speed semiconductor IC's into new weapons systems in the field, while the time lag for incorporating a new semiconductor technology into a commercial product is between six months and two years only(40). According to Data General spokesman Brad Stoup, today's commercial technology is five to ten years ahead of military capabilities(41). Increasing pressure from the Pentagon with a view to controlling commercial technologies is motivated not only by the military-applications potential, but also by the commercial sector's technological lead over the military. As a result of this trend alone, access to commercial technologies originating in the US will become more and more restricted. For this reason, and because such technologies represent the leading edge of knowledge, a beneficial and necessary industrial strategy for Western Europe will consist in concentrating on the enhancement of such technologies.

AN EXPANDING ROLE FOR THE PENTAGON: THE DANGERS

21. Within the US political power structure, the Pentagon's view of the risks to American security is the most comprehensive. The Department of Commerce and the State Department, implementing the Export Administration Act and the Arms Export-Control Act respectively, act, to a certain extent, as a moderating counter-balance. From the American society the counter-balance to the all-embracing security concept of the Pentagon comes from parts of industry for the exports controls on commodities and from the academic world, where restrictions on scientific communications are involved.

Although last year's review of the Export Administration Act in the US Congress resulted in a stalemate between the Senate and the House of Representatives, differences centred chiefly on the degree to which export-control regulations should be tightened up. The role of the Pentagon in monitoring trade within the West was a major controversial issue, however.

Despite the fact that the relevant legislation has not been amended, which, in the US, is the prerogative of Congress, the Pentagon is playing an increasingly important role in investigating trade within the West. On the basis of recent amendments to the export-control regulations, adopted by the Administration, the Pentagon is empowered to conduct a systematic investigation of all high-technology exports to 15 non-Communist countries (whose identities are classified; but it is assumed that no CoCom state is involved)(42). According to the Pentagon, which views this decision as an important victory, this signifies that security considerations will play a larger role in export policy.

22. In addition to its increasing role in industrial policy, as mentioned above, two developments in the field of information gathering have placed the Pentagon in a crucial position with regard to technology.

Firstly, the Defence Intelligence Agency (DIA) has conducted an assessment of the availability outside the US of technology, commodities, services and munitions(43). The final product, a database designated SOCRATES, is a readily accessible, up-to-date source of intelligence estimates of the capacity of technically significant countries - not merely the Warsaw Pact states, but non-Communist countries too - to develop, produce and utilize the technologies included in the MCTL. The assessments are expressed in years of leadtime or lag vis-à-vis the US, relative to the US's development time, and catalogue the capital resources determining the technological capacity of each

country. The assessments are microsurveys.

One of the implications of this database, once it has been completed, will be that the US will have a detailed technological overview of Europe, though such a complete survey will not be available to Europe itself.

23. The creation of a Military Significant Emerging Technologies Awareness List (METAL) has been the second development(44). The term 'emerging technology' is used to describe significant advances from one stage to the next in technological development. In science, this refers to the process by which a technology, if demonstrably feasible in principle, progresses from the research stage to the development stage, in which it will be applied to solve a practical problem. The METAL list contains seven to ten technologies which are currently emerging from the scientific stage and might be applicable to military systems. The Pentagon is monitoring the progress of these technologies closely, with a view both to gearing its own R & D to them (if they prove to be militarily attractive) and to including them on the MCTL as soon as they emerge from the development stage.

As a result of emerging technologies in the US being placed under the supervision of the Pentagon, access to them by the commercial sector will be difficult and, at best, delayed. Indications to this effect have already been received from chip manufacturers collaborating with the Pentagon in the development of very-high-speed semiconductor IC's(45).

CURBS ON SCIENTIFIC COMMUNICATIONS

44. Technology is to be found not only in products, but also in scientific publications (and, in the form of knowledge, even in the heads of scientists and engineers). Therefore, US controls and curbs on technology exports (Export Administration Act and Arms Export-Control Act) extend to technical data contained not only in all manner of publications but also in oral communications, whether abroad or to foreign visitors in the US.

Scientists in the US point out that this total preoccupation with national security may yet backfire(46): unhampered communications between scientists is an essential factor in scientific progress; curbs hamper scientists' critical investigations; errors go undetected longer.

Furthermore, science is a cumulative activity: all scientists build on the work of others. Thus, freedom of information is the basis for further scientific progress and prevents needless duplication(47).

To aspire to security by curbing exchanges of ideas and information leads only to a reduction in the pace and effectiveness of research efforts and to delays in progressing from research to implementation(48).

Moreover, the research community is international: in recent years, no more than 37 percent of the articles in the more than 2000 separate scientific periodicals were written by US citizens; only 21 percent of the chemistry articles and 30 percent of the physics articles had US authors. In addition, dependence on foreign research findings has increased in recent years(49).

Scientific conferences and symposia also play an important role in communications, permitting scientists to exchange their findings more quickly than through publications and to obtain immediate reactions and ideas from their colleagues. The informal exchange of ideas, which is characteristic of such conferences, may lead to significant changes in research, cooperation efforts and to the avoidance of duplication. Because such meetings frequently attract the leading researchers in a given field, and are productive for all concerned, they often draw an international audience(50).

Scientists and their students hold the same type of informal discussions at university: it is not without reason that the percentage of foreign doctoral students in the US rose considerably in the seventies (25-40 percent in a number of crucial natural and engineering sciences), while the percentage of foreign students among postdoctoral researchers rose to as much as 50 to 60 percent in the same disciplines(51).

25. The US conducts a policy which, to an ever greater extent, prevents the publication of scientific articles, causes papers to be withdrawn from symposia or makes it impossible for scientists to attend such meetings, and refuses foreign students admission to university courses. In doing so, the US is not only undermining the basis of its own progress, however, which it owes to scientific achievements rather than to secrecy; rather, it is also souring considerably the good relations enjoyed with friendly nations in Europe.

The disquieting aspect of this entire development is the fact that it is articles and conferences dealing with unclassified information that are being interfered with and that this is taking place not on the basis of a security inquiry, but in the light of individuals' nationalities(52).

26. It is the responsibility of the European Community's institutions and of the Member States to point out to the US

- . that it is unacceptable for the US to declare its legislation enforceable on the territory of its allies. If measures need to be taken by its allies in the light of security or foreign-policy considerations, consultations constitute the means to achieve the objectives concerned. In the security field, the appropriate forum for consultations is CoCom. However, it is in no way appropriate for the US first to obtain major concessions from its allies in such consultations and then, however, to apply additional, bilateral controls that also affect these allies. Agreed multilateral controls imply the abolition of unilateral controls.
- . that the pace of scientific progress is dependent on the proper organization and unhampered exchange of scientific information. Barriers in this area not only impede scientific progress; they also compel Europe to conduct its own research, overlapping and wasted effort being an unavoidable outcome. Mutual rivalry, unlike cooperation, benefits neither Europe nor the United States. If the US does not adopt a cooperative attitude on technology transfers to Western Europe, Europe will have no alternative but to compete.

The further review of the Export Administration Act, with a view to amendment presents, a timely opportunity to assess US intentions. A follow-up to this report may then be desirable.

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